SOUTH FORK LITTLE BUTTE FOREST MANAGEMENT PROJECT

BLM

Medford District Office

July 2015

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

ENVIRONMENTAL ASSESSMENT

DOI-BLM-OR-M060-2015-0001-EA

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Medford District Office
3040 Biddle Road
Medford, Oregon 97504
email address: BLM_OR_MD_Mail@blm.gov

IN REPLY REFER TO:

1792(ORM060)

JUL 2 2015

Dear Interested Public:

The attached *Environmental Assessment* (EA) for the South Fork Little Butte (SFLB) Forest Management Project is now available for a 30-day public review. The EA is also available electronically on the Medford District Bureau of Land Management (BLM) website at http://www.blm.gov/or/districts/medford/plans/index.php and on the SFLB Project website at http://www.blm.gov/or/districts/medford/plans/south/index.php.

The Bureau of Land Management, Ashland Resource Area, proposes to implement the SFLB Forest Management Project, designed to implement specific Management Objectives consistent with the 1995 Medford District Resource Management Plan (RMP). The BLM is proposing forest management activities on 2,488 acres of BLM-administered lands within the Lower and Middle South Fork Little Butte Creek Sub-watersheds of the Little Butte Creek Watershed. The Project would also include temporary and permanent road construction (3.04 miles and 0.80 miles respectively), road decommissioning (4.05 miles) and long-term closure of existing roads (7.27 miles), road renovations, and road improvements along haul routes.

We welcome your comments on the content of the EA. We are particularly interested in comments that address one or more of the following: (1) new information that would affect the analysis, or (2) information or evidence of flawed or incomplete analysis. Specific comments are the most useful. **Although comments are welcome at any time, comments are most useful if received by 4:30 PM on August 3, 2015.**

All comments should be made in writing and mailed or delivered to Kristi Mastrofini, Acting Field Manager, Ashland Resource Area, 3040 Biddle Road, Medford, OR 97504. Please note that all written submissions from private individuals in response to this notice, including your name, address, telephone number, email address, or other personal identifying information may be made available for public inspection and disclosure, unless you specifically request confidentiality. If you wish to withhold your personal identifying information from public review or disclosure, you must state this at the beginning of your written comment and provide justification for doing so. We will honor such requests to the extent allowed by law, but you should be aware that release of that information may be required under certain circumstances. All submissions from organizations or businesses and from individuals identifying themselves as representatives or officials of organization or business will be made available for public inspection and disclosure in their entirety.

Further information on this proposed project is available at the Medford District Office, 3040 Biddle Road, Medford, Oregon 97504 or by calling Kathy Minor, Lead Planning and Environmental Coordinator, at 541-618-2245.

Sincerely,

Kristi Mastrofini
Acting Field Manager
Ashland Resource Area

Enclosure

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MEDFORD DISTRICT OFFICE

EA COVER SHEET

RESOURCE AREA: Ashland

ACTION/TITLE: South Fork Little Butte Forest Management Project

EA NUMBER: DOI-BLM-OR-M060-2015-0001-EA

LOCATION: T. 37 S., R. 02 E., Sections 5, 11, 14, 15, 17, 20-23, 25, 27, 33, and 35; T. 37 S., R. 03 E., Sections 17-20 and 29-32; T. 38 S., R. 02 E., Sections 1, 3, and 11; and T. 38 S., R. 03 E., Sections 5, 6, 11, 17, 19-23, 27, and 29 in Jackson County, Oregon, Willamette Meridian.

LIST OF PREPARERS	RESPONSIBILITY
Kristi Mastrofini	Acting Field Manager
Craig Brown	Project Leader, Logging Systems
Nate Goodwine	Silviculture Prescriptions
Mike Derrig	Hydrology/Water Resources
Josh Robeson	Road Specifications
Greg Chandler	Fire and Fuels, Air Quality
Chris Volpe	Aquatic Resources and Aquatic Conservation Strategy
Amy Meredith	Soils
Jason Tarrant	Rangeland Resources/Grazing
Steve Godwin	Threatened & Endangered Animals, Terrestrial Wildlife
Armand Rebischke	Botany, Noxious Weeds
Zach Million	Recreation and Visual Resources
Stephanie Kelleher	ID Team Leader, NEPA Compliance & Writer/Editor
Kathy Minor	Lead Planning and Environmental Coordinator

TABLE OF CONTENTS

CHAPTER 1 – PURPOSE AND NEED

A. INTRODUCTION 1-1
B. WHAT IS BLM PROPOSING AND WHERE IS THE PROJECT LOCATED? 1-1
C. WHY IS THE BLM PROPOSING THIS FOREST MANAGEMENT PROJECT? 1-3
1. Need for the Proposed South Fork Little Butte Project 1-3
D. DECISION FRAMEWORK 1-5
E. LAND USE CONFORMANCE AND LEGAL REQUIREMENTS 1-6
1. Conformance with Land Use Plans 1-6
2. Consultation 1-7
3. Special Status Species 1-7
4. Statutes and Regulations 1-8
F. RELEVANT ASSESSMENTS AND PLANS 1-8
G. SCOPING AND ISSUES 1-10
1. Relevant Issues 1-11
2. Issues Considered but not further Analyzed 1-13

CHAPTER 2 – ALTERNATIVES

A. INTRODUCTION 2-1
B. DEVELOPMENT OF THE PROJECT 2-1
C. ALTERNATIVES DESCRIBED IN DETAIL 2-7
1. Alternative 1—No Action Alternative 2-7
2. The Action Alternatives 2-7
   a. Alternative 2—Proposed Action 2-7
   b. Alternative 3 2-18
D. COMPONENTS COMMON TO THE ACTION ALTERNATIVES 2-26
1. Silvicultural Objectives and Prescriptions 2-26
2. Commercial Harvest Methods 2-29
3. Post-Harvest Fuels Reduction Treatments 2-30
4. Project Design Features 2-30
5. Policy Level Project Design Features 2-43
E. COMPARISON OF THE ACTION ALTERNATIVES 2-45
F. ALTERNATIVES AND ACTIONS CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS 2-45
G. MONITORING 2-48

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

A. INTRODUCTION 3-1
1. Project Area and Analysis Area 3-1
2. Consideration of Past, Ongoing, and Reasonably Foreseeable Actions in Effects Analysis 3-1

B. SILVICULTURE 3-5
1. Issues 3-5
2. Affected Environment 3-5
   a. Landscape Pattern 3-6
   b. Plant Series and Associations 3-7
   c. Forest Stand Conditions 3-8
   d. Tree Growth and Vigor 3-9
   e. Forest Insects 3-11
   f. Forest Pathogens 3-13
   g. Coarse Woody Material 3-14
3. Environmental Consequences 3-16
   a. Alternative 1—No Action 3-16
   b. Alternative 2—Proposed Action 3-18
   c. Alternative 3 3-21
   d. Cumulative Effects 3-22
   e. Consideration of Douglas-fir Dwarf Mistletoe as a Beneficial Disturbance Agent 3-22

C. FIRE AND FUELS 3-23
1. Assumptions 3-23
2. Issues 3-23
3. Affected Environment 3-24
   a. Fire Disturbance History 3-24
   b. Fire Exclusion/Suppression 3-24
   c. Past Logging Practices 3-25
   d. Past Fuels Reductions Treatments 3-26
   e. Fire Regimes 3-26
   f. Predicted Climate Changes 3-27
   g. Condition Class 3-27
   h. Fire Risk and Fire Hazard Assessment 3-27
   i. Fuels Reduction and Fire Restoration 3-29
2. Environmental Consequences 3-30
   a. Alternative 1—No Action 3-30
   b. Alternatives 2 and 3 3-30

D. SOIL RESOURCES 3-34
1. Issues 3-34
2. Affected Environment 3-35
   a. Description of Soil Series and Characteristics 3-35
   b. Roads 3-41
   c. Soil Productivity 3-41
   d. Soil Stability 3-42
   e. Past Actions 3-42
2. Environmental Consequences 3-43
   a. Alternative 1—No Action 3-44
   b. Alternative 2—Proposed Action 3-44
   c. Alternative 3 3-57

E. WATER RESOURCES 3-58
1. Issues 3-58
2. Analysis Area Description 3-59
3. Affected Environment 3-63
4. Environmental Consequences 3-68

a. Alternative 1—No Action 3-69
b. Alternative 2—Proposed Action 3-70
c. Alternative 3 3-74
F. AQUATIC HABITAT & FISH 3-75
1. Introduction 3-75
2. Issues 3-75
3. Endangered Species Act and Coho Critical and Essential Fish Habitat 3-76
4. Riparian Reserves 3-77
5. Aquatic Conservation Strategy 3-77
6. Foreseeable Future Actions 3-77
7. Affected Environment—Fish and Designated Habitat 3-79
8. Environmental Consequences—Fish and Designated Habitat 3-82
a. Alternative 1—No Action 3-82
b. Alternatives 2 and 3 3-82
9. Affected Environment—Aquatic Habitat 3-82
10. Environmental Consequences—Aquatic Habitat 3-88
a. Alternative 1—No Action Alternative 3-88
b. Alternative 2—Proposed Action 3-88
c. Alternative 3 3-97
d. Summary of Effects – Aquatic Habitat 3-97
11. Affected Environment—Riparian Reserves 3-98
8. Environmental Consequences—Riparian Reserves 3-100
a. Alternative 1—No Action 3-100
b. Alternative 2—Proposed Action 3-100
c. Alternative 3 3-100
G. TERRESTRIAL WILDLIFE 3-101
1. Introduction 3-101
2. Issues 3-101
3. Assumptions 3-102
4. Affected Environment 3-102
a. Vegetation Conditions and Terrestrial Wildlife Habitats (General) 3-102
b. Special Status Wildlife Species 3-103
c. Survey and Manage Species 3-112
d. Other Wildlife Species of Concern 3-113
e. Deer Winter Range and Elk Management Area 3-115
2. Environmental Consequences 3-115
a. Alternative 1—No Action 3-115
b. Alternative 2—Proposed Action 3-116
c. Alternative 3 3-127
H. BOTANY 3-131
1. Introduction 3-131
2. Issues 3-132
3. Affected Environment 3-132
a. Survey Methods and Completion 3-132
b. Vascular and Non-Vascular Plants 3-132
c. Fungi 3-135
d. Noxious Weeds 3-135
4. Environmental Consequences 3-141
a. Alternative 1—No Action 3-141
b. Alternative 2—Proposed Action 3-142
c. Alternative 3 3-145
d. Cumulative Effects – Alternatives 2 and 3 3-145
I. RECREATION 3-146
1. Issues 3-146

2. Affected Environment 3-146
a. Dispersed Recreation 3-146
b. Hyatt-Howard Special Recreation Management Area 3-146
c. Buck Prairie Nordic Trail System 3-147
d. Winter Snowmobile and Snowshoe Use 3-147
e. Winter Play Area 3-147
f. OHV Use and Non-System Routes 3-147
3. Environmental Consequences 3-147
a. Alternative 1—No Action Alternative 3-147
b. Alternative 2—Proposed Action 3-147
c. Alternative 3 3-148
J. VISUAL RESOURCES MANAGEMENT 3-148
1. Issues 3-148
2. Affected Environment 3-148
3. Environmental Consequences 3-149
a. Alternative 1—No Action 3-149
b. Alternatives 2 and 3 3-149
K. SPECIAL AREA DESIGNATIONS 3-150
1. Affected Environment 3-150
a. Hole-in-the-Rock ACEC 3-150
b. Lost Lake RNA 3-150
2. Environmental Consequences 3-150
a. Alternative 1—No Action 3-150
b. Alternatives 2 and 3 3-150
L. RANGELAND RESOURCES/GRAZING 3-151
1. Affected Environment 3-151
2. Environmental Consequences 3-153
a. Alternative 1—No Action 3-153
b. Alternative 2—Proposed Action 3-153
c. Alternative 3 3-154
M. OTHER EFFECTS 3-154
1. Cultural Resources 3-154
2. Air Quality 3-154
a. Effects on Air Quality – Use of Plastic Covering for Burn Piles 3-154
b. Effects on Air Quality – Smoke Impacts 3-155
3. Economics 3-156
4. Environmental Justice 3-157

CHAPTER 4 – PUBLIC PARTICIPATION 4-1

REFERENCES R-1

APPENDIX A –PROPOSED UNITS AND HAUL ROUTE TABLES A-1

APPENDIX B – SFLB AQUATIC CONSERVATION STRATEGY B-1

APPENDIX C – SURVEY AND MANAGE COMPLIANCE C-1

APPENDIX D – WEED RISK ASSESSMENT D-1

APPENDIX E – ACRONYMS AND GLOSSARY E-1

CHAPTER 1 - PURPOSE AND NEED

A. INTRODUCTION

The Bureau of Land Management (BLM), Ashland Resource Area, proposes to implement the South Fork Little Butte (SFLB) Project, a forest management project. The SFLB Project is designed to implement the Bureau of Land Management's Medford District Resource Management Plan (RMP) (USDI 1995).

This Environmental Assessment (EA) documents the environmental analysis conducted to estimate the site-specific effects on the human environment that may result from the implementation of the SFLB Forest Management Project on BLM-administered lands. The analysis documented in this EA will provide the BLMs responsible official, the Ashland Resource Area Field Manager, with current information to aid in the decision-making process. This EA complies with the Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA; 40 CFR Parts 1500-1508) and the Department of the Interior's regulations on Implementation of the National Environmental Policy Act of 1969 (43 CFR part 46).

B. WHAT IS BLM PROPOSING AND WHERE IS THE PROJECT LOCATED?

This section provides a brief summary of BLM's proposal for forest management and associated transportation management activities. A more detailed description of BLM's Proposed Action and other alternatives considered is included in Chapter 2, Alternatives.

The South Fork Little Butte Forest Management Project would treat conifer forest stands on 2,488 acres (Alternative 2) of BLM-administered lands within the Lower South Fork Little Butte Creek and Middle South Fork Little Butte Creek sub-watersheds of the Little Butte Creek Watershed. A BLM silviculturist prescribed forest thinning prescriptions, tailored to the various site conditions (i.e., elevation, aspect, soil conditions, stand health, etc.) found throughout the Project Area, to meet the needs described below. A more detailed summary of the various prescriptions is included in Chapter 2, Section C, 1.

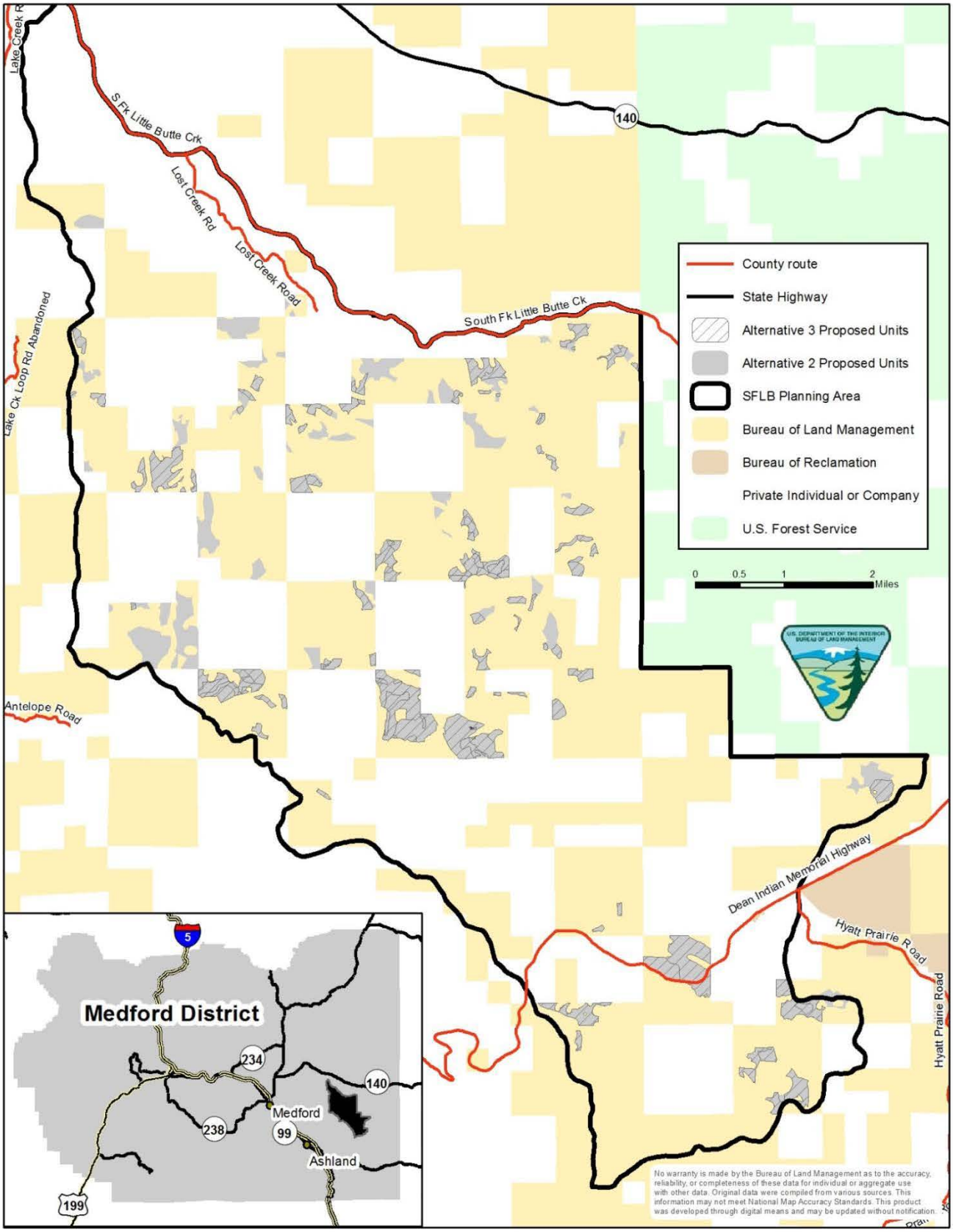
Forest management would be accomplished through a combination of commercial timber sale contract(s) and service contracts. An estimated 1,676 acres of commercial timber harvest would be accomplished through one or more timber sales. Fuels created from commercial harvest (activity slash) would be cut, hand-piled and burned. An estimated 1,553 acres are proposed for pre-commercial thinning; of which an estimated 741 acres of pre-commercial thinning would be within the commercial treatment units described above and 812 acres of pre-commercial thinning only would be accomplished through service contracts.

Transportation management activities proposed include timber haul, road improvements along haul routes, road renovation, temporary and permanent road construction (3.04 miles and 0.80 miles respectively), road decommissioning (4.05 miles) and long-term closure of existing roads (7.27 miles).

The project is on BLM-administered lands within the Matrix land allocation as defined by the Northwest Forest Plan (USDA and USDI 1994) and the Medford District BLM Resource Management Plan (RMP). Within the BLM ownership, Revested Oregon and California Railroad (O&C) lands comprise 96% of the Planning Area with Public Domain (PD) lands at 4.0%. The Proposed Action would treat approximately 2,339 acres of O&C and 149 acres of PD lands.

The Public Land Survey System (PLSS) description of the South Fork Little Butte Project is T. 37 S., R. 02 E., Sections 5, 11, 14, 15, 17, 20-23, 25, 27, 33, and 35; T. 37 S., R. 03 E., Sections 17-20 and 29-32; T. 38 S., R. 02 E., Sections 1, 3, and 11; and T. 38 S., R. 03 E., Sections 5, 6, 11, 17, 19-23, 27, and 29 in Jackson County, Oregon, Willamette Meridian (Map 1-1).

Map 1-1. Vicinity Map – South Fork Little Butte Forest Management Project



C. WHY IS THE BLM PROPOSING THIS PROJECT?

The SFLB Forest Management Project is designed to provide for long-term forest (timber) production in the SFLB Planning Area while minimizing the effects to existing northern spotted owl (NSO) habitat within the provincial home ranges of known northern spotted owl sites and NSO Critical Habitat and other Special Status Species.

This project is designed to move current conditions found in the South Fork Little Butte Project Area toward the desired forest stand conditions and management objectives identified for lands assigned to the Matrix land allocation in Medford District's 1995 Resource Management Plan.

Specifically, this forest management proposal is designed to:

- Ensure sustainable forest production, and the renewable resources they provide, by managing forests to improve conifer forest vigor and growth (USDI 1995, p. 72-73);

- Provide timber products from Matrix land allocations in accordance with the direction in the Medford District's 1995 Resource Management Plan (USDI 1995, pp. 72-73);

- Protect and conserve the federally listed northern spotted owls to achieve their recovery in compliance with the Endangered Species Act (ESA), approved recovery plans, the Medford District Resource Management Plan (USDI 1995, pp. 50-51) and Bureau Special Status Species policies (USDI 1995, p. 50); and

- Maintain a transportation system within the Project Area that serves resource management needs in an environmentally sound manner (USDI 1995, pp. 84-86).

1. Need for the South Fork Little Butte Project

The following discussion provides more detail concerning the need for forest and road management based on the 1995 RMP direction that applies to the Timber Management (Matrix) land allocation, current forest and road conditions, and their desired future conditions:

There is a need to maintain and promote vigorously growing conifer forests and provide timber resources, in accordance with sustained yield principles, on BLM-administered Matrix lands within the South Fork Little Butte Planning Area.

Forest stands selected for treatment in the SFLB Planning Area are overstocked or have been impacted by disease, drought, or insects. As trees compete for limited water, nutrients, and growing space they become stressed and more susceptible to mortality from insects, forest pathogens, and drought. Forest thinning treatments are needed to maintain vigorously growing forest stands, which are more fire-resilient and resistant to insect and disease attacks, in accord with sustained yield forestry and to capture tree mortality in compliance with RMP guidance (USDI 1995, p. 186).

The 1995 Medford District RMP adopted a set of silvicultural treatments for managing conifer forests on Matrix lands (USDI 1995, Appendix E, pp. 179-196); the SFLB Forest Management Project proposes forest thinning and regeneration harvest prescriptions designed to direct future stand growth, initiate new forest development, reduce the impacts of insect and diseases, and increase fire resiliency on forest stands to the extent possible. A summary of silvicultural prescriptions by forest stand type (i.e. Douglas-fir, pine, mixed conifer, white fir, etc.) and treatment objective (thinning, regeneration, and disease control) for the action alternatives is included in Chapter 2, Section C, 1.

One of the applicable laws governing the major portion of BLM-administered lands in the SFLB Planning Area is the Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act of 1937 (O&C Act), for

which sustainable timber production is the primary purpose.

Matrix lands within the SFLB Planning Area are intended to achieve sustainable timber production and other forest commodities, provide jobs and contribute to community stability through both growth and harvest, while also promoting the development of fire-resilient forests (USDI 1995, p. 38). Timber products produced from this area would be sold in support of the District's Allowable Sale Quantity (ASQ) declared in the 1995 RMP (USDI 1995, pp. 17, 72-73).

There is a need to protect and conserve the federally listed northern spotted owl to achieve their recovery in compliance with the Endangered Species Act, approved recovery plans, the Medford District Resource Management Plan (USDI 1995, pp. 50-51), and Bureau Special Status Species policies.

The northern spotted owl (NSO) is currently listed as a threatened species under the Endangered Species Act. Based on information in petitions to list the NSO as endangered sent to the USFWS in 2012, the petition action may be warranted. A Federal Register notice was published initiating the 12-month review of the status of the NSO to determine if the petition is warranted.

The BLM needs to retain sufficient nesting, roosting, and foraging habitat within the provincial home range of known northern spotted owl sites to support breeding, feeding, and sheltering. The BLM needs to conserve the older, high quality, and occupied forest habitat as necessary to meet the northern spotted owl recovery goals. Science-based, active forest management is needed to restore forest health, especially in drier forests in the eastern and southern portions of the owl's range. The 2011 Northern Spotted Owl Revised Recovery Plan recommends maintaining and restoring "older and more structurally complex multi-layered conifer forests on Federal and non-Federal lands across [the northern spotted owl's] range… while allowing for other threats, such as fire and insects, to be addressed by restoration management actions" (USDI FWS 2011, p. III-67).

Lands administered under the O&C Act must also be managed in accordance with other environmental laws, such as the Endangered Species Act (ESA) and the Clean Water Act. Some provisions of these laws take precedence over the O&C Act. For instance, the ESA requires that the Secretary [of the Interior] to ensure that management of O&C lands will not likely result in jeopardy to listed species or destruction or adverse modification of critical habitat. The ESA directs the Secretary and all Federal agencies to utilize their authorities to carry out programs for the conservation and recovery of listed species. One of the purposes of the ESA is the preservation of ecosystems upon which endangered and threatened species depend and would minimize the need to list species under the ESA (USDI 1995, p. 17-18).

Within the SFLB Planning Area, there is a need to develop and maintain a transportation system that serves the needs of users in an environmentally sound manner (USDI 1995, p. 84).

The existing transportation system for the South Fork Little Butte Planning Area is insufficient to provide economically feasible operational access to BLM-administered lands in need of forest management. On the other hand, some roads are no longer serving resource program needs, some of which are located within Riparian Reserves, paralleling or crossing streams and contributing to sedimentation and riparian habitat fragmentation.

Roads throughout the Planning Area have also been identified that need maintenance to restore, repair, or improve road surfaces, culverts, and roadside drainage ditches in order to reduce road related erosion and sedimentation to stream courses.

Road construction, decommissioning and renovation is designed for the South Fork Little Butte Project to improve road access to areas in need of forest management, reduce road densities in areas where the road system no longer serves resource program needs, and to maintain roads to reduce road-related erosion and sedimentation to stream courses.

South Fork Little Butte Creek was identified as a Tier 1 Key Watershed in the NWFP (USDA and USDI 1994) and the Medford District RMP (USDI 1995). Tier 1 Key Watersheds contribute directly to the conservation of at-risk salmonids and resident fish species. They also have a high potential of being restored as part of a watershed restoration program. Key Watershed objectives require that there will be no net increase in roads (USDI 1995, p. 23).

D. DECISION FRAMEWORK

This Environmental Assessment (EA) will provide the information needed for the responsible official, the Ashland Resource Area Field Manager, to select a course of action to be implemented for the SFLB Project. The Ashland Resource Area Field Manager must decide whether to implement one of the Action Alternatives, select the No Action Alternative, or choose a combination of components found within those alternatives analyzed.

In choosing the alternative that best meets the project needs/objectives, the Field Manager will consider the extent to which each alternative responds to the decision factors listed below. The forthcoming Decision Record will document the authorized officer's rationale for selecting a course of action based on the effects documented in the EA, and the extent to which each alternative:

1. Reduces competition-related mortality and risks associated with fire, drought, insects and diseases, and increases tree vigor, growth, and stand resiliency;
2. Provides for the establishment and growth of conifer species while retaining structural and habitat components, such as large trees, snags, and coarse woody debris;
3. Maintains or improves existing suitable northern spotted owl habitat within the provincial home range (1.2 mile radius) of known active northern spotted owl sites and substantially all of the older and more structurally complex, multi-layered conifer forests (critical habitat);
4. Addresses the short-term and long-term costs of forest management in the Planning Area;
5. Captures opportunities to implement improvements in the transportation system to provide for public safety and protect water quality; and
6. Contributes to the District's Allowable Sale Quantity as directed by the Medford District RMP.

The decision will also include a determination whether or not the impacts of the actions are significant to the human environment. If the impacts are determined to be within the range analyzed in the Medford District Resource Management Plan Final Environmental Impact Statement (FEIS) (USDI 1994) and the Northwest Forest Plan Supplemental Final EIS (USDA and USDI 1994), or otherwise determined to be insignificant, a Finding of No Significant Impact (FONSI) can be issued and the decision implemented. If this EA determines that the significance of impacts are unknown or greater than those previously analyzed and disclosed in the RMP/FEIS and the Northwest Forest Plan, then a project-specific EIS must be prepared.

The following section provides a more detailed description of the decision factors to be considered in the forthcoming decision regarding the implementation of the South Fork Little Butte Project.

Reduces competition-related mortality and increases resiliency of forest stands to wildfire, drought, disease, and insects.

Forested stands in the SFLB Planning Area have become predisposed to stand-replacing fires and insect and disease epidemics. In addition, changes in climate and increasing drought conditions make the need to reduce competition and increase resiliency of these forest stands even more important. The Medford District RMP directs the BLM to incorporate silvicultural treatments that reduce tree mortality and restore the vigor, resiliency, and stability of forest stands (USDI 1995, p. 186).

Maintain or Improve northern spotted owl habitat within the provincial home range of known sites and within Critical Habitat Units OR-37 and OR-38.

Northern spotted owl Critical Habitat Units (CHUs) OR-37 and OR-38 overlap the South Fork Little Butte Planning Area. Prior to the implementation of the Medford District RMP (which incorporated the Northwest Forest Plan), the U.S. Fish and Wildlife Service (USFWS) designated critical habitat as critical habitat units (CHUs) across Washington, Oregon, and northern California to provide additional protection for the northern spotted owl. The Medford RMP includes a network of reserves (Late-Successional, Riparian and other land use allocations) to provide habitat for northern spotted owl recovery. These reserves were not identical to the CHUs designated by the USFWS and areas within the CHUs were designated as Matrix lands allocated to the production of a sustainable supply of timber and other forest commodities.

Declining conifer forest conditions described above are being experienced in CHUs OR-37 and OR-38 as well. Silvicultural prescriptions should be designed so that the South Fork Little Butte Project could contribute to long-term maintenance of large tree structure and trees with old-growth characteristics over time, by reducing overly dense stands which, in turn, may reduce the potential for stand replacing wildfires and large-scale loss to competition and disease.

Design a Project that is economically practical (USDI 1995, Appendix E, p. 180).

The Medford District RMP directs that all silvicultural systems (forest management prescriptions) applied to achieve forest stand objectives would be economically practical (USDI 1995, p.180; USDI 1994, p. 2-62). The economic feasibility of forest management actions is affected by the ease of access from the forest road system. Portions of the Project Area are inaccessible from existing forest roads, which increases the cost associated with forest treatments. The SFLB Project should be designed to improve economic efficiency of implementing silvicultural systems to achieve forest health and timber management objectives.

Improve the transportation system in the South Fork Little Butte Watershed.

The existing transportation system for the South Fork Little Butte Project Area is insufficient to provide economically feasible operational access to BLM-administered lands in need of forest management. On the other hand, some roads are no longer serving resource program needs, some of which are located within Riparian Reserves, paralleling or crossing streams and contributing to sedimentation and riparian habitat fragmentation.

Roads throughout the Project Area have also been identified that need maintenance to restore, repair, or improve road surfaces, culverts, and roadside drainage ditches in order to reduce road related erosion and sedimentation to stream courses. The South Fork Little Butte Project should be designed to include actions that would lead to improved water quality conditions.

Contributes toward the Districts Allowable Sale Quantity (ASQ)

The SFLB Forest Management Project is located on BLM-administered lands allocated to produce a sustainable supply of timber. Timber products removed to meet Timber Resource Objectives (USDI 1995, pp.17 and 72-73) would contribute toward the District's Allowable Sale Quantity (ASQ).

E. LAND USE CONFORMANCE AND LEGAL REQUIREMENTS

1. Conformance with Land Use Plans

The Ashland Resource Area of the Medford District BLM designed this project to be in conformance with the 1995 *Medford District Record of Decision and Resource Management Plan* (ROD/RMP). The 1995 Medford District RMP incorporated the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl and the Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the*

Range of the Northern Spotted Owl (USDA and USDI 1994).

The SFLB Forest Management Project is consistent with the Medford District RMP as amended by the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (2001 ROD); the *BLM Vegetation Treatments Using Herbicides Final Programmatic EIS Record of Decision* (USDI 2007); Record of Decision (BLM): Vegetation Treatments Using Herbicides on BLM Lands in Oregon (USDI 2010); *Medford District Integrated Weed Management Plan Environmental Assessment* (USDI 1998) and tiered to the *Northwest Area Noxious Weed Control Program* (EIS, USDI 1985). This project utilizes the December 2003 Survey and Manage species list. This list incorporates species changes and removals made as a result of the 2001, 2002, and 2003 Annual Species Reviews (ASRs) with the exception of the red tree vole. For the red tree vole, the Ninth Circuit Court of Appeals vacated the category changes and removal of the red tree vole in the mesic zone, and returned the red tree vole to its status as existed in the 2001 ROD Standards and Guidelines, which make the species Category C throughout its range.

2. Consultation

Formal consultation with the U.S. Fish and Wildlife Service was initiated on January 9, 2015 with the Medford BLM South Fork Little Butte Biological Assessment (BA) (USDI 2015a). The USFWS released a Biological Opinion (BO) (Reference Number 01EOFW00-2015-F-0090) on May 15, 2015 (USDI FWS 2015).

Informal consultation with the USDC National Marine Fisheries Service (NMFS) and formal consultation under the Magnuson-Stevens Fishery Conservation Act was initiated on February 23, 2015 with the Biological Assessment for the South Fork Timber Sale (USDI 2015a). A letter of concurrence from the NMFS was received by the BLM on March 24, 2015 (NOAA Fisheries 2015).

Consultation for federally-listed botanical species was not needed as the SFLB Planning Area is outside the range of any federally-listed botanical species.

Letters describing the preliminary Proposed Action initiating consultation with the local federally recognized Native American Tribes were sent on April 10, 2014. Further consultation in the form of meetings, phone calls, and emails did not identify any concerns with the proposed activities.

Consultation with the State Historic Preservation Office (SHPO) was not needed as the BLM determined that the project will have “no effect” to cultural resources.

3. Special Status Species

The SFLB Forest Management Project is consistent with BLM Manual 6840 (USDI 2008), the purpose of which is to provide policy and guidance for the conservation of BLM Special Status Species and the ecosystems upon which they depend on BLM-administered lands. BLM Special Status Species include those species listed or proposed for listing under the Endangered Species Act (ESA), as well as those designated as Bureau Sensitive by the State Director. The objectives of the BLM Special Status policy are:

- To conserve and/or recover ESA-listed species and the ecosystems on which they depend so that ESA protections are no longer needed for these species; and

- To initiate proactive conservation[1] measures that reduce, or eliminate, threats to Bureau Sensitive species to minimize the likelihood of and need for listing of these species under the ESA (USDI 2008, Section .02).

1 Conservation: as applied to Bureau Sensitive species, is the use of programs, plans, and management practices to reduce or eliminate threats affecting the status of the species, or improve the condition of the species’ habitat on BLM-administered lands (USDI 2008, Glossary p. 2).

4. Statutes and Regulations

The Proposed Action is designed to be in conformance with the direction given for the management of public lands in the Medford District and the following:

- **Oregon and California Lands Act of 1937 (O&C Act)**. Requires the BLM to manage O&C lands for permanent forest production. Timber shall be sold, cut, and removed in accordance with sustained-yield principles for the purpose of providing for a permanent source of timber supply, protecting watersheds, regulating stream flow, contributing to the economic stability of local communities and industries, and providing recreational facilities.

- **Federal Land Policy and Management Act of 1976 (FLPMA)**. Defines BLM's organization and provides the basic policy guidance for BLM's management of public lands.

- **National Environmental Policy Act of 1969 (NEPA)**. Requires the preparation of environmental impact statements for major federal actions which may have a significant effect on the environment.

- **Endangered Species Act of 1973 (ESA)**. Directs Federal agencies to ensure their actions do not jeopardize species listed as "threatened and endangered" or adversely modify designated critical habitat for these listed species.

- **Clean Air Act of 1990 (CAA)**. Provides the principal framework for national, state, and local efforts to protect air quality.

- **National Historic Preservation Act of 1966 as amended (NHPA).** Requires federal agencies to take into account the effect of their federal or federally-licensed undertakings on historic properties, whether those properties are federally owned or not.

- **Archaeological Resources Protection Act of 1979 (ARPA)**. Protects archaeological resources and sites on federally-administered lands. Imposes criminal and civil penalties for removing archaeological items from federal lands without a permit.

- **Safe Drinking Water Act (SDWA) of 1974 (as amended in 1986 and 1996)**. Protects public health by regulating the nation's public drinking water supply.

- **Clean Water Act of 1987 (CWA)**. Establishes objectives to restore and maintain the chemical, physical, and biological integrity of the nation's water.

F. RELEVANT ASSESSMENTS AND PLANS

The following documents contain information related to existing conditions and management practices in the South Fork Little Butte Planning Area. These documents are incorporated by reference into the project documentation.

Little Butte Creek Watershed Analysis (1997)

Watershed Analysis (WA) is a procedure used to characterize conditions, processes and functions related to human, aquatic, riparian and terrestrial features within a watershed. Watershed Analysis is issue driven. Analysis teams of resource specialists identify and describe ecological processes of greatest concern in a particular "fifth-field" watershed (also referred to as Fifth-Field Hydrologic Unit Codes, or HUC5s), and recommend restoration activities and conditions under which other management activities should occur. Watershed Analysis is not a decision-making process. The resulting WA is not a decision document under NEPA, and there is no action that is proposed for implementation with the completion of the analysis. Rather, Watershed Analyses provides information and non-binding recommendations for agencies to establish the

context for subsequent planning, project development, regulatory compliance and agency decisions (REO 1995, p. 1).

The SFLB Planning Area falls within Little Butte Creek Watershed Analysis Area. The Watershed Analysis focused on the use of existing information available at the time the analysis was conducted, and provides baseline information. Additional information, determined to be necessary for completing an analysis of the SFLB Forest Management Project, has been collected and is considered, along with existing information provided by the 1997 *Little Butte Creek Watershed Analysis.* In addition, this planning effort provided an opportunity to assess the current condition of BLM-administered lands in the South Fork Little Butte Creek sub-watersheds and, where needed, update information in the Watershed Analysis pertaining to the physical and biological elements. This updated information was used to help guide development of the SFLB Project proposal. Management Objectives and Recommendations provided by the 1997 Watershed Analysis were also considered and addressed as they applied to the SFLB Project proposal.

Water Quality Restoration Plan for the North and South Forks Little Butte Creek Key Watershed (May 2006).

The BLM is recognized by Oregon Department of Environmental (DEQ) as a Designated Management Agency for implementing the Clean Water Act on BLM-administered lands in Oregon. The BLM has signed a Memorandum of Agreement (MOA) with the DEQ that defines the process by which the BLM will cooperatively meet state and federal water quality rules and regulations.

To comply with the BLM-DEQ Memorandum of Agreement, the BLM completed the Water Quality Restoration Plan for the North and South Forks Little Butte Key Watershed (USDI 2006a). This document describes how the BLM will meet Oregon water quality standards for 303(d)-listed streams on BLM-administered lands within the North and South Forks Little Butte Creek Tier 1 Key Watershed. The organization of this water quality restoration plan was designed to be consistent with the DEQ's Rogue Basin Water Quality Management Plan (WQMP) which was completed in 2008, and contained information that would support the Oregon Department of Environmental Quality's (DEQ) development of the Rogue Basin Total Maximum Daily Load (TMDL). A TMDL defines the amount of pollution that can be present in the waterbody without causing water quality standards to be violated. DEQ established the Rogue Basin TMDL in 2008 on schedule and it was approved soon after by the US Environmental Protection Agency (EPA).

The WQMP described a strategy for reducing water pollution to the level of the load allocations and waste load allocations prescribed in the TMDL. The approach is designed to restore the water quality and result in compliance with the water quality standards, thus protecting the designated beneficial uses of waters of the state. Through implementation of the RMP, Aquatic Conservation Strategy, and Best Management Practices, the Proposed Action is designed to attain the recovery goals for listed streams on federal lands in the North and South Forks Little Butte Key Watershed. Recovery goals are identified in the Water Quality Restoration Plan for the North and South Forks Little Butte Key Watershed (USDI 2006). The Proposed Action draws upon the passive and active restoration management actions recommended for achieving federal recovery goals. Following the WQRP for the North and South Forks Little Butte Creek Key Watershed assures that BLM's management will not violate the Clean Water Act.

Revised Recovery Plan for the Northern Spotted Owl (2011)

In June 2011, the USFWS (U.S. Fish and Wildlife Service) finalized the *Revised Recovery Plan for the Northern Spotted Owl*, which contains 33 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 (RA 32) in the Recovery Plan recommends "maintaining and restoring the older and more structurally complex multi-layered conifer forests (USDI FWS 2011, III-67)." The intent of RA 32 is to maintain substantially all of the older and more structurally complex multi-layered conifer forests on federal lands in order not to further exacerbate the competitive interactions between spotted owls and barred owls.

Also included in the Revised Recovery Plan is Recovery Action 10 (RA 10) which recommends "Conserving spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population (USDI FWS 2011, III-43)." Within the administrative units of the Rogue River-Siskiyou National Forest (FS) and the Medford District Bureau of Land Management (BLM), an interagency, interdisciplinary team was created to develop interim guidance for incorporating Recovery Action 10 (RA 10) when planning and implementing management activities on federal lands in southwest Oregon (USDA, USDI, and USDI FWS 2013). As part of the proposal development process for the SFLB Project, a core team of specialists worked to incorporate this interim guidance. Refer to Chapter 2, Section B, Development of the Project, for more details.

The SFLB Project defers proposed treatment in RA 32 stands identified by interagency survey guidance (USDA and USDI 2010), follows principles in the SW Oregon Recovery Action 10 Guidance Document (USDA, USDI, and USDI FWS 2013), and is consistent with consultation completed with the U.S. Fish and Wildlife Service (USDI FWS 2015); therefore, the SFLB Project is consistent with the *Revised Recovery Plan for the Northern Spotted Owl* (USDI FWS 2011).

U.S. Department of Interior, Bureau of Land Management, Western Oregon Districts, Transportation Management Plan (1996, updated 2002 and 2010).

The Western Oregon Transportation Management Plan provides goals, objectives, and guidelines for managing BLMs road and trail transportation system throughout Western Oregon. This transportation management plan, is not a decision document, rather it provides guidance for implementing applicable decisions of the Medford District RMP (which incorporated the Northwest Forest Plan).

Southwest Oregon Fire Management Plan (ODF 2014)

The Southwest Oregon Fire Management Plan (FMP) provides Southwest Oregon with an integrated concept for coordinated wildland fire planning and protection among federal, state, local government entities and citizen initiatives. The Fire Management Plan is not a decision document.

The FMP introduces fire management concepts addressing fire management activities in relation to resource objectives stated in the current land and resource management plans or land use plans (parent documents) of the federal agencies, the laws and statutes that guide the state agencies and private protective associations, and serves as a vehicle for local agencies and cooperators to more fully coordinate their participation in relation to those activities.

G. SCOPING AND ISSUES

Scoping is the process the BLM uses to identify issues related to the proposal (40 CFR 1501.7) and determine the extent of environmental analysis necessary for an informed decision. It is used early in the NEPA process to identify (1) the issues to be addressed, (2) the depth of the analysis, (3) alternatives or refinements to the Proposed Action, and (4) potential environmental impacts of the Proposed Action. Scoping is performed not to build consensus or get agreement on a project proposal, but rather to solicit relevant site-specific comments that could aid in the analysis and final design of the proposal.

Scoping has occurred for the SFLB Project. The SFLB Project appeared in the Ashland Resource Area's Schedule of Proposed Actions published in Medford's Messenger (BLM's quarterly newsletter) beginning in the spring 2014 edition. A letter briefly describing the Proposed Action and inviting comments was mailed to adjacent landowners, interested individuals, organizations, and other agencies on April 4, 2014. Four (4) comments and numerous Interest Response Forms were received during the 30-day scoping period.

Numerous articles were submitted for BLM review during the scoping process. The BLM reviewed these documents, and considered the information in developing the final Proposed Action and alternatives. A list of the literature submitted can be found in the References section of this EA.

1. Relevant Issues

An interdisciplinary (ID) team of resource specialists reviewed the proposal and all pertinent information, including public input received, and identified relevant issues to be addressed during the environmental analysis.

A. Hydrologic Function and Water Quality

(1) Even with planned road decommissioning contributing to long-term improvement in watershed conditions, there are short-term increases in road densities and impacts on watershed conditions with new road construction. While there are immediate positive effects related to decreased channelization of water runoff and sediment routing, it takes time for vegetation to reclaim decommissioned roads and decades for full recovery (depending on the method of decommissioning and the condition of the road at the time it is decommissioned).

(2) There is potential for short-term effects to water quality from increased sediment produced from disturbance associated with the combination of new road construction, road decommissioning (mainly mechanical method), road renovation, and log hauling activities.

(3) Conde Creek, Dead Indian Creek, Soda Creek, Lost Creek, Deer Creek, and South Fork Little Butte Creek are within the project area and are listed as 303(d) streams for varying reasons. Non-point source pollution (sedimentation) from management activities has the potential to degrade the aquatic ecosystem (e.g., reduced water quality for salmon, steelhead, and trout).

(4) Concerns were raised that forest thinning and regeneration harvest (and associated canopy reduction), logging (particularly tractor yarding) and road construction could adversely affect hydrologic flow, peak flow and low flow, potentially leading to increased erosion, stream channel downcutting, and an increase the adverse effects of flooding.

B. Potential for Impacts to Coho Salmon and Their Critical Habitat

(1) South Fork Little Butte Creek, Soda Creek, Indian Creek, and Lost Creek are considered critical habitat for coho salmon, listed as threatened under the Endangered Species Act (ESA) of 1973. The South Fork Little Butte Creek Watershed is also designated as a Tier 1 Key Watershed for the recovery of at-risk stocks of fish. The Planning Area is located entirely within the South Fork Little Butte Creek Key Watershed. There is concern that increased sedimentation from the implementation of the project proposal (see Potential for Impacts to Hydrologic Function and Water Quality above) could potentially impact fish habitat and the recovery of fish populations in South Fork Little Butte Creek.

C. Potential for Impacts to Northern Spotted Owls and Their Critical Habitat

(1) Activities associated with timber harvest may affect nesting, roosting, foraging and dispersal habitat within Critical Habitat Units OR-37 and OR-38. CHU OR-37 provides the single most important link connecting the Oregon Cascades Province to the Klamath Mountains province.

(2) The presence of barred owls and their interaction with northern spotted owls should be considered.

D. Potential for Cumulative Effects

(1) There is a potential for adverse cumulative effects on watershed conditions (soils, water quality, hydrologic function, aquatic habitat) and wildlife habitat within the Little Butte Creek Watershed from road building, timber harvest activities, grazing, OHV use, and fire suppression on BLM, Forest Service, and private lands.

E. Economics

(1) There is potential for impacts to the economic feasibility of the overall project implementation due to the high costs associated with handling large amounts of small diameter commercial and noncommercial material, limited road access in some areas, and road improvements that are needed for watershed maintenance and protection.

F. Site Productivity

(1) Activities associated with timber harvest, road building and decommissioning, and prescribed fire may have impacts on soils and site productivity from compaction, displacement, and change in organic matter and soil chemistry.

(2) Unstable soils are prevalent in the Planning Area; consider how project activities would affect the stability of soils in the area.

G. Terrestrial and Aquatic Wildlife

(1) Timber harvesting could potentially lead to reduction of forest stand structure, including canopy cover, and snag/down wood densities in the South Fork Little Butte Creek Project Area, impacting habitats for Bureau Special Status Species and other wildlife utilizing the Planning Area. Comments were received listing concerns specifically for the northern spotted owl, Pacific fisher, Bureau Sensitive bat species, Neotropical migratory birds, and Survey and Manage Species.

(2) Dwarf mistletoe infestations can have beneficial effects for some wildlife species (habitat, food source, etc.); timber harvesting to reduce the mistletoe infestations could adversely affect species that benefit from its presence in stands.

(3) Road construction and renovation may affect terrestrial and aquatic species and their habitats. Roads can cause mortality from road construction, mortality from collision with vehicles, modification of animal behavior, alteration of the physical environment, alteration of the chemical environment, and increased use of an area by humans.

(4) Deer and elk winter range areas exist in the Planning Area; manage according to RMP, which emphasizes providing thermal cover and minimizing disturbances between November 15th and April 1st.

H. Botanical

(1) Forest management and road construction activities may affect Bureau Special Status vascular plants, bryophytes, lichens, and fungi.

(2) Forest management and logging and associated road construction can potentially increase the risk of introduction and spread of noxious weeds. Vehicular travel is the highest risk factor for the introduction of noxious weeds.

I. Silviculture

(1) Ground-based logging could lead to higher incidences of root damage and scarring of residual trees.

(2) Forest management activities may affect late-successional habitat and individual large trees. People expressed their concerns for maintenance of old-growth forest and large-diameter tree structure capable of becoming old-growth forest over the next century, including large snag and down woody debris recruitment.

(3) Forest management activities should harvest across all age classes to thin out understory fuels and to provide for timber resources.

J. Fire & Fuels

(1) Timber harvesting could increase surface fuels over the short-term (6 months to 2 years) in stands treated.

(2) Leaving untreated logging slash, even if only for a short period of time, could lead to increased wildfire behavior and increased risk of escape from initial attack.

(3) Management of forest stands usually results in altered microclimates. Increasing spacing between the canopies of trees can contribute to increased wind speeds, increased temperatures, drying of topsoil and vegetation and increased shrub and forb growth. These changes in microclimates and vegetation structures can alter wildfire behavior and its effects on the land (fire severity).

(4) New road construction has the potential to increase the risk of human fire starts.

(5) Some comments were received suggesting that untreated forest stands with closed canopy conditions result in lower fire severity when burned by wildfire than open and non-forest vegetation conditions. This information was also correlated, by commenters, to a conclusion that long absence of fire is a predictor of low severity fire effects.

K. Air Quality

(1) Particulate matter produced during the implementation of prescribed fire has the potential to adversely affect air quality.

L. Visual Resources and Recreation

(1) Forest management activities may alter visual character (evidence of management) and may impact attainment of Visual Resource Management Objectives.

(2) Timber harvest and hauling operations could impact winter recreation use along the Table Mountain/Buck Prairie winter use area.

(3) Forest management activities may affect recreation values that may be provided by unroaded sections of public lands within the Project Area.

(4) Decommissioning roads may affect public access to some areas and limit enjoyment of public lands, and should be left open instead of decommissioned.

M. Cultural Resources

(1) Timber harvest and road development and improvement activities could affect archaeological or historical sites.

2. Issues Considered but not Further Analyzed

The following comments or issues were discussed by the interdisciplinary team. It was determined these issues were beyond the scope of this project. These issues, along with a rationale for their being "considered but not analyzed in detail" in this EA, are listed below. Also see Chapter 2, *Actions and Alternatives Considered but Eliminated from Detailed Analysis* for options and alternatives considered but not further analyzed.

Comment: Consider the cumulative effects of greenhouse gas emissions associated with this project. Consider the long-term impacts of proposed activities on carbon storage.

Rationale for Eliminating from Detailed Analysis: Other recent EAs on the Medford District (e.g., Howard Forest Management Project, Evans Creek Forest Management Project, and Cottonwood Forest Management Project) with comparable treatments, have analyzed the effects to carbon and the effects

were found to be similar. In those documents, carbon storage and carbon emissions of the proposed actions were calculated to determine the net contributions of greenhouse gases resulting from potential treatments. Carbon emissions (carbon dioxide) were calculated from timber harvest activities (including fuel consumption) and post-harvest fuel treatments. These EAs found proposed actions would reduce carbon stores temporarily but it would result in net increases over time.

The Medford District PRMP/FEIS assumes an annual timber harvest of 3,000 acres of BLM-administered lands designated as Matrix. 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.

Comment: Avoid using regeneration harvest to create/enhance early seral habitat.

Rationale for Eliminating from Detailed Analysis: The purpose of the regeneration harvest proposed in the SFLB Project is not to create or enhance early seral habitat. Limited amounts of regeneration harvest are proposed in the SFLB Project stands in stands with declining growth rates or deterioration from high stand density levels, insects, disease, or other factors. The silvicultural objectives for the proposed regeneration are to: 1) create growing space for a new cohort of trees and/or increase the growth of existing understory trees; 2) reduce understory stem density in the current stand and control the growth rates of existing understory trees for long-term survivability; 3) create opportunities for establishment of species that are shade intolerant and provide long-term success or survival of less prominent species (e.g., sugar pine); and 4) reduce the long-term effects of forest disease by reducing the spread of disease to existing overstory and understory trees (Insect and Disease Management only).

The SFLB Project would not create stands of early seral forest. Proposed units identified for regeneration harvest would be designed to retain a minimum of 30 to 40 percent canopy cover at the stand level and leave 16 to 15 trees per acre greater than 20-inches DBH providing a structural component to the residual stand. Structural retention is a key component of all SGFMA prescriptions (USDI 1995, pp.192-194). In forest stands identified for Insect and Disease Management trees exhibiting a diseased condition would be harvested, leaving a residual overstory of at least 6 to 8 overstory trees per acre greater than 20-inches DBH. Stands would be harvested to a range of 30 to 35 percent canopy cover. Single tree selection would be followed up with one or a combination of silvicultural activities, such as understory thinning, prescribed burning, and/or tree planting of desirable species to create multilayered, structurally complex residual stands.

None of the silvicultural prescriptions proposed under this project would lead to the creation of early seral habitat ; therefore, comments related to early seral habitat and associated issues are not relevant to this project.

Comment: Consider the effects of climate change on northern spotted owls. Specifically, consider that "climate uncertainty represents an increased risk for spotted owl recovery; it may be harder to sustain existing older forests and harder to establish new forests and sustain them through long periods of forest succession."

Rationale for Eliminating from Detailed Analysis: Consideration of effects of climate change is more appropriately determined at a larger scale than this project level analysis. On a larger scale, it is acknowledged by the USFWS that climate change is likely to further exacerbate some existing threats such as the effects of past habitat loss, and changes in forest composition or extent is likely; however, although such effects seem to be likely, it is not yet possible to quantify how those environmental changes are likely to affect the spotted owl (USDI FWS 2011 and see Doppelt el al. 2008).

CHAPTER 2 - ALTERNATIVES

A. INTRODUCTION

This Chapter describes the project development process, the Proposed Action and alternatives developed by the BLM to achieve the objectives identified in the Purpose and Need statements in Chapter 1. A "No Action" Alternative is presented to form a baseline for analysis. Project Design Features (PDFs), which apply the Best Management Practices as described in Appendix D of the RMP (and modified by Resource Management Plan Maintenance dated July 12, 2012), are integral to the design of the Action Alternatives (Alternative 2, which is the Proposed Action, and Alternative 3). The PDFs are incorporated into the analysis of anticipated environmental impacts described in Chapter 3. Section D of this chapter provides a table (Table 2-18) that presents a cross-walk for comparing the Action Alternatives.

B. DEVELOPMENT OF THE PROJECT

Treatment Area Selection

The South Fork Little Butte Project was designed to conform to the 1995 Medford District Resource Management Plan (USDI 1995) and to meet the purpose and need identified in Chapter 1. The South Fork Little Butte Project is in the Matrix Land Use Allocation (LUA), which includes federal lands outside of reserves and special management areas that are available for scheduled timber harvest at varying levels (USDI 1995). Matrix lands are intended to achieve sustainable timber production and other forest commodities, providing jobs and contributing to community stability through both growth and harvest, while also promoting the development of fire-resilient forests (USDI 1995, p. 38). The South Fork Little Butte Project was considered for treatment at this time as a result of a previous review that identified dense forested stands within the Planning Area that need to be treated to reduce insect and diseases concerns and promote forest resiliency. The South Fork Little Butte Planning Area encompasses portions of two 6th field sub-watersheds (Lower and Middle South Fork Little Butte Creeks) of the Little Butte Creek 5th field watershed.

The Medford District's 2012 Integrated Vegetation Management analysis of the current conditions of watersheds within the Medford District evaluated all 5th field watersheds based on the specific timber, fuels, silviculture, and northern spotted owl needs. Seven categories with separate measurements were used to score and rank the watersheds: 1) percentage of BLM lands within the watershed; 2) amount of dry forest and young stands (less than 80 years old) within the watershed; 3) The amount of 10-30" diameter at breast height (DBH) class available for harvest; 4) the amount of high fuel hazard and Fire Regime Condition Class (FRCC) within Wildland Urban Interface (WUI) within the watershed; 5) opportunities for enhancement or conservation of owl sites, 6) the percentages of Matrix and Adaptive Management Area (AMA) within the watershed; and 7) the amount of existing roads within the watershed. Little Butte Creek 5th field watershed was ranked as a medium priority for treatment. Projects in Ashland Resource Area's one high ranking 5th field watershed, Middle Applegate River, have been implemented in the past few years, so it was feasible to begin working in watersheds with a ranking of medium.

Once the Planning Area was established, an interdisciplinary team (IDT) of resource specialists was brought together to begin evaluating the area for potential treatments. The IDT filtered the Planning Area through a series of screens before the Proposed Action was developed. The screening process was intended to ensure the proposal meets RMP guidelines and conservation and recovery actions for federally listed species. The screening process described below helped to distill feasible treatment areas from the larger Planning Area.

The first step in the screening process was to identify ownership within the Planning Area. Within the 35,383-acre South Fork Little Butte Planning Area, the BLM manages 18,035 acres (51%). The following screens were then applied to BLM-managed lands within the Planning Area. They are broken out into four categories to better understand the overarching reason for elimination (Figure 2-1).

1. Policy – RMP Plan Level

Timber Production Capability Classification (TPCC) Withdrawn: TPCC is the process for partitioning forestland into major classes indicating relative suitability to produce timber on a sustained yield basis. TPCC withdrawn lands are lands identified as unavailable for planned forest management based on site specific information. There are exceptions to this rule (USDI 1995, p.72); however, for this project, forest management activities on TPCC withdrawn lands (1,828 acres) were screened from consideration.

Known Owl Activity Centers (KSOACs): KSOACs are the best 100 acres of northern spotted owl habitat around the nest site or owl activity center, for all documented sites as of January 1, 1994 in Matrix and AMA land allocations (USDA and USDI 1994a). KSOACs are managed as Late-Successional Reserves intended to preserve an intensively used portion of the breeding season home range close to a nest site or center of activity (USDI 1995). Because these areas are important to meeting objectives for species other than spotted owls, these areas are to be maintained even if they become no longer occupied by spotted owls (USDA and USDI 1994a). There are approximately 722 acres of KSOACs overlapping the Planning Area and no proposed treatment would occur in the activity centers.

Special Areas: Areas that may need special management, which include Hole-in-the-Rock Area of Critical Environmental Concern (ACEC) and Lost Lake Research Natural Area (RNA) within the Planning Area. Both of these special areas do not allow timber harvest (USDI 1995, pp. 59-61).

Great Gray Owl Core and Buffers: Great Gray Owl Core or Meadow Buffer: As per the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USDA and USDI 2001, p. 39), a no-harvest buffer of 300 feet around meadows and natural openings and a ¼ mile protection zone around known nest sites has been provided.

Special Habitat Buffers: The Medford District RMP provides management guidelines to protect special habitats for plants and animals, such as meadows, cliffs, caves, and talus slopes with a no harvest buffer ranging from 100 to 200 feet depending on site-specific circumstances and the objective to protect the special habitat values; and new road locations would avoid special habitats (USDI 1995, pp. 45, 49). Field verification by Resource Area biologists was completed and where a 100-foot buffer was proposed, justification was documented.

2. Policy – Project Level

Northern Spotted Owl (NSO) Recovery Plan Recommendations: In 2011, the U.S. Fish and Wildlife Service issued a Revised Recovery Plan for the Northern Spotted Owl (NSO). The Recovery Plan includes Recovery Actions, which are recommendations to guide activities that would help to further the recovery objectives for the northern spotted owl. The BLM worked with the U.S. Fish and Wildlife Service to incorporate the Recovery Goals and Actions in the Recovery Plan consistent with BLM laws and regulations. The effects to spotted owls and their critical habitat were considered while planning this project. The following strategies were implemented in order to meet the project objectives and reduce effects to northern spotted owls and their critical habitat. To the extent practicable, the Relative Habitat Suitability (MaxEnt) model described in the 2011 Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011), the Medford District known owl sites layer, recent spotted owl survey results, and spotted owl radio telemetry location data were used to determine treatment options in order to reduce effects to known northern spotted owl sites. Refer to the Wildlife Resources section in Chapter 3 for more information (e.g., definition of terms, description of habitat types, etc.).

- Critical Habitat: Critical habitat for the northern spotted owl was first designated in 1992 in *Federal Register* 57 (USDI 1992), and includes the primary constituent elements that support nesting, roosting, foraging (NRF) and dispersal. Designated critical habitat also includes forest land that is currently unsuitable, but has the capability of becoming NRF habitat in the future (57 FR 10:1796-1837). Critical habitat was revised for the northern spotted owl and the final designation was published by the USFWS in the *Federal Register* (signed on August 12, 2008, 73 Federal Register 157:47326) and became

effective on September 12, 2008. The 2008 USFWS's Critical Habitat delineations were challenged in court and the 2008 designation of northern spotted owl CHU was remanded. The USFWS was ordered to revise the CHU designation. On February 28, 2012, the Service released the proposed critical habitat in the form of maps and the draft form of the *Federal Register* publication. The proposed rule was published in the *Federal Register* on March 8, 2012 (77 *Federal Register* 46:14062-14165). The final Critical Habitat Rule was published in the Federal Register on December 4, 2012 **(**77 Federal Register 233:71876-72068) and became effective January 3, 2013.

The 2012 Final Critical Habitat Rule and principles in the 2011 Revised Recovery Plan were used to inform specific prescriptions when treatment units were located within the 2012 Designated Critical Habitat. Adverse effects were avoided in occupied sites within critical habitat. Adverse effects in critical habitat located outside of the home ranges of known owl sites were only proposed in areas where the habitat could be improved in the long-term (i.e., proposed treatments in capable, dispersal, or roosting/foraging habitat within high habitat suitability according to the relative habitat suitability model); treatments would improve stand resiliency; or where the ecological needs of the stand outweighed the owl habitat needs (e.g., pine restoration on a ridge that is in low habitat suitability according to the relative habitat suitability model)). Nesting, Roosting, and Foraging (NRF) habitat and roosting/foraging habitat are not proposed for removal within critical habitat. More intense prescriptions that would either downgrade or remove habitat and have adverse impacts to spotted owls, were considered in areas outside of critical habitat and high priority owl sites.

The Medford District uses a six category system to classify spotted owl habitat (McKelvey 1 through 6). The ratings are based on canopy cover, tree size (diameter at breast height), and habitat elements. McKelvey Ratings 1 and 2 represent Nesting habitat and Roosting/Foraging habitat, but can also serve as dispersal habitat. McKelvey ratings 3 and 4 currently do not meet spotted owl habitat. McKelvey Ratings 5 and 6 represent dispersal habitat. Treatment in NRF habitat (McKelvey 1) was dropped from consideration if it occurred in high priority sites or in critical habitat. Since the stands were already functioning as NRF habitat, the team determined that treatments were not necessary to improve upon this habitat. Only three acres of NRF habitat is proposed for treatment in the South Fork Little Butte Project and would occur outside of known spotted owl home ranges and outside of critical habitat.

In limited cases, where road construction was necessary to access the proposed treatment acres and no other road was available, small amounts of roosting/foraging (McKelvey 2) and dispersal (McKelvey 5) removal would occur in the project area. The removal of small amounts of habitat from road and landing construction were considered in areas that would allow access to treatments that would have long-term benefits to spotted owl habitat.

- <u>RA10 Important Habitat/Historical High Priority Site:</u> In 2011, the U.S. Fish and Wildlife Service issued a Revised Recovery Plan for the Northern Spotted Owl (NSO). The Recovery Plan includes Recovery Actions, which are recommendations to guide activities that would help to further the recovery objectives for the northern spotted owl. Recovery Action 10 (RA 10) recommends conserving spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population. Within the administrative units of the Rogue River-Siskiyou National Forest (FS) and the Medford District BLM, an interagency, interdisciplinary team was created to develop interim guidance for incorporating RA 10 when planning and implementing management activities on federal lands in southwest Oregon. The southwest Oregon plan established two primary objectives as described in the plan; 1) prioritize known and historic spotted owl sites and 2) identify vegetation management that would enhance spotted owl habitat.

  The South Fork Little Butte team worked to meet the intent of RA 10 as one purpose of the project is to protect and conserve northern spotted owls and their habitat. To the extent practicable, the BLM followed principles in the SW Oregon Recovery Action 10 Guidance Document (USDA and USDI

2013) to reduce impacts to sites with recent pairs and/or reproduction activity within the Project Area. Northern spotted owl sites within the Project Area were prioritized in high and low categories based on occupancy and reproductive success data. The objective at the high priority sites was to avoid adverse effects by not removing or downgrading nesting, roosting, and foraging (NRF) habitat within the home range. While some adverse effects are anticipated at three sites, the proposed action is not likely to impact the reproduction or survival of the owls at these sites because the vegetation treatments are in areas where owls were not located in previous telemetry studies or only small amounts of NRF habitat would be removed from road/landing construction. The objectives at these low priority sites are to accelerate the growth of spotted owl habitat or treat stands for ecological benefits as described in the Recovery Plan and the 2012 Designated Critical Habitat Rule. These objectives would result in short-term adverse effects, for long-term benefits.

- NSO Nest Patch: Northern Spotted Owl Nest Patch: The nest patch is the 300-meter radius (70 acres) area around a known spotted owl nest tree or center of activity that is important to owls. It is one of three scales developed in 2008 by a regional interagency team to analyze effects to northern spotted owls. The other two scales are the home range and 0.5 mile core area. Nest area arrangement and nest patch size have been shown to be an important attribute for site selection by spotted owls (Swindle et al. 1997, Perkins et al. 2000, Miller et al. 1989, and Meyer et al. 1998). The nest patch size also represents key areas used by juveniles prior to dispersal. Miller et al. (1989) found that on average, the extent of forested area used by juvenile owls prior to dispersal averaged approximately 70 acres.

  The total acres of treat and maintain prescriptions (meaning treating the stand while maintaining current habitat (NRF, Dispersal)) within the 0.5 mile core area of high priority owl sites were reduced and in some cases eliminated in order to reduce the effects to spotted owls at these sites.

- RA32 Deferred Stands: In 2011, the U.S. Fish and Wildlife Service issued a Revised Recovery Plan for the Northern Spotted Owl (NSO). The Recovery Plan includes Recovery Actions, which are recommendations to guide activities that would help to further the recovery objectives for the northern spotted owl. Recovery Action 32 (RA 32) recommends to "*maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality spotted owl habitat stands are 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* (USFWS 2011, p. III-67)." The purpose of Recovery Action 32 is to provide refugia for northern spotted owls as they adapt to competitive pressures from an increasing population of barred owls.

  The BLM decided to defer forest management in stands identified as RA 32 stands within the Planning Area at this time. Using the 2010 Draft RA 32 Habitat Evaluation Methodology (version 1.3) developed jointly by the Medford Bureau of Land Management, Rogue River-Siskiyou National Forest, and the Roseburg Office of the U.S. Fish and Wildlife Service, BLM wildlife biologists identified areas within the SFLB Forest Management Project that met the intent of Recovery Action 32. Stands identified as RA 32 forest stands were removed from consideration for timber harvest and detailed analysis.

Riparian Reserves: Riparian Reserves are portions of the watershed where riparian-dependent resources receive primary emphasis and where special standards and guidelines apply. Riparian Reserves overlay other land use allocations and are delineated during implementation of site-specific analysis of the critical hillslope, riparian, and channel processes and features (USDA and USDI 1994a). Preliminary proposed units for this project were delineated in GIS without consideration for Riparian Reserve buffers located within the forest stands. Approximately 615 acres of preliminary proposed units were found to be within Riparian Reserves and were not considered for treatment in the final Proposed Action. Through ground survey and field work, errors in the GIS Riparian Reserve layer were identified and the GIS layer was updated to reflect actual stream and spring

locations. Areas dropped due to these updates are captured above as well. This doesn't account for all Riparian Reserve lands in the Planning Area, only within areas initially identified for treatment in the preliminary proposal.

3. Suitability of Stands

The timber sale planner and silviculturist assessed the timber harvest potential on BLM-administered lands within the Planning Area using the Forest Operations Inventory (FOI) layer and other GIS layers. Identified treatment needs were based on the Medford District Resource Management Plan (RMP) silvicultural management systems for those lands (*Southern General Forest Management Area* (SGFMA)). The following criteria were used to eliminate stands from treatment consideration:

- Vegetative Condition – grasslands, shrublands, hardwood/woodlands.
- Stands thinned in last 0-20 years awaiting regrowth.
- Stands at or near SGFMA retention requirements (overlaps with stands thinned in the last 0-20 years): **t**he stand is at or below 16-25 trees per acre that are greater than 20 inches diameter at breast height and is not diseased. The remaining stand has not reached maturity to warrant a commercial thin.
- Stands at or near *Northern General Forest Management Area* (NGFMA) retention requirements (overlaps with stands thinned in the last 0-20 years): the stand is at or below 6-8 trees per acre that are greater than 20 inches diameter at breast height and the remaining stand has not reached maturity to warrant a commercial thin.
- Stands salvaged from fire or blowdown events in the last decade.
- Young stands from previous regeneration harvest – not ready for treatment.
- Young stands regenerated from fire – too small for harvest.

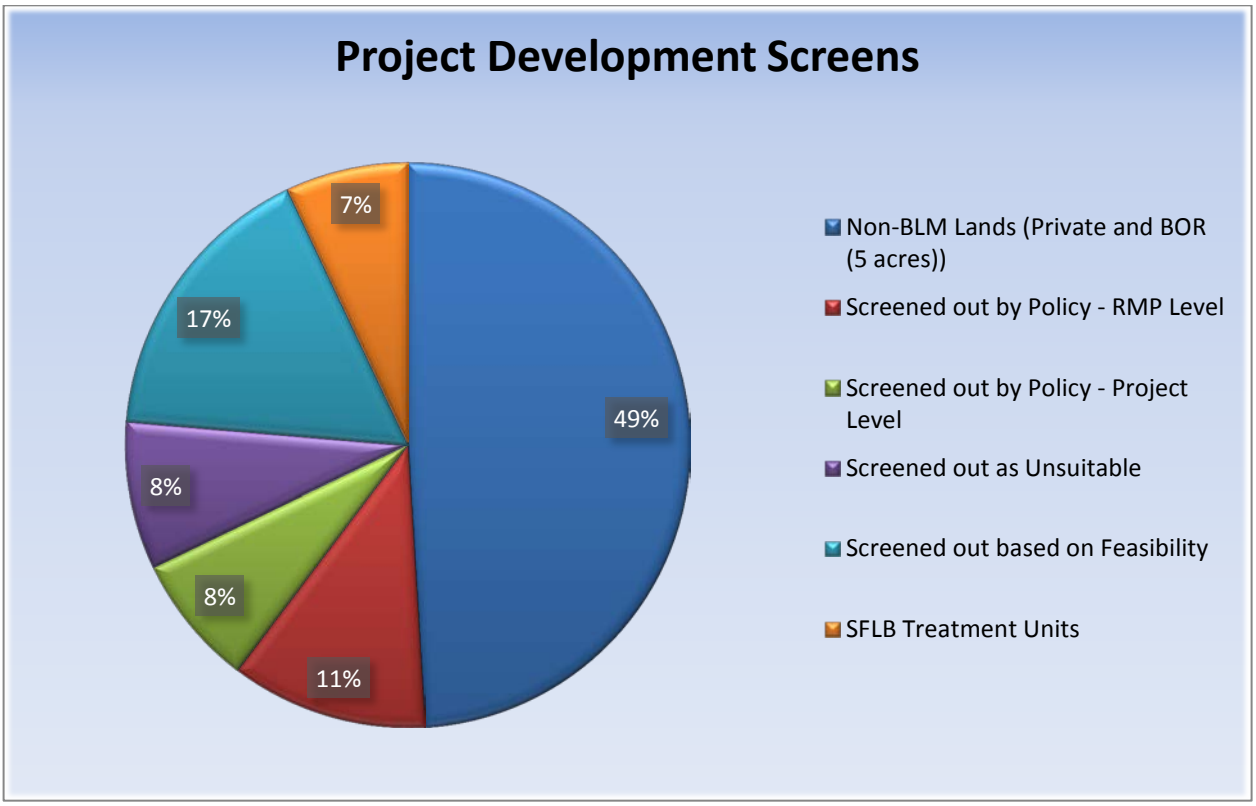
4. Feasibility

Potential treatment units were screened by members of the IDT (timber sale planner, engineer and logging systems specialist) for economic and logistical feasibility for treatment. For example, a potential treatment unit where the only logistically feasible harvest method would be helicopter yarding due to difficult access may have been eliminated from consideration as uneconomical for a variety of reasons including low volume, harvest volume too scattered to achieve appropriate payloads, distance from helicopter landing, adverse haul to helicopter landing, etc. Another example where a potential unit may have been deemed uneconomical occurred when the harvest volume per acre resulting from the application of canopy cover retention prescriptions to treat and maintain habitat for owls dropped to a level that was too low to be economically feasible.

Resource specialists determined other applicable soils, hydrologic, wildlife, and other RMP management guidelines to minimize impacts to resources.

Concerns and issues raised by the public and/or our collaborative partner, the SOFRC, were incorporated into the design of the Action Alternatives.

Figure 2-1. Proposed South Fork Little Butte Treatment Units Compared to Total Planning Area.



Watershed Analysis Update

The SFLB Planning Area falls within Little Butte Creek Watershed Analysis Area. The Watershed Analysis was completed in 1997 and characterized the human, aquatic, riparian, and terrestrial features, conditions, processes, and interactions within the watershed (REO 1995). This planning effort provided an opportunity to assess the current condition of BLM-administered lands in the South Fork Little Butte Creek sub-watersheds and, where needed, update information pertaining to the physical and biological elements. The updated information was collected and used to guide the development of the project proposal and where applicable, was included in the analysis of the project (Chapter 3, Environmental Consequences). A Watershed Analysis Update document is anticipated to be completed and made available to the public in the fall of 2015.

Transportation Management Inventory and Assessment

An interdisciplinary transportation working group comprised of BLM resource specialists (road engineer, hydrologist, fisheries biologist, wildlife biologist, forester, and outdoor recreation planner) was established to review the transportation system in the Little Butte Creek Watershed and make recommendations for roads within the SFLB Planning Area that could be analyzed.

An inventory and review of the existing transportation network was conducted to aid in the assessment of the current condition, to evaluate the transportation system for an appropriate level of management, as well as to identify opportunities to reduce road densities. Roads within the planning area vary from primitive, four-wheel drive (jeep) roads (non-system roads) to engineer-designed roads with culverts, drainage features, and crushed rock surfacing that receive regular maintenance by BLM (system roads). The inventory process specifically identified 1) roads that need maintenance to restore, repair, or improve road surfaces, culverts, and roadside drainage ditches in order to reduce road-related erosion and sedimentation to stream courses; 2) roads that are no longer serving resource programs needs and whether they are contributing to sedimentation and riparian habitat fragmentation; 3) roads needed to provide access for forest management identified to be in need of maintenance or repair; as well as 4) roads under existing agreements for private land access and reciprocal right-of-ways.

Opportunities to more appropriately manage the road system were incorporated into the Action Alternatives described below. Road construction, road decommissioning, both natural and mechanical, as well as road closures and road maintenance opportunities have been identified to address the needs acknowledged during the assessment process.

C. ALTERNATIVES ANALYZED IN DETAIL

1. Alternative 1 – No Action Alternative

The No Action Alternative describes a baseline against which the environmental effects of theProposed Action can be compared. The No Action Alternative discusses the consequences of not taking action. No Action assumes the current resource trends will continue into the future. Under the No Action Alternative, no vegetation management would be implemented; there would be no commercial cutting of trees and there would be no understory reduction or fuels reduction treatments. Normal programmed road maintenance would be performed. Other activities authorized by separate NEPA analyses could happen. The analysis of the No Action Alternative answers the question: What would occur to the resources of concern if the Proposed Action does not take place?

Selection of the No Action Alternative would not constitute a decision to reallocate these lands to non-commodity uses. The decision maker does not need to make a specific decision to select the No Action Alternative. If that is the choice, the Proposed Action would simply be dropped and the NEPA process ended. Future harvesting, young stand forest development work, fuels reduction treatments, other connected actions, and road management in this area would not be precluded and could be analyzed under a subsequent NEPA document.

2. The Action Alternatives

This section describes the two Action Alternatives considered in detail. The narrative summary of each alternative is followed by summary tables listing the amount of acres proposed by prescription and harvest method, and a table detailing proposed new road construction and/or road decommissioning (where applicable). A detailed list of commercial and non-commercial harvest units and a road use table can be found in Appendix A. Components that are common to both Action Alternatives, including silvicultural objectives and prescriptions, commercial harvest methods, post-harvest fuels reduction work, Project Design Features (PDFs), and other Project Development Criteria are described in further detail under Section D (Components Common to the Action Alternatives).

a. Alternative 2 – Proposed Action

Alternative 2 was developed to achieve the objectives described in Chapter 1, the Purpose and Need for the South Fork Little Butte Forest Management Project. Alternative 2 was designed to achieve forest health objectives while minimizing the impacts to northern spotted owls and other Special Status Species within forest stands in the Planning Area.

Proposed Forest Management Activities

Under this alternative, approximately 2,488 acres of vegetation would be treated using various commercial and non-commercial silvicultural prescriptions as described under Section D (Components Common to the Action Alternatives). About 1,676 acres are proposed for commercial harvest treatments. Approximately 1,553 acres are proposed for non-commercial treatments, of which 741 acres are within commercial harvest units and 812 acres are strictly non-commercial stands (Table 2-1 below, and Tables 2-2, and 2-3 in Appendix A).

The cutting and removal of trees is accomplished in commercial conifer forests by a timber sale contract which sells material over eight (8) inches DBH (diameter at breast height). Trees to be retained or removed are designated in accordance with the marking guidelines developed for the project. Depending on stand conditions, individual trees are marked for retention (leave tree marking) or for harvest (cut tree marking). Non-

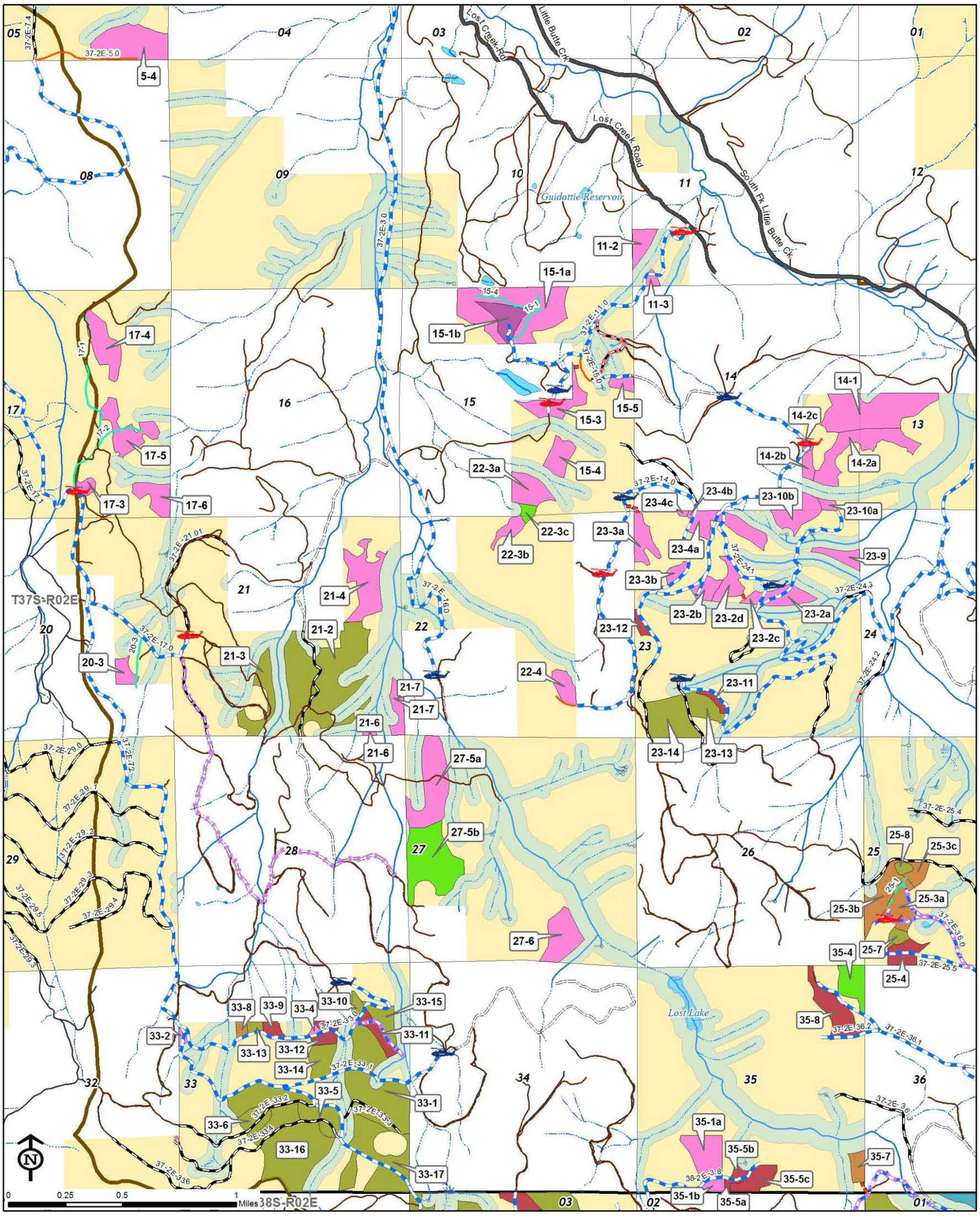
commercial vegetation (material less than eight (8) inches DBH) would be removed through contracts that hire out cutting and piling of material. Tops and limbs of trees cut would be treated to reduce fire risk by piling and burning the material in a controlled manner. The BLM would burn the piles during wet weather conditions. Some material could be made available for firewood, pulp or woody biomass depending on market conditions and demand.

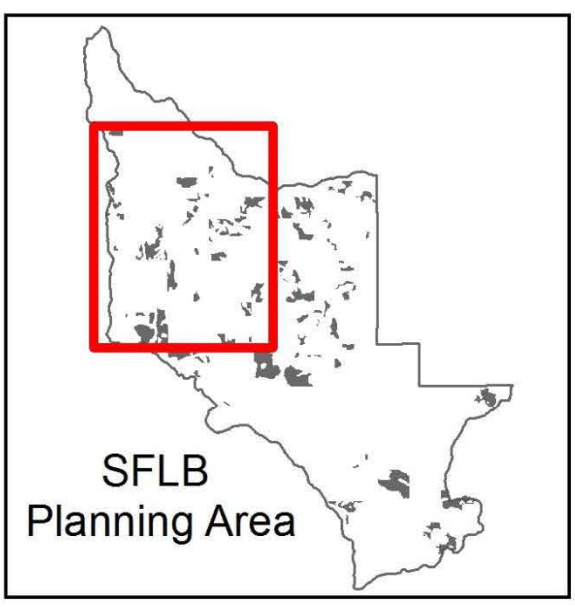
Table 2-1 summarizes the project by silvicultural treatment prescriptions and timber harvest methods. Unit specific information is displayed in Tables 2-2 and 2-3 (Appendix A) and Maps 2-1 to 2-5.

Table 2-1. Alternative 2: Summary of Acres by Silvicultural Prescription and Harvest Method

Commercial Prescriptions	Est. Acres
Selective Thinning	1,060
Group Selection	109
Density Management	32
Regeneration Harvest	133
Mortality Salvage	342
Total	1,676
Non-commercial Prescriptions	**Est. Acres**
Understory Reduction	812
Understory Reduction within Commercial Harvest Units	741
Total	1,553
Timber Harvest Method	**Est. Acres**
Tractor Yarding	1,005
Cable Yarding	268
Helicopter Yarding	333
Bull-Line Yarding	70
Total	1,676

Map 2-1. South Fork Little Butte Project – Alternative 2





Roads
- Bureau of Land Management
- County route
- Forest Service
- Other state route
- Municipal route (urban, residential, etc.)
- Private road (no symbol)
- Not Known
- Non-system Road
- Proposed Designated Skid Trails
- Proposed Haul Routes

Proposed Road Decommissioning
- Fully Decommission
- Long-Term Closure

Proposed New Road Construction
- Temporary
- Permanent

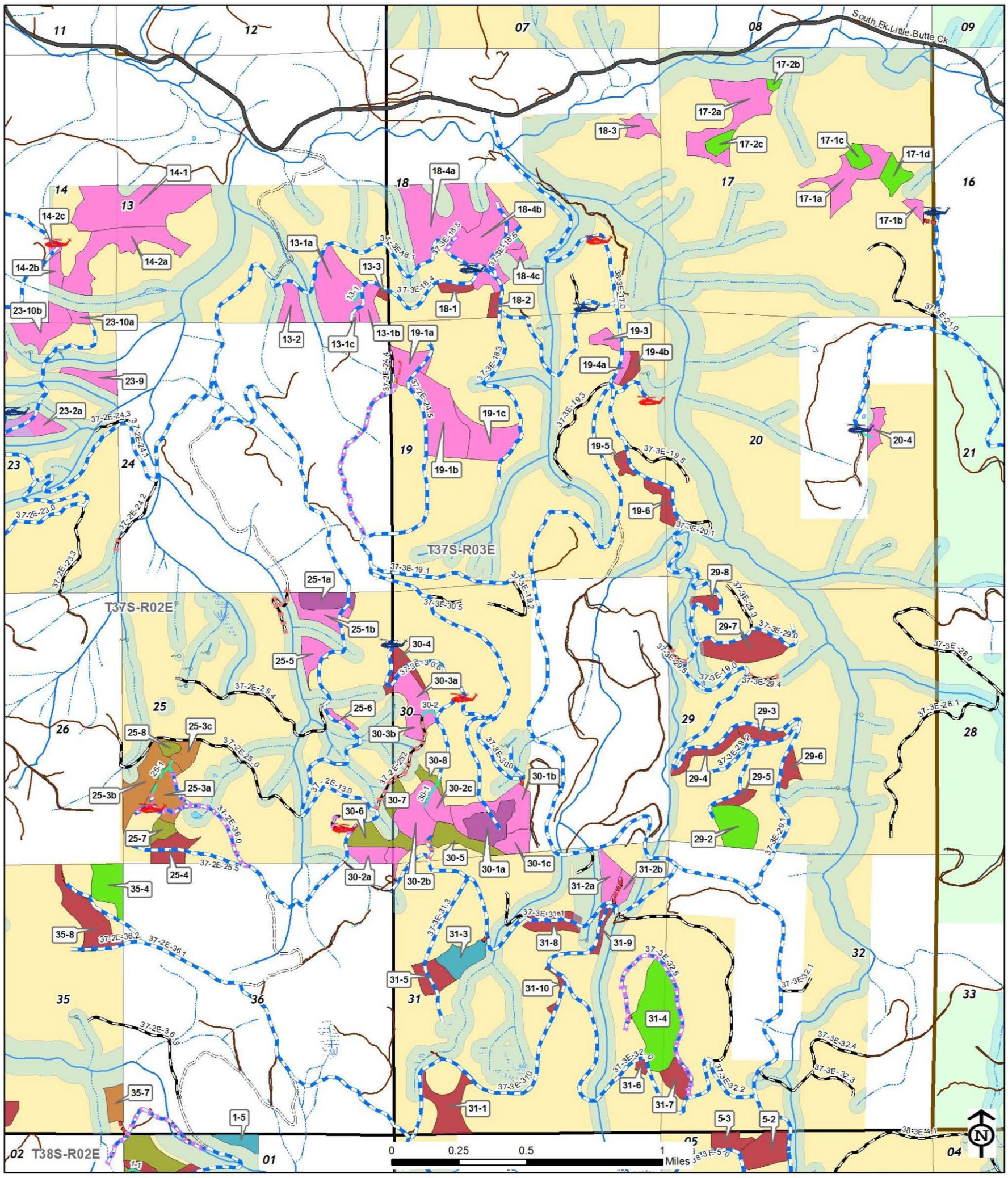
Helicopter Landings Status
- New
- Old

Treatments
- Density Management
- Group Selection
- Insect and Disease Management
- Structural Retention
- Selective Thinning
- Mortality Salvage
- Understory Reduction

Ownership
- Bureau of Land Management
- U.S. Forest Service
- Bureau of Reclamation
- Private Individual or Company

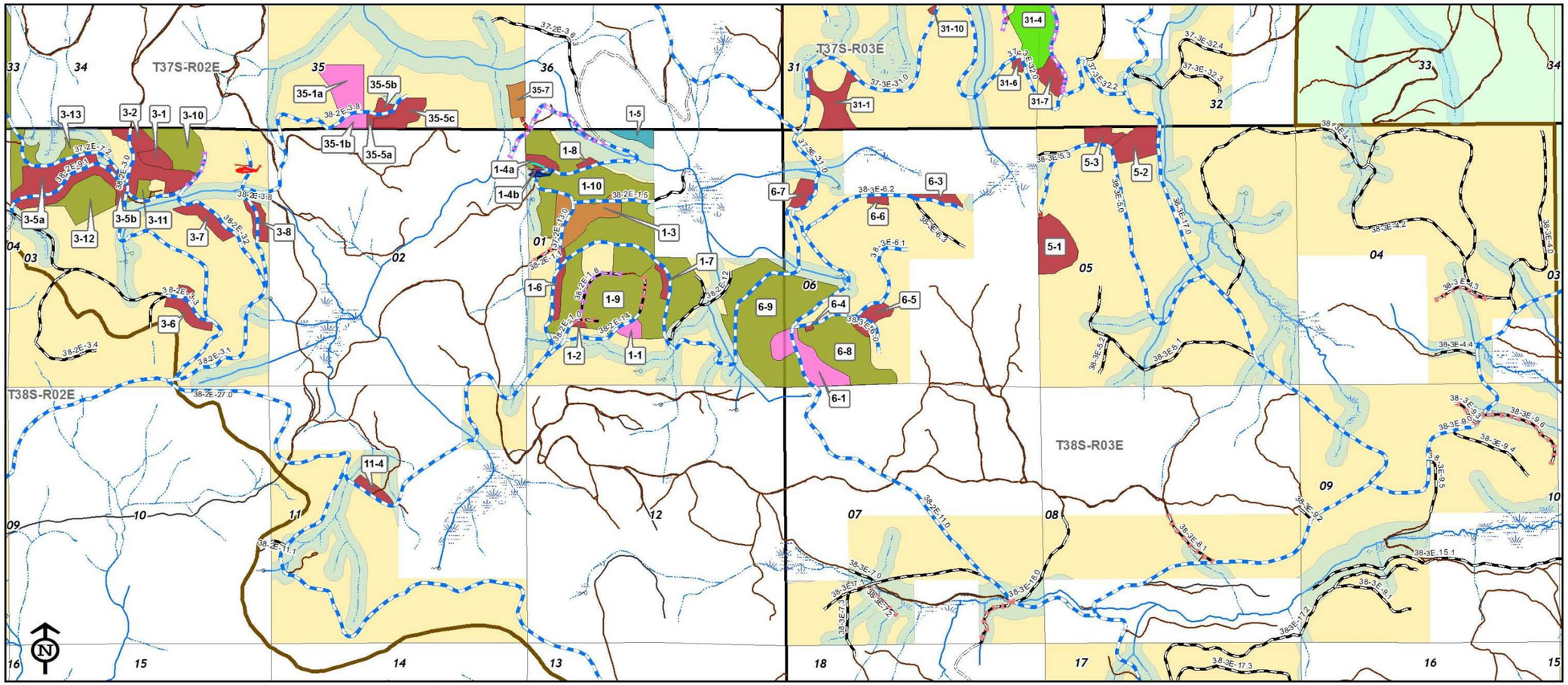
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.

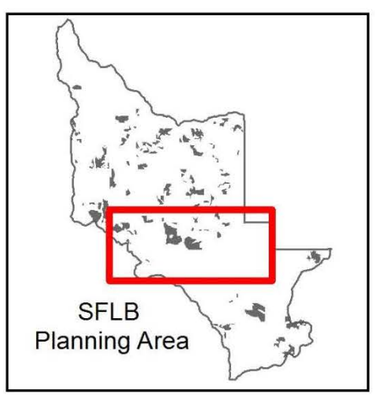
Map 2-2. South Fork Little Butte Project – Alternative 2



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 and may be updated without notification.

Map 2-3. South Fork Little Butte Project – Alternative 2





0 0.25 0.5 1 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 and may be updated without notification.

Roads
- Bureau of Land Management
- County route
- Forest Service
- Other state route
- Municipal route (urban, residential, etc.)
- Private road (no symbol)
- Not Known
- Non-System Road
- Proposed Designated Skid Trails
- Proposed Haul Routes

Proposed Road Decommissioning
- Fully Decommission
- Long-Term Closure

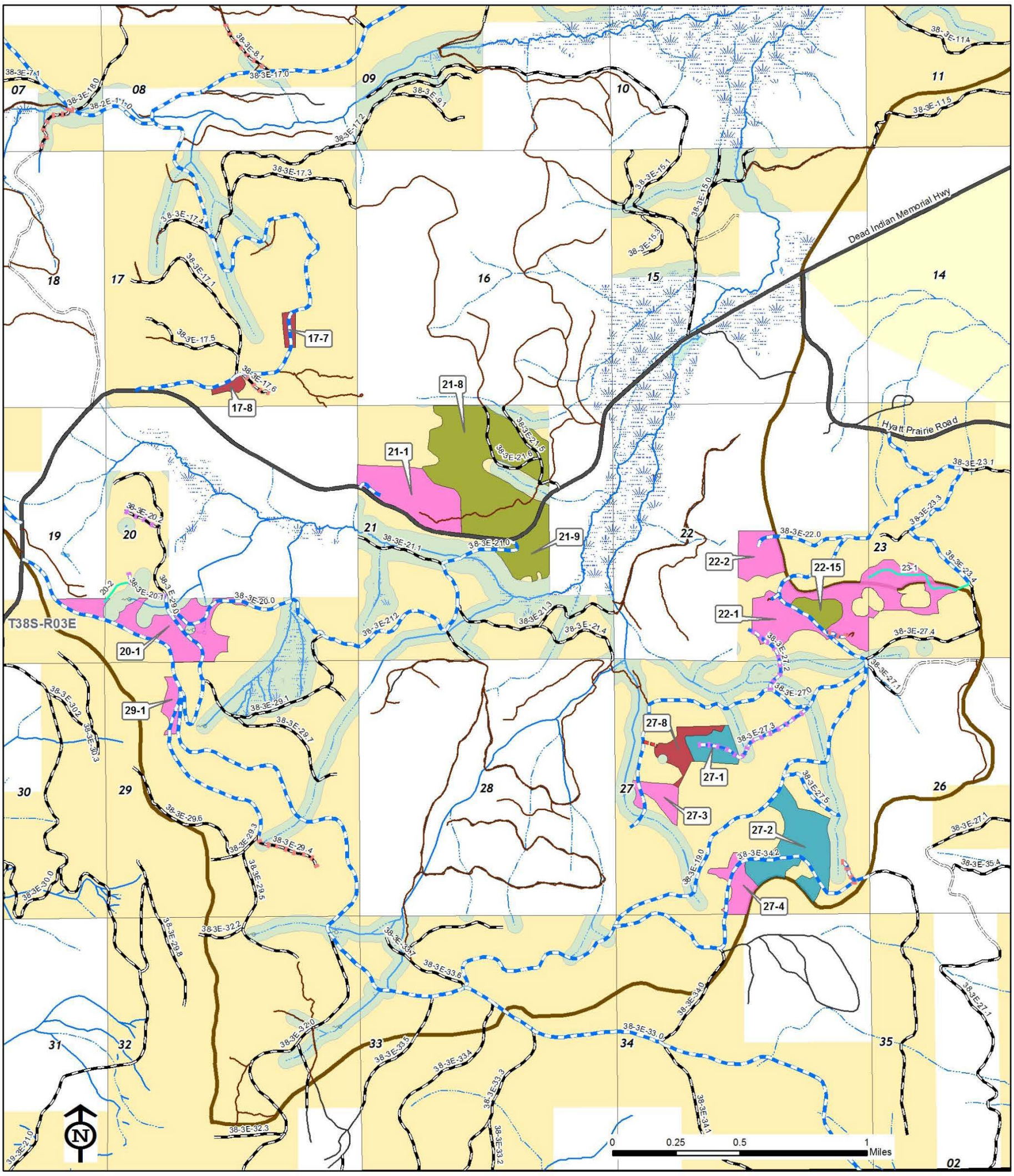
Proposed New Road Construction
- Temporary
- Permanent

Helicopter Landings Status
- New
- Old

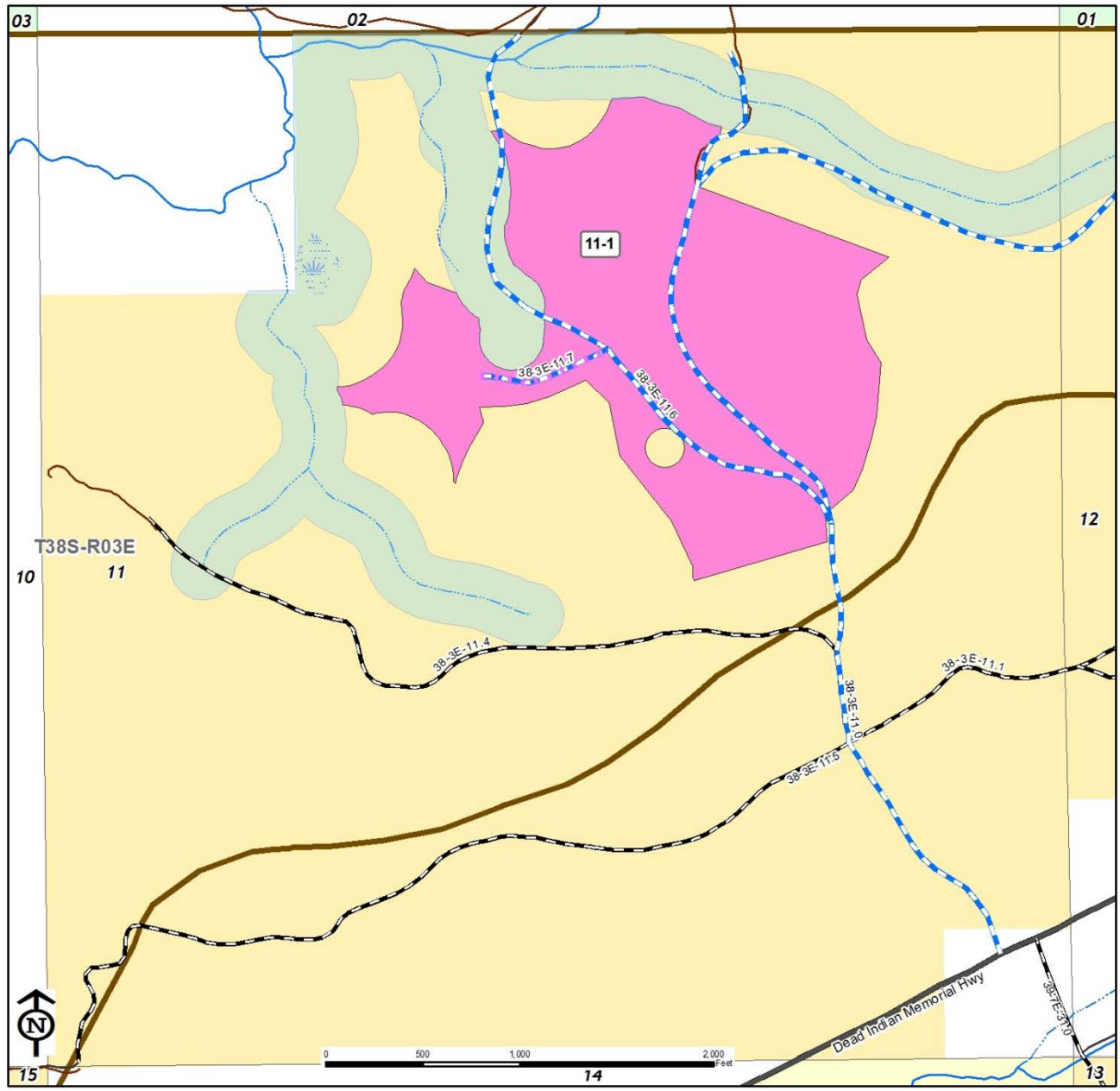
Treatments
- Density Management
- Group Selection
- Insect and Disease Management
- Structural Retention
- Selective Thinning
- Mortality Salvage
- Understory Reduction

Ownership
- Bureau of Land Management
- U.S. Forest Service
- Bureau of Reclamation
- Private Individual or Company

Map 2-4. South Fork Little Butte Project – Alternative 2



Map 2-5. South Fork Little Butte Project – Alternative 2



Roads
- Bureau of Land Management
- County route
- Forest Service
- Other state route
- Municipal route (urban, residential, etc.)
- Private road (no symbol)
- Not Known
- Non-System Road
- Proposed Designated Skid Trails
- Proposed Haul Routes

Proposed Road Decommissioning
- Fully Decommission
- Long-Term Closure

Proposed New Road Construction
- Temporary
- Permanent

Helicopter Landings Status
- New
- Old

Treatments
- Density Management
- Group Selection
- Insect and Disease Management
- Structural Retention
- Selective Thinning
- Mortality Salvage
- Understory Reduction

Ownership
- Bureau of Land Management
- U.S. Forest Service
- Bureau of Reclamation
- Private Individual or Company

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 and may be updated without notification.

Proposed Haul Routes (Existing Roads) and Road Improvements and Renovation

Under Alternative 2, an estimated 122.28 miles of existing roads would be used as haul routes and improved as needed to meet BLM standards (Appendix A, Table 2-4). Road work on existing roads to access commercial harvest units may include such items as: grading and shaping roads, spot rocking, brushing, cleaning road drainage ditches and culvert basins, repairing and installing water dips, and replacing and installing culverts.

Temporary bridges would be utilized for two temporary channel crossings, one on road 37-2E-3.00 A and one on 38-2E-1.07. Placement of portable bridges would not involve ground disturbance; they are hauled in and placed across the stream channel from the existing roadway during the dry season.

Road 37-2E-7.04 would have two temporary channel crossings. Cattle-guards may be placed across the stream channels during the dry season with drain rock. If cattle-guards are not used, drain rock would be placed along entire channel. Approaches will be rocked for 150 feet on each side of crossing. Both crossings would be removed before the wet season.

Roads 37-2E-25.03, 37-2E-25.06, 37-2E-33.05, 37-3E-18.05, 37-3E-32.05, 38-2E-3.02 B, 38-3E-11.07, and 38-3E-20.01 would have existing barricades removed. The roads would be brushed and saplings in the running surfaces would be removed. Grass growing in the roadbeds would not be bladed off unless needed to reduce fire danger. Road grading would only occur in areas needing drainage improvement or for safe passage of vehicles. After harvest operations are completed, the roads would be left in an erosion-resistant condition and earthen barricades would be replaced. Blockage at the entrance would consist of placing logs, slash, boulders, earthen berms, and other material so the entrance is camouflaged for a minimum distance of 100 feet or as needed to prevent unauthorized vehicle use.

Roads 37-2E-11.00E, 37-2E-15.01, and 37-3E-29.02 are existing overgrown impassable BLM roads. These roads would be brushed and saplings in the running surfaces would be removed. Road grading would only occur in areas needing drainage improvement or for safe passage of vehicles.

BLM would renovate portions of roads 37-2E-13.00 F3 and 38-3E-20.00 to facilitate access to harvest Units. Renovation of roads 37-2E-13.00 F3 and 38-3E-20.00 would involve reshaping the road with a blade, spot rocking, and restoring water drainage.

Spur 23-2 is an existing closed non-system road on BLM. Spur 23-2 would have existing barricade removed. The road would be brushed and saplings in the running surface would be removed. Grass growing in the roadbed would not be bladed off unless needed to reduce fire danger. Road grading would only occur in areas needing drainage improvement or for safe passage of vehicles. After harvest operations are completed, the road would be left in an erosion-resistant condition and earthen barricade would be replaced.

Spurs 21-1 and 35-8 are existing overgrown impassable non-system road on BLM. Both spurs would be brushed and saplings in the running surface would be removed. Grass growing in the roadbed would not be bladed off unless needed to reduce fire danger. Road grading would only occur in areas needing drainage improvement or for safe passage of vehicles. After harvest operations are completed, the roads would be fully decommissioned. Spur 21-1 would also require construction of a road approach off of Dead Indian Memorial highway. The approach would be constructed and maintained to Jackson County standards.

Spurs 25-3, 30-3, 22-1, and 27-1 are existing open non-system roads on BLM. These roads would be brushed and saplings in the running surfaces would be removed. Grass growing in the roadbeds would not be bladed off unless needed to reduce fire danger. Road grading would only occur in areas needing drainage improvement or for safe passage of vehicles. After harvest operations are completed, these roads would be fully decommissioned or obliterated.

Spur 22-2 is an existing open non-system road on BLM with a dispersed camp site. The road would be brushed and saplings in the running surface would be removed. Road grading would occur and rock would be placed along its entire length.

Proposed Road Construction (Temporary and Permanent)

Alternative 2 would construct approximately 3.84 miles of new road to provide access to proposed harvest units. About 0.80 miles of road constructed would be permanently added to the road system and approximately 3.04 miles of temporary road construction is proposed (Tables 2-5 and 2-6). All road construction and subsequent decommissioning activities would adhere to associated PDF's identified in Section D (Components Common to the Action Alternatives).

Following use, all newly constructed permanent roads would receive adequate rock surfacing or would be closed with a gate or blocked and winterized prior to the wet season. Blockage at the entrance shall consist of constructing an earthen trench barrier to prevent motorized vehicle use for an extended/indefinite period. Prior to closure the road will be left in an erosion-resistant condition.

Temporary roads constructed would be fully decommissioned or obliterated at the completion of timber harvest activities. Fully decommissioning would include decompacting the surface to a depth of 12 to 18 inches or to a point where 10 inches diameter stones are the dominant substrate (whichever is shallower). Where it is determined by the Authorized Officer that decompacting temporary roads would cause unacceptable damage to the root systems of residual trees along a majority of the temporary road, such as where new temporary roads are constructed within the dripline of trees, subsoiling may be intermittent or scarification may be used instead. Equipment must be able to avoid rocky areas and adapt to changes in rock depth. Slash, boulders, and other debris would be placed along the road's entire length as determined by availability of materials to provide ground cover and discourage mechanized use. Blockage at the entrance would consist of placing logs, slash, boulders, earthen berms, and other material so the entrance is camouflaged for a minimum distance of 100 feet and vehicle use is precluded. Seeding with approved native seed species and mulching with weed-free straw or approved native materials would occur within 100 feet of the roads entrance. Obliterated roads would be treated similar to fully decommissioning; however, where fill occurs, recontouring and outsloping the travelway to disperse runoff would occur. Treatments described may be modified by the Authorized Officer in consultation with appropriate earth scientists or aquatic specialists.

Table 2-5. Alternative 2: Proposed New Road Construction.

Road Number	Approximate Length (miles)	Surface	Control	Comments
37-2E-14.00C	0.10	NAT	BLM	Closed with Gate
37-2E-5.00	0.46	NAT	BLM	Closed with Gate
37-2E-24.04C	0.10	NAT	BLM	Close with Barrricade System
37-2E-15.00A	0.14	NAT	BLM	Closed with Gate
Total mileage:	0.80			

Abbreviations:

Surface: NAT=Natural

Control: BLM=Bureau of Land Management

Table 2-6. Alternative 2: Temporary Road Construction

Road Number	Approximate Length (miles)	Surface	Control
T37 R2E Spur 13-1	0.05	NAT	BLM
T37 R2E Spur 15-1	0.27	NAT	BLM
T37 R2E Spur 15-4	0.30	NAT	BLM
T37 R2E Spur 17-1	0.86	NAT	BLM
T37 R2E Spur 17-2	0.24	NAT	BLM
T37 R3E Spur 18-1	0.05	NAT	BLM
T37 R2E Spur 20-3	0.23	NAT	BLM
T37 R2E Spur 25-1	0.07	NAT	BLM
T37 R2E Spur 25-2	0.03	NAT	BLM
T37 R2E Spur 25-3	0.04	NAT	BLM
T37 R3E Spur 20-1	0.05	NAT	PVT
T37 R3E Spur 30-1	0.12	NAT	BLM
T37 R3E Spur 30-2	0.07	NAT	BLM
T38 R2E Spur 1-1	0.06	NAT	BLM
T38 R3E Spur 20-2	0.14	NAT	BLM
T38 R3E Spur 23-1	0.46	NAT	BLM
Total mileage:	3.04		

Abbreviations:

Surface: NAT=Natural

Control: BLM = Bureau of Land Management, PVT = Private

Proposed Full Decommissioning and Long-Term Closures of Existing Roads

Approximately 4.05 miles of road is proposed for full decommissioning (Table 2-7) and 7.27 miles of road is proposed for long-term-closure under Alternative 2 (Table 2-8). Roads proposed for full decommissioning in the Project Area are not needed for future management purposes. Roads proposed for long-term closure would be closed with an earthen barrier or its equivalent for an extended/indefinite period, but could be operated and maintained again in the future.

Roads proposed for full decommissioning using mechanical treatment would include decompacting the surface to a depth of 12 to 18 inches or to a point where 10 inches diameter stones are the dominant substrate (whichever is shallower). Where it is determined by the Authorized Officer that decompacting roads may cause unacceptable damage to the root systems of residual trees along a majority of the road, decompacting may be intermittent, or scarification may be used instead. Equipment must be able to avoid rocky areas and adapt to changes in rock depth. Slash, boulders, and other debris would be placed along the road's entire length as determined by availability of materials to provide ground cover and discourage mechanized use. Blockage at the entrance would consist of placing logs, slash, boulders, earthen berms, and other material so the entrance is camouflaged for a minimum distance of 100 feet and vehicle use is precluded. Seeding with approved native seed species and mulching with weed-free straw or approved native materials would occur within Riparian Reserves and within 100 feet of the roads entrance. Full decommissioning of roads involving mechanical treatment would include the removal of all drainage structures. Treatments described may be modified by the Authorized Officer in consultation with appropriate earth scientists or aquatic specialists.

Roads proposed for full decommissioning identified as natural treatment are currently overgrown with trees and are considered to be decommissioned due to a natural process of vegetation growth and have no drainage structures needing to be removed. Full decommissioning of these roads would remove it from the BLM transportation database, and the natural re-vegetation of the roadbed would continue.

Roads proposed for full decommissioning using both treatments would include a combination of mechanical treatment, such as decompacting the surface, removing drainage structures, and blocking the entrance of the road, and natural treatment where roadbeds have overgrown and are considered naturally decommissioned.

Roads identified for long-term closure would be treated as follows: The road would be effectively blocked and winterized prior to the wet season. Blockage at the entrance would consist of placing logs, slash, boulders, earthen berms, and other material so the entrance is camouflaged for a minimum distance of 100 feet and vehicle use is precluded. Prior to closure, the road will be left in an erosion-resistant condition.

Table 2-7. Alternative 2: Proposed Full Decommissioning of Existing Roads

Road Number	Approximate Length (miles)	Surface	Control	Decommission Treatment
T37 R2E Spur 25-3	0.10	NAT	BLM	Mechanical
T37 R3E Spur 30-3	0.10	NAT	BLM	Mechanical
T38 R3E Spur 22-1	0.09	NAT	BLM	Mechanical
T38 R3E Spur 27-1	0.11	NAT	BLM	Mechanical
37-2E-15.00A	0.43	NAT	BLM	Both*
37-2E-24.00B	0.24	NAT	BLM	Natural
37-2E-24.02B	0.05	NAT	BLM	Natural
37-2E-25.02	0.42	NAT	BLM	Both*
37-2E-33.07	0.04	NAT	BLM	Natural
37-3E-29.04	0.12	GRR	BLM	Natural
37-3E-29.05	0.10	NAT	BLM	Both*
38-2E-1.00B	0.10	NAT	BLM	Natural
38-2E-1.01	0.14	NAT	BLM	Mechanical
38-2E-1.04B	0.17	NAT	BLM	Natural
38-3E-4.03	0.22	NAT	BLM	Mechanical*
38-3E-7.02	0.16	NAT	BLM	Mechanical*
38-3E-8.01	0.26	NAT	BLM	Both*
38-3E-9.03A	0.12	NAT	BLM	Mechanical*
38-3E-9.06A	0.40	NAT	BLM	Natural
38-3E-17.06A	0.14	NAT	BLM	Both*
38-3E-18.00B1	0.26	NAT	BLM	Mechanical*
38-3E-29.04	0.28	NAT	BLM	Both*
Total mileage:	4.05			

Abbreviations:

Surface: NAT = natural, GRR = Grid Rolled Rock, ASC = Aggregate Surface Course

Control: BLM=Bureau of Land Management

* No funding has been identified to date; however, the Transportation Management Inventory and Assessment process has identified these roads for potential decommissioning and they would be decommissioned as funding allows.

Table 2-8. Alternative 2: Proposed Long-Term Closures of Existing Roads

Road Number	Approximate Length (miles)	Existing Surface: Depth (inches) and Type	Control	Closure Type
37-2E-17.00 D	0.38	NAT	BLM	Barricade
37-2E-17.00 E	1.68	NAT	PVT	Barricade*
37-2E-24.04 B-C	0.79	NAT	PVT	Barricade
37-2E-25.03	0.23	NAT	BLM	Barricade*
37-2E-25.06	0.12	NAT	BLM	Barricade
37-2E-33.05	0.28	NAT	BLM	Barricade*
37-2E-36.00B	0.48	PRR	BLM	Barricade
37-3E-18.05	0.07	NAT	BLM	Barricade
37-3E-32.05	0.93	NAT	BLM	Barricade
38-2E-1.06	0.30	NAT	BLM	Barricade
38-2E-1.07	0.54	NAT	BLM	Barricade*
38-2E-3.02 B	0.17	ASC	BLM	Barricade*
38-3E-11.07	0.13	NAT	BLM	Barricade
38-3E-20.01	0.19	NAT	BLM	Barricade
38-3E-20.02	0.15	NAT	BLM	Barricade*
38-3E-27.02	0.31	NAT	BLM	Barricade
38-3E-27.03	0.52	NAT	BLM	Barricade
Total mileage:	7.27			

Abbreviations:
Surface: NAT=Natural, PRR = Pit Run Rock
Control: BLM = Bureau of Land Management, PVT = Private
* No funding has been identified to date; however, the Transportation Management Inventory and Assessment process has identified these roads for potential long-term closure and they would be barricaded as funding allows.

Proposed Designated Skid Trails and Helicopter Landings

Twenty-six sites have been identified for potential use as helicopter landings under Alternative 2. Fourteen of these sites are existing landings and at the remaining 12 sites, new landings would be constructed (Maps 2-1 to 2-5). New helicopter landings would be approximately one acre in size, would be minimized in Riparian Reserves, and would adhere to associated PDFs.

Eleven designated skid trails are proposed to access treatment units and would range in length from 70 feet to 540 feet and would adhere to associated PDFs (Section D. 4, Project Design Features for Harvest and Yarding).

b. Alternative 3

Alternative 3 was developed to achieve the objectives described in Chapter 1, the Purpose and Need for South Fork Little Butte Project. Alternative 3 was designed to address the desire for no road construction and to provide further protection of northern spotted owl habitat within the provincial home ranges of known northern spotted owl sites.

Proposed Forest Management Activities

Under Alternative 3, approximately 1,579 acres of vegetation would be treated using various commercial and non-commercial silvicultural prescriptions as described under Section D (Components Common to the Action Alternatives). About 960 acres are proposed for commercial harvest treatments. Approximately 1,133 acres are

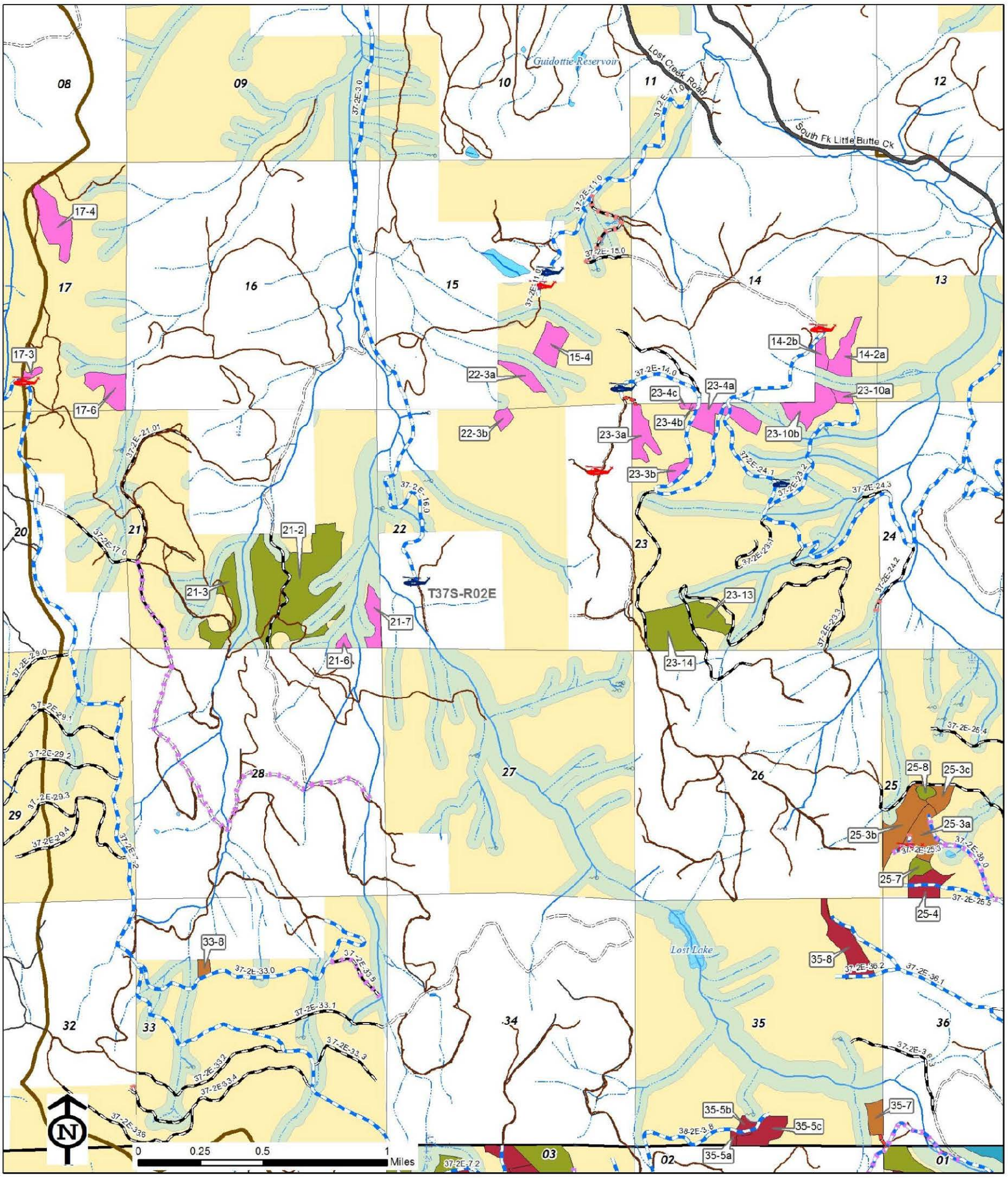
proposed for non-commercial treatments, of which 514 acres are within commercial harvest units and 619 acres are strictly non-commercial stands.

Table 2-9 summarizes the project by silvicultural treatment prescriptions and timber harvest methods. Unit specific information is displayed on Maps 2-6 to 2-10 below and in Appendix A, Tables 2-10 and 2-11.

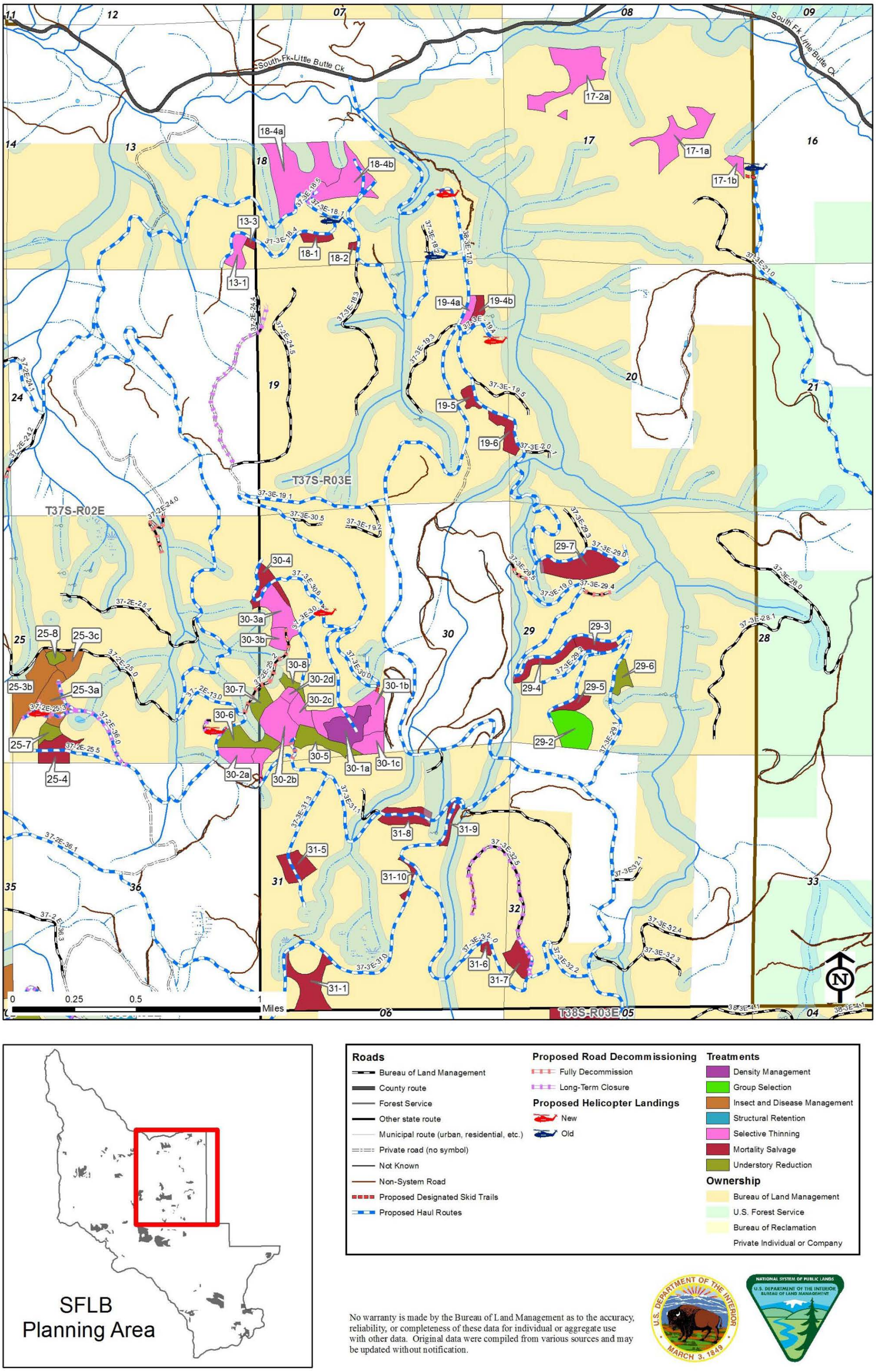
Table 2-9. Alternative 3: Summary of Acres by Silvicultural Prescription and Harvest Method

Commercial Prescriptions	Est. Acres
Selective Thinning	507
Group Selection	14
Density Management	12
Regeneration Harvest	121
Mortality Salvage	306
Total	960
Non-commercial Prescriptions	**Est. Acres**
Understory Reduction	619
Understory Reduction in Commercial Harvest Units	514
Total	1,133
Timber Harvest Method	**Est. Acres**
Cable Yarding	114
Tractor Yarding	643
Helicopter Yarding	145
Bull-Line Yarding	57
Total	960

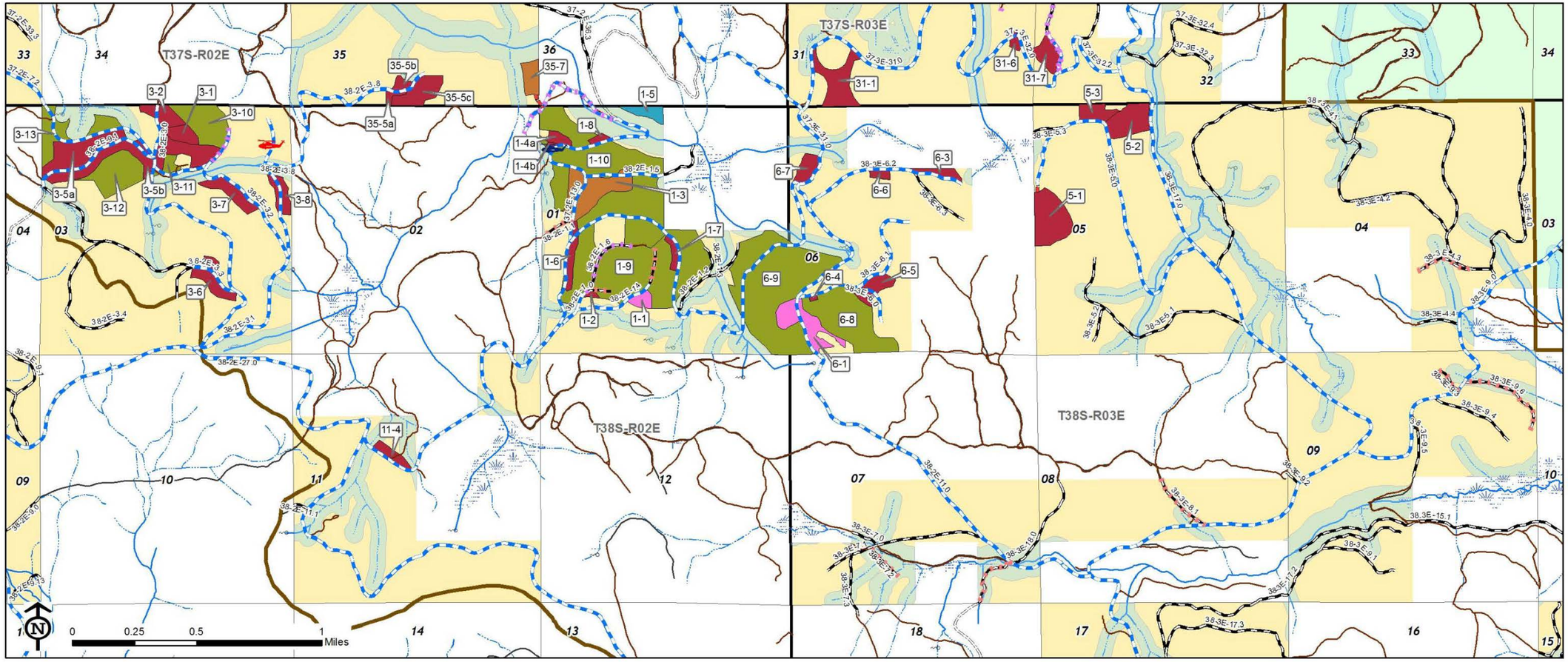
Map 2-6. South Fork Little Butte Project – Alternative 3



Map 2-7. South Fork Little Butte Project – Alternative 3



Map 2-8. South Fork Little Butte Project – Alternative 3



1:24,000

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 and may be updated without notification.

Roads
- Bureau of Land Management
- County route
- Forest Service
- Other state route
- Municipal route (urban, residential, etc.)
- Private road (no symbol)
- Not Known
- Non-System Road
- Proposed Designated Skid Trails
- Proposed Haul Routes

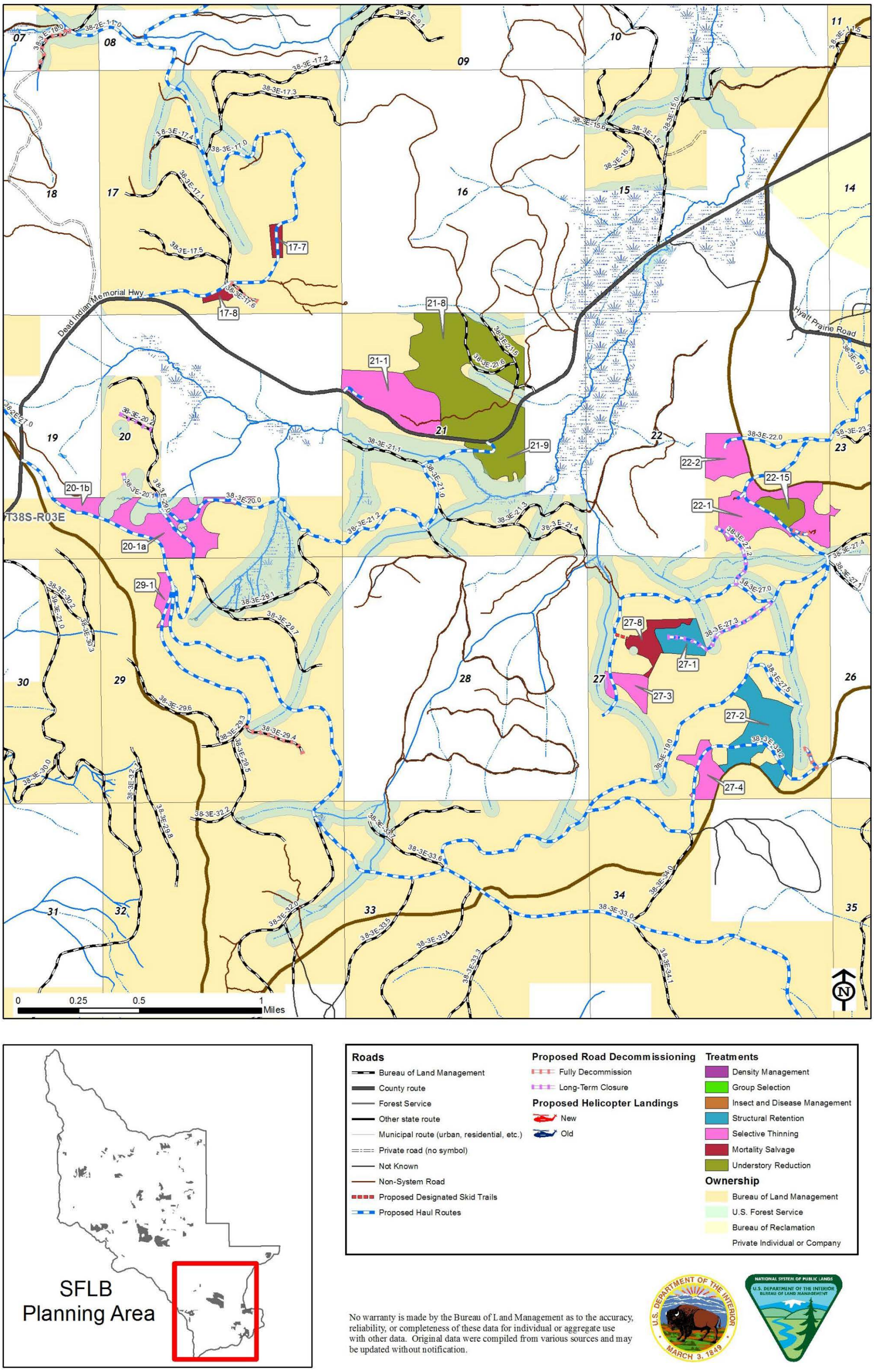
Proposed Road Decommissioning
- Fully Decommission
- Long-Term Closure

Proposed Helicopter Landings
- New
- Old

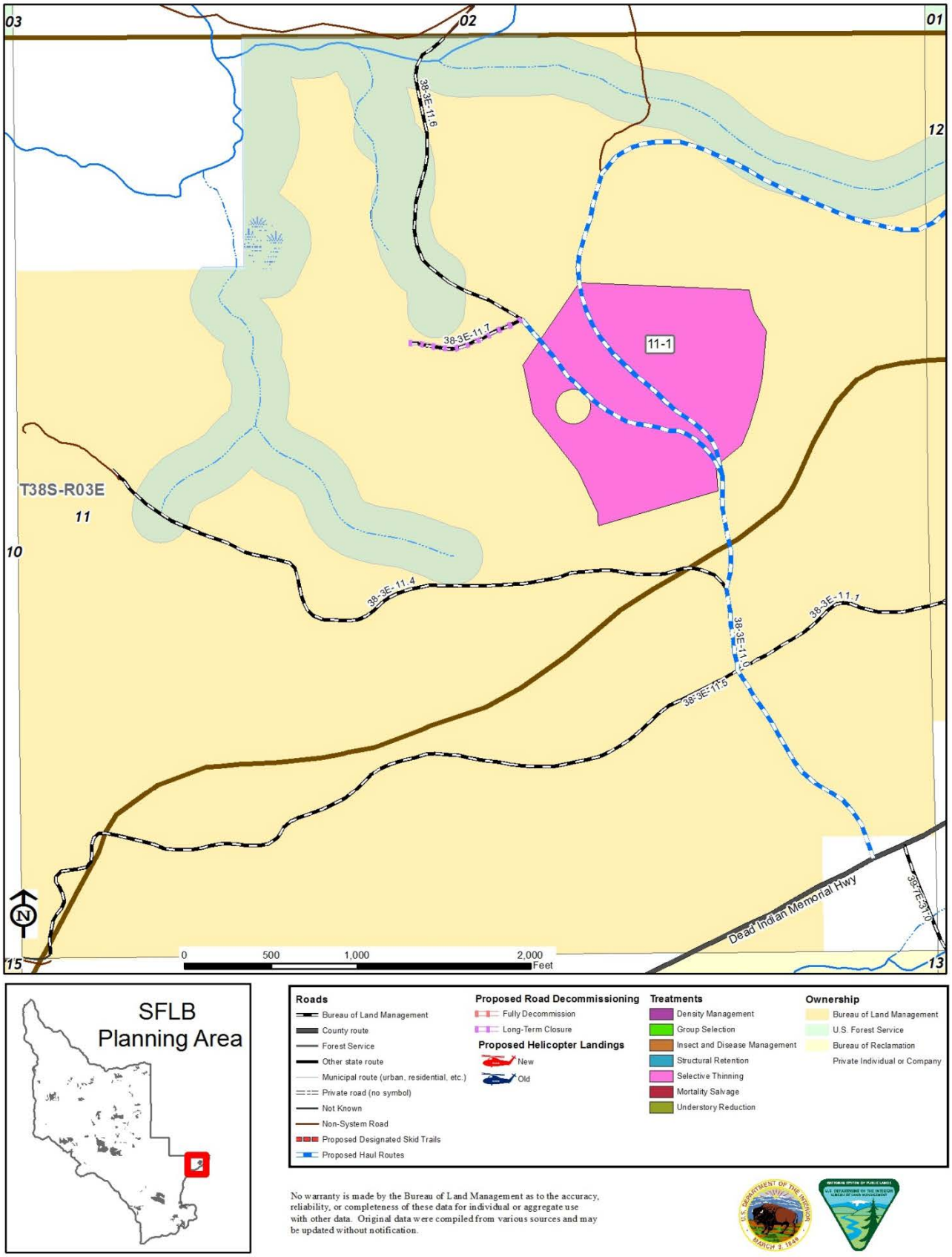
Treatments
- Density Management
- Group Selection
- Insect and Disease Management
- Structural Retention
- Selective Thinning
- Mortality Salvage
- Understory Reduction

Ownership
- Bureau of Land Management
- U.S. Forest Service
- Bureau of Reclamation
- Private Individual or Company

Map 2-9. South Fork Little Butte Project – Alternative 3



Map 2-10. South Fork Little Butte Project – Alternative 3



Proposed Haul Routes (Existing Roads) and Road Improvements and Renovation

Under Alternative 3, an estimated 109.28 miles of existing roads would be used as haul routes and improved as needed to meet BLM standards (Appendix A, Table 2-12). Road work on existing roads to access commercial harvest units may include such items as: grading and shaping roads, spot rocking, brushing, cleaning road drainage ditches and culvert basins, repairing and installing water dips, and replacing and installing culverts.

Temporary bridges would be utilized for two temporary channel crossings, one on road 37-2E-3.00 A and one on 38-2E-1.07. Placement of portable bridges would not involve ground disturbance; they are hauled in and placed across the channel from the existing roadway during the dry season.

Roads 37-2E-25.03, 37-2E-25.06, 37-3E-18.05, 37-3E-32.05, 38-2E-3.02 B, and 38-3E-20.01 would have existing barricades removed. The roads would be brushed and saplings in the running surfaces would be removed. Grass growing in the roadbeds would not be bladed off unless needed to reduce fire danger. Road grading would only occur in areas needing drainage improvement or for safe passage of vehicles. After harvest operations are completed, the roads would be left in an erosion-resistant condition and earthen barricades would be replaced.

Roads 37-2E-11.00E and 37-3E-29.02 would be brushed and saplings in the running surfaces would be removed. Road grading would only occur in areas needing drainage improvement or for safe passage of vehicles.

BLM would renovate portions of roads 37-2E-13.00 F3 and 38-3E-20.00 to facilitate access to harvest Units. Renovation of roads 37-2E-13.00 F3 and 38-3E-20.00 would involve reshaping the road with a blade, spot rocking, and restoring water drainage.

Spurs 21-1 and 35-8 are existing overgrown impassable non-system road on BLM. Both spurs would be brushed and saplings in the running surface would be removed. Grass growing in the roadbed would not be bladed off unless needed to reduce fire danger. Road grading would only occur in areas needing drainage improvement or for safe passage of vehicles. After harvest operations are completed, the roads would be fully decommissioned. Spur 21-1 would also require construction of a road approach off of Dead Indian Memorial highway. The approach would be constructed and maintained to Jackson County standards.

Spurs 25-3, 30-3, 22-1, and 27-1 are existing open non-system roads on BLM. These roads would be brushed and saplings in the running surfaces would be removed. Grass growing in the roadbeds would not be bladed off unless needed to reduce fire danger. Road grading would only occur in areas needing drainage improvement or for safe passage of vehicles. After harvest operations are completed, these roads would be fully decommissioned or obliterated.

Spur 22-2 is an existing open non-system road on BLM lands with a dispersed camp site. The road would be brushed and saplings in the running surface would be removed. Road grading would occur and rock would be placed along its entire length.

Proposed Full Decommissioning and Long-Term Closures of Existing Roads

Under Alternative 3, road decommissioning and long-term closure of roads is also proposed; the same as described under Alternative 2 (pp. 2-16 to 2-18).

Proposed Designated Skid Trails and Landings outside of Treatment Units

Eighteen sites have been identified for potential use as helicopter landings under Alternative 3. Six of these sites are existing landings and at the remaining 12 sites, new landings would be constructed (Maps 2-6 to 2-10). New helicopter landings would be approximately one acre in size, would be minimized in Riparian Reserves, and would adhere to associated PDFs.

Seven designated skid trails are proposed to access treatment units and would range in length from 150 feet to 360 feet and would adhere to associated PDFs (Section D. 4, Project Design Features for Harvest and Yarding).

D. COMPONENTS COMMON TO THE ACTION ALTERNATIVES

1. Silvicultural Objectives and Prescriptions

The vegetation treatments proposed under the South Fork Little Butte Project are divided into two categories: commercial and non-commercial treatments. Commercial refers to treatment areas where the trees to be removed are of sufficient size to be sold as saw logs to produce dimensional lumber or plywood veneer. Non-commercial refers to treatment stands where the material to be removed is smaller than eight inches diameter breast height (DBH).

The vegetation treatments proposed use a variety of silvicultural techniques based on the existing and potential vegetation at each site. A group of silvicultural prescriptions have been developed that match the potential and existing characteristics of each site with the forest vegetation goals. These prescriptions take into account changes in the potential vegetation based on factors such as aspect, slope, available moisture and soil type. The prescriptions guide which trees are to be left and which trees are to be removed. The target density for trees left on each site is based on the individual site's ability to sustain healthy trees long term.

The silvicultural prescriptions are as follows:

Commercial Prescriptions

Selective Thinning

There are four types of Selective Thinning prescriptions proposed in the South Fork Little Butte Project based on the vegetation type. The general silvicultural objectives for all selective thinning prescriptions include:

1) Reduce stand density to increase tree growth, quality, and vigor of the remaining trees;
2) Create diversified stand structure (height, age, and diameter classes);
3) Develop spatial heterogeneity within stands (e.g., fine-scale structural mosaic);
4) Increase resilience/resistance of forest stands to wildfire, drought, insects, etc. by reducing stand density and ladder fuels;
5) Increase growing space and decrease competition for large and/or legacy pine, oak, and cedar.

Selective Thinning will be a combination of thinning with groups or openings to the extent or amount recommended by vegetation type and/or plant series that exists. These stand treatments would generally target low vigor trees over healthy trees (proportional thinning and low thinning) to reduce stand density and improve stand resiliency and individual tree health. This prescription would be used to accelerate the growth of remaining trees while promoting desired species that are best adapted to site conditions. Spatial distribution of leave trees should be based on tree condition (live crown ratio and crown form), as opposed to leaving trees based on a distance grid. Trees would be removed singly or in groups (openings) and stands will have a wide range of basal area or tree spacing targets based on stand types or conditions. The amount and size of openings created will depend on vegetation types (ponderosa pine, Douglas-fir, mixed conifer, and white fir) and current stand development stages. Opening size will range from 0.10-0.25 acre where fire resilient and drought tolerant species need release to reduce competition. Opening size will range from 0.25-0.50 acres where regeneration is encouraged or where poor crown conditions exist (weakened and suppressed trees). The extent or amount of openings permitted will range from 5-15% of the total treatment unit area. Openings should be no closer than 100 feet to the next opening. Trees may be marked in patches (e.g., groups of trees with poor crowns) and left in clumps (e.g., groups of old trees) where necessary. Unique stand features such as snags, coarse woody debris, large hardwoods, and older trees exhibiting old-growth characteristics will remain to maintain desired structural

components for wildlife. In addition to such stand features, rock outcrops, special status species sites, and seeps/wet areas would be protected.

Selective Thinning —Douglas-fir (ST/DF)

Stands that are predominantly Douglas-fir and have low-moderate productive site conditions would be treated to a relative density range of 0.30-0.40. Stands will be harvested to a range of 40-50% canopy cover and will be thinned using guidelines to reduce basal area to between 100 and 130 ft² per acre. These stands are lacking suitable natural regeneration of drought tolerant and fire resilient species in the understory, while the overstory is greater than 90% Douglas-fir with scattered legacy ponderosa pine, incense cedar, and black oak.

Selective Thinning —Mixed Conifer (ST/MC)

Stands that are predominantly Douglas-fir and have moderate-high productive site conditions would be treated to a relative density range of 0.35-0.45. Stands will be harvested to a range of 40-50% canopy cover and will be thinned using guidelines to reduce basal area to between 110 and 140 ft² per acre. Depending on aspect and elevation these mixed conifer stands can have a relatively high amount of stand density due to the presence and absence of shade tolerant species. These stands are generally dominated by a Douglas-fir, ponderosa pine, and white fir overstory, with less prominent species as incense cedar and sugar pine.

Selective Thinning —White Fir (ST/WF)

Stands that are predominantly white fir and have moderate-high productive site conditions will be treated to a relative density range of 0.35-0.45. Stands will be harvested to a range of 45-55% canopy cover and will be thinned using guidelines to reduce basal area to between 120 and 140 ft² per acre. These stands are dominated by shade tolerant species in the understory and overstory. The overstory is greater than 90% white fir with remnant or legacy Douglas-fir and incense cedar.

Selective Thinning—Ponderosa Pine (ST/PP)

Stands that are predominantly composed of ponderosa pine or have the lowest productive site conditions would be treated to a relative density range of 0.25-0.35. Stands would be harvested to a range of 35-45% canopy cover and will be thinned using guidelines to reduce basal area to between 80 and 110 ft² per acre. These sites may have suitable natural regeneration of drought tolerant and fire resilient species in the understory; however more shade tolerant species (Douglas-fir) have restricted growth in the overstory (dominant and co-dominant trees).

Group Selection

The principal purpose for a group selection treatment is to create structural diversity among stands that are homogenous in appearance, or have a one-layer overstory. Residual trees will have improved health, vigor, and growth from the added growing space, water, and nutrients that they receive. Group selection will create small openings, allowing regeneration establishment and release, will preserve legacy trees within the stand, and remove trees of low vigor. There are two types of retention levels for group selection listed below to increase spatial heterogeneity.

Group Selection >40% (GS-40)

Stands will be harvested to a range of 40-50% canopy cover and will be treated using guidelines to reduce basal area between 100 and 140 ft² at the stand level. The size of patches or openings should be no greater than 0.50 acres and should not exceed 25% of the total treatment unit area. Opening size will range from 0.10-0.25 acres where fire-resilient and drought-tolerant species need release to reduce competition. Opening size will range from 0.25-0.50 acres where regeneration is encouraged or where poor crown conditions exist (weakened and suppressed trees). Openings should be no closer than 100 feet to the next opening.

Group Selection >60% (GS-60)

Stands will be harvested to a range of 60-70% canopy cover and will be treated using guidelines to reduce basal area between 160 and 180 ft² at the stand level. The size of patches or openings should be no greater than 0.25

acres and should not exceed 20% of the total treatment unit area. Opening size will range from 0.10-0.25 acres where fire-resilient and drought-tolerant species need release to reduce competition. Opening size will be no larger than 0.25 acres where regeneration is encouraged or where poor crown conditions exist (weakened and suppressed trees). Openings should be no closer than 100 feet to the next opening.

Density Management (DM)

The primary objective of the density management prescription is to reduce stand density in order to promote the growth and structural development of the remaining stand. Density Management is prescribed in stands that are currently providing northern spotted owl roosting and foraging habitat. Based on the unit location (within 0.5 mile core areas), the objective for spotted owls would be to treat and maintain the habitat. Spacing of the residual (leave) trees would involve crown spacing of the healthiest dominant and co-dominant trees to achieve a canopy cover of 60% or greater at the stand level. Stands will be treated to a relative density range of 0.50-0.60 as a result and will be thinned using guidelines to reduce basal area to between 160 and 180 ft^2 per acre. Unique stand features such as snags, coarse woody debris, large hardwoods, and older trees exhibiting characteristics will remain to maintain desired structural components for wildlife.

Smaller trees would be targeted for removal over larger trees. Trees targeted for removal would include those exhibiting crown decline, narrow crown widths, and that contribute least to the canopy layer or structural components. Trees that demonstrate these characteristics would be individually selected for removal, unless it compromises the required minimum canopy cover of 60%. Trees may be marked in small patches (i.e., groups of trees with poor crowns) and left in clumps (i.e., groups of old trees) to create hiding cover for wildlife species and increase spatial heterogeneity. The size of patches or openings should be no greater than 0.20 acres and should not exceed 5% of the total treatment unit area.

Regeneration Harvest

Two types of regeneration harvest are proposed in stands with declining growth rates or experiencing deterioration from high stand density levels, insects, disease, or other factors: A) Structural Retention and B) Insect and Disease Management. The silvicultural objectives here are as follows: 1) create growing space for a new cohort of trees and/or increase the growth of existing understory trees; 2) reduce understory stem density in the current stand and control the growth rates of existing understory trees for long term survivability; 3) create regeneration opportunities for species that are shade intolerant and provide long-term success or survival of less prominent species (e.g., sugar pine); and 4) reduce the long-term effects of forest disease by reducing the spread of disease to existing overstory and understory trees (Insect and Disease Management only).

Structural Retention (SR)

This prescription applies to stands primarily dominated by mature Douglas-fir, have poor annual stand growth, and/or have limited conifer regeneration. Thinning these stands would not provide the desired growth and increase in productivity. As directed by the Medford District RMP, structural retention as proposed under this project would leave at least 16 to 25 large green conifer trees per acre, provided structural objectives were met. Large green conifer trees are described as those greater than 20 inches diameter at breast height (DBH). Stands would be harvested to a range of 30-40% canopy cover.

Insect and Disease Management (IDM)

This prescription applies to stands that have a high degree of dwarf mistletoe disease infection and contain susceptible tree species in the understory and overstory. Many of these stands developed in conjunction with disturbance (fire, insects, harvest, etc.) and lack desirable growth rates and vigor ratings for site conditions. These sites are exhibiting a deteriorating stand condition and are not currently providing a suitable environment to meet long-term management objectives stated above. These stands do not currently provide NRF or dispersal habitat due to the lack of structure and canopy cover, but they are capable of developing into dispersal and/or NRF in the future. The primary objective is to reduce the long-term effects of forest disease by reducing the spread of disease to existing overstory and understory trees, not eradicating it.

The silvicultural strategy would use the single tree selection method whereby, the most infected trees would be removed and least infected and/or uninfected trees would be retained depending on topographic positions and site conditions. The Medford District RMP instructs to "design silvicultural treatments so that within-stand endemic levels do not increase, and where possible, affected trees contribute to the achievement of land use allocation objectives (USDI 1995, p. 194)." The presence of mistletoe necessitates a variation in prescriptions with stand conditions in these areas requiring lower than 40% canopy cover (USDI 1995). These stands exhibiting a diseased condition would be harvested, leaving a residual overstory of 6-8 trees per acre (TPA) greater than 20-inches DBH. Stands will be harvested to a range of 30-35% canopy cover. Single tree selection would be followed up with one or a combination of silvicultural activities, such as understory thinning, prescribed burning, and/or tree planting of desirable species.

Mortality Salvage (MS)

Mortality Salvage is proposed in stands or portions of stands where dead and dying trees are found. Dying trees are defined as a standing tree that has been severely damaged by forces such as fire, wind, ice, insects, or disease, such that in the judgment of an experienced forest professional or someone technically trained for the work, the tree is likely to die within a few years. The primary objective is to assist in meeting Allowable Sale Quantity (ASQ) for timber production. Mortality Salvage involves removing dead and dying trees singly or in groups for sawlogs, specialty products, or fuelwood. These stand types would have a minimum amount of snags retained after salvage is completed as directed by the Medford District RMP (USDI 1995, p. 63). A minimum of 2 snags per acre greater than 16 inches DBH will be retained, preferably in clumps or groups.

Non-Commercial Prescriptions

Understory Reduction (UR)

The silvicultural objectives here are as follows: 1) reduce stand density to increase tree growth, quality, and vigor of existing understory trees; and 2) reduce understory stem density in the current stand and control the growth rates of existing understory trees for long term survivability. Understory Reduction is used to accomplish pre-commercial thinning and fuels reduction treatments for even and uneven-aged conifer stands. Understory Reduction consists of cutting small trees (generally less than 8 inches diameter for conifer and less than 12 inches diameter for hardwood) and vegetation with chainsaws and disposing of the material by hand-piling and burning or use of a lop and scatter method in lighter fuels. Understory Reduction increases tree growth rates and promotes horizontal and vertical structural diversity in stands. Understory Reduction is also used in stands where pines and shade-intolerant hardwood species are diminishing in vigor and numbers because of overcrowded stand density conditions. This prescription may be applied to understories and/or areas of high stocking of small trees in commercial stands proposed for harvest.

2. Commercial Harvest Methods:

Trees designated for removal as a result of application of the forest stand prescriptions described above would be moved from forest stands to landing areas using a combination of cable and tractor yarding methods.

Cable (Skyline) Yarding*:* This harvest method involves a carriage that moves logs laterally to and longitudinally along a suspended cable. During the lateral yarding stage, the logs are dragged along the ground, at least on one end to the skyline (cable) corridor. In the longitudinal yarding stage (up the slope to the landing on or near a road), the logs can be either fully suspended or partially dragged (one end suspended), depending on the system and ground conditions. This harvest method requires narrow skyline corridors about every 150 to 200 feet, and parallel to each other, through the treatment unit. Corridors are about 9 to 15 feet wide, depending on the size of trees to be removed and the terrain, and are pre-located and approved by the BLM.

Bull-line Yarding: on slopes generally greater than or equal to 35 percent, biomass and sawlog material created from harvest operations would be yarded to landings or road sides. This method drags trees short

distances (generally less than or equal to 150 feet) with no suspension from the ground. This yarding system does not require guy line anchors, tail hold trees, or cable corridors.

Tractor Yarding: utilizes tractors to drag trees to landing locations. Tractor yarding only occurs on lands with less than 35 percent slopes. This method requires narrow skid trails (about 9 to 12 feet wide). Skid trail locations are approximately 150 feet apart, but vary depending on the site-specific terrain, and are pre-located and approved by the BLM Contract Administrator. Pre-located skid trails minimize the area of ground a tractor operates on, thus, minimizing soil disturbance.

Mechanized Harvesters: utilize ground-based harvester/forwarder or feller/buncher systems. Mechanical equipment is driven to the trees for harvest, although there is a requirement for equipment to have the capability to reach 20 feet. Harvester/forwarders (a.k.a. cut-to-length systems) operate on slash generated from project activity, while feller/buncher equipment operates on or off designated skid trails, based on soil moisture conditions and terrain limitations. The area compacted would not exceed the overall unit compaction rate of 12%. Allowable passes using this equipment is limited to 1 to 2, and mechanical trails would be limited to operating an average of 50 feet off of designated skid trails.

Helicopter Yarding: lifts trees bunched together by a cable, moving the trees from the treatment unit to a landing area near a road. Helicopter yarding allows for full suspension of the trees from the treatment unit to the landing area and does not create skid trails or corridors. Trees posing safety hazards would be removed when operationally required.

3. Post-Harvest Fuels Reduction Treatments

Small diameter slash (generally 3 inches diameter and less) created from commercial forest thinning (activity slash) would be cut, handpiled, and covered with plastic following completion of timber harvest operations; slash piling usually occurs within one month to six weeks of harvesting. Pile burning is usually completed within 6 months to one year of timber harvesting depending on the time of year the harvest occurred; slash needs a period of time to cure before burning can take place. Some material could be made available for firewood, pulp or woody biomass depending on market conditions and demand.

4. Project Design Features

Project Design Features **(**PDFs) are an integral part of the Action Alternatives (Alternatives 2 and 3). They are developed to avoid or reduce the potential for adverse impacts to resources. PDFs include seasonal restrictions on many activities in order to minimize erosion and reduce disturbance to wildlife. PDFs also outline protective buffers for sensitive species, mandate the retention of snags, and delineate many measures for protecting Riparian Reserves throughout the project. Where applicable, PDFs reflect Best Management Practices and standard operating procedures.

PDFs included in this project description are carried forward into contracts as required contract specifications. BLM contract administrators and inspectors monitor the operations of contractors to ensure that contract specifications are implemented as designed.

Best Management Practices (BMPs) are designed to reduce nonpoint source pollution to the maximum extent practicable and are considered the primary mechanisms to achieve Oregon Water Quality standards. Implementation of PDFs, in addition to establishment of Riparian Reserves, would equal or exceed Oregon State Forest Practice Rules. 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; the report noted that proper implementation of BMPs was essential to minimizing non-point source pollution (Kattelmann 1996). BMPs would be monitored and, where necessary, modified to ensure compliance with Oregon Water Quality Standards. The PDFs listed below apply to the Proposed Action (Alternative 2).

a. Harvest and Yarding

Objective 1: Protect Riparian Reserves

(1) No commercial harvest in Riparian Reserves.

(2) No use of skid trails in Riparian Reserves, with the exception of one location to access a landing in Unit 5-2a along Conde Creek Road (38-3E-17) (Map 2-3).

(3) Trees would be directionally felled away from Riparian Reserves.

(4) No logging slash would be piled within Riparian Reserves.

Objective 2: Prevent Offsite Soil Erosion and Soil Productivity Loss

(1) When operationally feasible, all units would be yarded in such a way that the coarse woody material remaining after logging would be maintained at or greater than current levels in order to protect the soil surface and maintain soil productivity.

(2) Wherever trees are cut to be removed, directional felling away from dry draws and developed waterways would be practiced. Trees would be felled to the lead in relation to skid trails. Developed waterways in the Project Area would be protected from damage and kept free of slash.

(3) All tractor skid trail locations would be approved by the BLM Contract Administrator prior to construction. Maximum area in skid trails used would be less than 12% of the harvest unit. Existing skid trails would be utilized when possible. Maintain 150-foot spacing between designated skid trails.

(4) Do not place skid trails where water would be channeled onto unstable headwall areas. Avoid headwalls and toe of slopes when designing designated skid trails on fragile (FP) soils.

(5) Tractors would be equipped with integral arches to obtain one-end log suspension during log skidding. Avoid tractor operations and skid trail locations on ground with slopes over 35 percent and areas with high water tables. The intent is to minimize areas affected by tractors and other mechanical equipment (disturbance, particle displacement, deflection, and compaction) and thus minimize soil productivity loss.

(6) Tractor yarding on designated skid trails would occur from May 15th to October 15th. Variations in these dates would be permitted dependent upon weather and soil moisture conditions as determined by the Authorized Officer in consultation with aquatic and/or soils scientists. Tractor yarding on designated skid trails would be allowed when soil moisture content is 30% or less to ensure that soil rutting or displacement beyond the trail does not occur.

(7) When measuring soil moisture, require a minimum of 4 gravimetric water content samples using the oven dry method. Soil samples must be collected between depths of 4-6 inches. Collect samples in the areas likely to have the highest water content.

(8) In order to restrict the amount of detrimentally compacted soil to less than 12% in a timber harvest unit, designated skid trails must be spaced 150 feet apart on average. Equipment use off of these designated skids trails may be acceptable under either of the following conditions:

- Allow mechanized equipment capable of creating and walking on slash (such as a cut-to-length system) to work off designated skid trails for one or two passes on at least 8 inches of slash and under dry soil conditions (less than 15% soil moisture content). Limit secondary trails to a minimum of 50-foot spacing off designated skid trails. All other use of ground-based equipment will be restricted to designated skid trails.

and/or,

- Allow mechanized equipment (feller-buncher systems) to work off designated skids tails when soil moisture content is less than 15% for 1 or 2 passes only (one round-trip). These 1

to 2 pass secondary trails must be spaced a minimum of 50 feet apart off of designated skid trails. All other use of ground-based equipment will be restricted to designated skid trails.

If indications of detrimental soil compaction are observed (loss of soil structure, platiness) off of designated skid trails, the activity shall be suspended until the soil strength is sufficient to resist detrimental compactive forces.

(9) All skid trails would be waterbarred according to BLM standards. Where soil erosion is not expected to occur (e.g. flat ground), waterbars would not be necessary. Main tractor skid trails, where they intersect haul roads and radiate from landings, would be camouflaged and blocked by scattering slash and other debris. Also, where material such as logs and other organic debris exists, this material would be placed along the length of skid trails as determined by the Contract Administrator. The intent is to minimize erosion and routing of overland flow to streams by decreasing disturbance (e.g., unauthorized use by OHVs).

(10) Tractor yarding or other mechanized operations would be allowed over the snow when the snow pack is sufficient to protect the soil. Logging on snow would be allowed when snow depth is 18 inches or greater, and negligible ground surface exposure would occur during operations (USDI 1995, p. 166). If snow depth is less than 18 inches, yarding may be allowed on designated skid trails if soil moisture content is less than 30%. Skid trail spacing and soil moisture requirements would be waived if ground-based operations occur over sufficient snow pack (as described above). The intent is to minimize compaction and off-site erosion and sedimentation to local waterways.

(11) For all cable yarding, maximum operational suspension would be maintained on slopes greater than 50 percent. Maximum operational suspension would be practiced to alleviate gouging and other disturbance on draw side slopes and headwalls. Minimum corridor widths (generally less than 15 feet in width) would be utilized to reduce soil productivity loss. Waterbars would be constructed manually on steeper slopes with higher erosion potential to direct water off the cable yarding corridors.

(12) Skyline and tractor yarding would be avoided up and down dry draws. The intent is to minimize the occurrence of erosion and compaction in existing areas of concentrated surface or substrate flow.

(13) In helicopter units, avoid harvesting trees on potentially unstable ground (i.e. headwalls, sag ponds, or hummocky ground).

(14) The BLM would immediately shut down all timber harvest and yarding operations if excessive soil damage would occur due to weather or soil moisture conditions.

b. Prescribed Fire

Objective 1: Protect Riparian Reserves

(1) Pile burning would not occur within 50 feet of either side of the stream channel in Riparian Reserves for fish-bearing or perennial streams. Pile burning would not occur within 30 feet of either side of long-duration intermittent streams or in short-duration intermittent channels. No pile burning would occur within Riparian Reserves or potentially unstable areas (Table 2-13).

(2) No mechanical piling would occur within Riparian Reserves.

Table 2-13. Project Design Features for Prescribed Fire Treatments in Riparian Reserves.

Feature Type	Pile Burning
Fish-bearing streams	Not allowed within 50 ft. either side of stream channel.
Perennial streams	Not allowed within 50 ft. either side of stream channel.
Long-duration intermittent streams	Not allowed within 30 ft. either side of stream channel.
Short-duration intermittent streams	Not allowed within the stream channel
Wetlands and reservoirs	Not allowed in RR
Unstable and potentially unstable areas	Not allowed in RR

Objective 2: Prevent Off-site Soil Erosion and Soil Productivity Loss

(1) Waterbars on tractor and hand firelines would be constructed according to District guidelines (USDI 1995:167).

(2) No pile burning would occur within the draw bottom of dry draws.

(3) Piles would be dispersed across treatment areas. Piles would be burned when soil and duff moisture are high enough to limit the consumption of adjacent duff and organic matter around the edges of the piles.

(4) No mechanical piling allowed off of roads or landing areas.

c. Roads and Landings

Objective 1: Protect Riparian Reserves

(1) New landings or expansion of old landings would be minimized in Riparian Reserves.

Objective 2: Prevent Off-site Soil Erosion

(1) Road and landing construction, improvements, renovation, and decommissioning would occur between May 15th to October 15th or as approved by the Authorized Officer. Variations in these dates would be permitted dependent upon weather and soil moisture conditions and with a specific erosion control plan (e.g., rocking, waterbarring, seeding, mulching, barricading) as determined by the Contract Administrator in consultation with aquatic and/or soils scientists. All construction activities would be stopped during a rain event of 0.2 inches or more within a 24-hour period or if determined by the Administrative Officer that resource damage would occur if construction is not halted. If on-site information is inadequate, measurements from the nearest Remote Automated Weather Station would be used. Construction activities would not resume until determination is made by the Contract Administrator that resource damage would not occur.

(2) All new permanent roads would receive adequate rock surfacing or would be closed and winterized prior to the wet season. Blockage at the entrance shall consist of constructing an earthen trench barrier to prevent motorized vehicle use for an extended/indefinite period. Prior to closure the road will be left in an erosion-resistant condition.

(3) Bare soil due to landing construction/renovation would be protected and stabilized prior to fall rains to reduce soil erosion and sediment potential. Methods used would be dependent on site conditions and may include: mulch and seed with native grasses or other approved seed; surface with durable rock material; or leave “as is” where natural rock occurs or where vegetation/topography prevents movement of sediment.

(4) Fill slopes on all new landings would be seeded with native or approved seed and mulched, except where rock occurs.

(5) All helicopter landings and landings located along temporary roads or within Riparian Reserves would be treated as follows to reduce erosion and compacted area. Unless the landing is rocked or located within a quarry, the surface would be treated by decompacting the soil so that it is lifted and fractured in place leaving it loose and friable to a depth of 12-18 inches, or as determined adequate in consultation with watershed specialists. Slash, boulders and other debris would be placed as determined by availability to provide ground cover and discourage mechanized use. Blockage at the entrance would consist of placing logs, slash, boulders, berms, and other material so the entrance is camouflaged and vehicle access is precluded. Seeding with approved native seed species (20 lbs./acre) would occur. Mulching with weed-free straw or approved native materials would occur on landings within Riparian Reserves. Landings located on private property under the reciprocal right-of-way program would be treated as outlined above, including establishing riparian buffer widths equivalent to what is used on federal lands, unless the landowner objects to such treatment. The exception to this is a proposed helicopter landing on private land (T.37 S., R.2 E., N ½, Sec. 34) located adjacent to a seasonal wetland. In addition to the conditions described above, perimeter erosion control would be required to prevent landing expansion and other detrimental impacts. Perimeter control would consist of silt fence or other applications that are installed according to manufacturer's specifications or otherwise approved by the Authorized Officer in consultation with an aquatic or earth science specialist that would adequately define the operational boundary and contain displaced soil and other material within the landing.

(6) Do not load excavated material from road construction on tops of hillsides in fragile (FP) soils. Endhaul waste materials to stable areas. Divert road drainage away from unstable areas. Do not undercut toe of slide areas.

(7) Slash would be windrowed when available at the base of newly-constructed fill slopes to catch sediment.

(8) Roads identified for full decommissioning or obliteration would be treated as follows: The road surface (travelway) would be decompacted so that the former compacted surface would be rendered loose and friable to a depth of 12 to18 inches or to a point where 10-inch diameter stones are the dominant substrate (whichever is shallower). Slash, boulders, and other debris would be placed along the roads "entire length" as determined by availability of materials to provide ground cover and discourage mechanized use. Blockage at the entrance would consist of placing logs, slash, boulders, berms, and other material so the entrance is camouflaged for a minimum distance of 100 feet and vehicle access is precluded. Seeding with approved native seed species and mulching with weed-free straw or approved native materials would occur within Riparian Reserves and within 100 feet of the roads entrance. Obliterated roads would be treated similar to fully decommissioning; however, where fill occurs, recontouring and outsloping the travelway to disperse runoff would occur. Both methods would include the removal of all drainage structures. Treatments described may be modified by the Authorized Officer in consultation with appropriate earth scientists or aquatic specialists.

(9) Temporary roads would be fully decommissioned at the completion of log haul and within the same season as constructed/opened unless needed for other purposes, such as access for firewood, etc. If this occurs, the road would be effectively blocked during the wet season to prevent motorized use. These measures are designed to effectively discourage and prevent use by OHVs. Work would occur between May 15st and October 15th.

(10) All pre-existing features designed to limit mechanized/vehicle access such as previously decommissioned roads, earthen berms, logs, boulders, and other utilized materials shall be returned to pre-operational condition following harvest operations, as directed by the Authorized Officer.

(11) Blading and vegetation removal would be avoided unless necessary to remove drainage impediments when maintaining inboard ditches. Sediment control measures would be evaluated and implemented if necessary, where ditchline blading is required within 200 feet of streams.

Objective 3: Protect Natural Discharge Patterns

(1) Where possible, rolling grades and outsloping would be used on road grades that are less than 8%. These design features would be used to reduce concentration of flows and minimize accumulation of water from road drainage.

(2) Cross drain structures (culverts, water dips, waterbars) would be installed at intervals not greater than the spacing distances identified in the RMP (USDI 1995, p. 177) for soil erosion class and road gradient.

(3) Armored splash pads (e.g. rock material) would serve as energy dissipaters at cross drain outlets or drain dips where water is discharged onto loose material or erodible soil.

d. Ford and Temporary Bridge Installation and Culvert Removal

Objective 1: Minimize impact on aquatic species.

(1) Instream work period on fish-bearing streams would be from June 15th to September 15th.

(2) The channel elevation of two existing ford locations on road 37-2E-7.4 would be built up by the addition of clean washed river rock to facilitate vehicular traffic over the ford while protecting the natural stream bed and minimizing the disturbance to the channel adjacent banks. The material may be left in channel after use of the fords is complete. It is anticipated that both streams will be dry or lack surface flow at the ford locations during the period of use of the fords.

(3) On site rock and excavated material at the first crossing on road 37-2E-7.4 will be utilized to build up the elevation of the road/stream capture point and to fill in the rutted diversion channel adjacent to the road, as directed by the Authorized Officer along with consultation with watershed specialists. The intent is to reduce the likelihood of future diversions of stream flow out of channel.

(4) A portable temporary bridge will be installed at an existing ford over Coho Critical Habitat on Lost Creek, on road 37-2E-3.0. A portable temporary bridge will also be used to cross upper Lost Creek on an unnumbered road in the SW ¼ of T37S, R02E, Section 36 to span a washed out crossing over rainbow trout habitat. As the crossings would be bridges, they would allow for unhindered passage of water and aquatic organisms. Crossings would be assembled and dismantled during the instream work period, when stream flows were low, and an excavator would be able to place and remove the bridges from outside the wetted channel. Sediment fences (e.g., straw bales, straw or woodchip waddles) as approved by the Authorized Officer in consultation with the watershed specialist would be placed between any needed constructed bridge abutments and the wetted edges of the channel to reduce the potential for disturbed soil to enter the stream. Clean washed river rock would be the material used as needed to build up bridge abutments. This material could be left on site after removal of the bridges.

Objective 2: Protect Streambanks and Stream Channel Integrity

(1) New road approaches at all new stream crossings would be as near a right angle to the stream as possible to minimize disturbance to streambanks and riparian habitat.

(2) Road approaches to the two fords on road 37-2E-7.4 and the locations of the temporary bridges would be rocked with four inches of pit run for 100 feet on each side of the stream center line.

(3) New or replacement culverts would be sized to accommodate 100-year flood events.

Objective 3: Prevent Off-site Soil Erosion and Control Sediment

(1) For nonfish-bearing streams, instream work (including fill additions or removal for culvert installation and removal) would be limited to the instream work period unless the stream is dry, and then work could occur during the general dry season (May 15th to October 15th). Work would be temporarily suspended if rain saturates soils to the extent that there is potential for environmental damage, including movement of sediment from the road to the stream channel.

(2) Sediment and erosion controls would be used during construction and decommissioning to minimize stream sedimentation as much as possible. Sediment control techniques may include, but are not limited to, settling ponds, silt fences, straw bales or waddles, or coconut fiber bales. Sediment and erosion controls would be placed immediately (within 10 feet) downstream of the instream work to reduce sediment movement downstream from the project site.

(3) Waste stockpile and borrow sites would not be located within Riparian Reserves.

(4) Fill or other unconsolidated fine sediment material over or adjacent to stream crossings would be stabilized as soon as possible after construction or decommissioning has been completed, or before October 15th. Exposed soils would be seeded and mulched prior to fall rains.

Objective 4: Prevent Chemical Water Pollution

(1) During construction, installation, or removal of instream structures, including culverts, fords, and temporary bridges, the contractor would be responsible for meeting all state and federal requirements for maintaining water quality. Standard contract stipulations would include the following:

(a) Heavy equipment would be inspected and cleaned before moving onto the project site in order to remove oil and grease, noxious weeds and excessive soil.

(b) Hydraulic fluid and fuel lines on heavy mechanized equipment must be in proper working condition in order to avoid leakage into streams.

(c) Waste diesel, oil, hydraulic fluid and other hazardous materials and contaminated soil would be removed from the site and disposed of in accordance with DEQ regulations. Areas that have been saturated with toxic materials would be excavated to a depth of 12 inches beyond the contaminated material or as required by DEQ.

(d) Equipment refueling would be conducted within a confined area outside Riparian Reserves.

(e) Use spill containment booms or other equipment as required by DEQ.

(f) Equipment containing toxic fluids would not be stored in or near (within 300 feet) a stream channel anytime.

e. Hauling

Objective 1: Prevent Offsite Soil Erosion

(1) No hauling would occur during the wet season (October 15th to May 15th) except on roads determined to have adequate surfacing as identified in the EA (Appendix A, Table 2-4)[1]. Hauling during the shoulder season (October 15th to December 1st and April 1st to May 15th) on all other roads, including natural surface may be allowed during periods of prolonged dry conditions as approved by the Authorized Officer along with consultation with watershed specialists. Recognizing the difference between the shoulder season where prolonged dry periods sometimes occur and the middle portion of winter when precipitation is a common occurrence is important in preventing road related sediment from reaching stream channels.

(2) No hauling would occur on any roads during precipitation events when rutting is occurring or turbid runoff is likely to reach flowing streams or other surface water. This would protect the road from damage and decrease the potential for off-site sediment movement.

(3) Hauling on snow would be allowed by the Authorized Officer in consultation with an aquatic and/or earth science specialist on surfaced roads other than those identified in the EA when at least 4 inches of packed frozen snow is present.

[1] Wet season haul would be allowed on roads with durable rock surfacing and sufficient surface depth to resist rutting or development of sediment on road surfaces in accordance with the Medford District RMP plan maintenance BMPs (USDI 2012).

(4) Road maintenance would be limited to the dry season (May 15th to October 15th) other than plowing of snow as described or for emergency purposes. Certain activities may be considered such as rocking, blading of aggregate roads, and roadside brushing when conditions are dry and the activity occurs a minimum of 200 feet from any stream.

(5) Dust abatement would include water or lignin.

f. Quarries

Objective 1: Protect Riparian Reserves

(1) No quarry development or expansion would occur within Riparian Reserves.

Objective 2: Prevent Off-site Soil Erosion

(1) Rock used to stabilize selected roads and landings and minimize erosion would be obtained from existing quarries or purchased.

g. Oil and Hazardous Materials & Emergency Response

During operations described in the proposed action, the operator would be required to have a BLM-approved spill plan or other applicable contingency plan. In the event of any release of oil or hazardous substance, as defined in Oregon Administrative Rules (OAR) 340-142-0005 (9)(d) and (15), into the soil, water, or air, the operator would immediately implement the site's plan. As part of the plan, the operator would be required to have spill containment kits present on the site during operations. The operator would be required to be in compliance with OAR 629-605-0130 of the Forest Practices Act, Compliance with the Rules and Regulations of the Department of Environmental Quality. Notification, removal, transport, and disposal of oil, hazardous substances, and hazardous wastes would be accomplished in accordance with OAR 340-142, Oil and Hazardous Materials Emergency Response Requirements, contained in Oregon Department of Environmental Quality regulations.

h. Silviculture

Objective 1: Protect Residual Leave Trees

(1) Logging slash should be handpiled outside of the driplines of individual pine trees and burned.

(2) Handpiles would be burned when soil and duff moisture are high enough to reduce the consumption of adjacent duff and organic material around the hand pile.

(3) No more than 25% of the pine tree live crown should be scorched for trees 8 inches DBH and larger.

(4) White fir is extremely susceptible to fungal attacks and root rots. Avoid damage to white fir along haul routes, planned skid roads, or adjacent to major landings where heavy mechanical injury can occur during harvest operations.

Objective 2: Maintain vigorously growing conifer forest for permanent forest production

(1) After timber harvest, non-merchantable trees with undesirable silvicultural characteristics should be slashed to reduce hazardous fuels and overall stand density. When thinning understory conifers, select leave trees based on the following criteria to meet silvicultural objectives:

(a) Minimum 4-inch terminal leader with at least the top 40 % of the tree containing live limbs.

(b) Non-chlorotic, light or dark green with very little or no yellowish tint.

(c) Undamaged top.

(d) Free of visible disease, cankers, fire damage, or blister rust.

(e) Demonstrates good form and vigor.

(f) No multiple tops or ramiforms.

(g) In the absence of conifers that meet the above definition for an acceptable crop tree, include any live conifer seedling that is at least three (3) feet tall that falls within the spacing guidelines.

i. Terrestrial Wildlife

Objective 1: Protect Northern Spotted Owl Nest Reserves

(1) Seasonally restrict habitat modifying activities from March 1st to September 30th within 0.25 miles of known northern spotted owl nest sites (Table 2-14). The seasonal restriction could be waived if the BLM determines the site is not occupied, or owls are not nesting.

Table 2-14. Units within 0.25 miles of NSO Sites Requiring Seasonal Restrictions

Unit #	Township/Range/Section	Restriction Date
15-1a	370S/020E/15	March 1 to September 30
11-2	370S/020E/11	March 1 to September 30
11-3	370S/020E/11	March 1 to September 30
22-3b	370S/020E/22	March 1 to September 30
20-3	370S/020E/20	March 1 to September 30
27-6	370S/020E/27	March 1 to September 30
23-2a	370S/020E/23	March 1 to September 30
23-2c	370S/020E/23	March 1 to September 30
14-2a	370S/020E/13	March 1 to September 30
13-2	370S/020E/13	March 1 to September 30
19-1b	370S/030E/19	March 1 to September 30
19-1c	370S/030E/19	March 1 to September 30
18-2	370S/030E/18	March 1 to September 30
29-7	370S/030E/29	March 1 to September 30

Objective 2: Reduce Disturbance (noise & habitat) Impacts to Northern Spotted Owl

(1) Work activities that produce loud noises above ambient levels would not occur within specified distances (Table 2-15) of any documented owl site during the critical early nesting period, March 1 and June 30, or until two weeks after the fledging period. This seasonal restriction may be waived if protocol surveys determine the activity center is not occupied, owls are non-nesting, or owls failed in their nesting attempt. The distances listed in Table 2-15 may be shortened with Level 1 concurrence if substantial-topographical breaks or blast blankets (or other devices) would muffle sound between the work location and nest sites.

Table 2-15. Mandatory Spotted Owl Restriction Distances

Activity	Zone of Restricted Operation
Heavy Equipment (including nonblasting quarry operations)	105 feet
Chain saws	195 feet
Impact pile driver, jackhammer, rock drill	195 feet
Small helicopter or plane	360 feet*
Type 1 or Type 2 helicopter	0.25 miles*
Blasting; 2 pounds of explosive or less	360 feet
Blasting; more than 2 pounds of explosives	1 mile
* If less than 1,500 feet above ground level.	

(2) The Resource Area Biologist may extend the restricted season until September 30 during the year of harvest, based on site-specific knowledge (such as a late or 2nd nesting attempt).

(3) Burning would not take place within 0.25 miles of documented spotted owl sites from March 1st through June 30th, or until two weeks after the fledging period, unless substantial smoke not drift into the nest patch.

Objective 3: Provide Wildlife Trees & Habitat for Cavity Dependent Species

(1) Retain and protect where possible (if not jeopardizing public or worker safety) snags to minimize impacts to cavity-dependent species. In salvage units, some snags may be removed as part of the silvicultural prescription. Retain all trees damaged during felling operations that were not originally marked for treatment for future snag and cavity recruitment. If damaged trees must be felled for safety reasons approval will be obtained from the sale administrator and felled trees will be left on-site.

(2) Retain and protect where possible trees possessing characteristics of importance to wildlife species. Examples of such characteristics include: large trees with broken tops, hollow trees, trees with platform (woody, vegetative, or nests constructed by various species) structures, trees with loose bark or deformities.

Objective 4: Protect Wildlife Species Which Have Mandated Protections

(1) A variety of raptors occur across the landscape within, or near, the Project Area. Any nest sites located prior to or during harvest would be protected from human disturbances that may disturb or interfere with nesting using a 0.25-mile seasonal buffer between approximately March 1st and July 15th (USDI 1995, p. 48). This restriction may be waived at the discretion of the Resource Area Wildlife Biologist if no nest sites are located before or during operations.

(2) One known Bald Eagle nest sites exist in the Planning Area. Seasonally restrict Project activity around nest sites. Avoid disturbance within 0.5 miles from February 1st through August 15th (USDI 1995, p. 57). This restriction may be waived at the discretion of the Resource Area Wildlife Biologist. This limited operating period will affect Unit 22-1. Manage the approximately 30-acre core area around nest sites. Retain older forests within 0.5 miles of nests. Large overstory trees and dominant trees along ridges in the vicinity of nests will be retained.

Objective 5: Manage Wildlife Species Protected as Survey and Manage Species

(1) Known locations of Survey and Manage and Bureau Sensitive snails, *Monadenia chaceana*, *Helminthoglypta hertleini*, *Monadenia fidelis celeuthia*, and *Vespericola sierranus* would be protected through the application of site specific buffers, which would be recorded using a GPS and marked on the ground with flagging. Surveys are completed. Target species identified will be buffered.

(2) Approximately 10% of fuels reduction handpiles would be left unburned during firing operations to create refugia for small mammals and other species.

(3) Additional Survey and Manage wildlife species are protected in accordance with RMP guidelines as amended by the 2001 Survey and Manage ROD and Standards and Guidelines (USDA and USDI 2001). See Section D.5: Policy Level Project Design Features for specific guidelines used in the design of this project.

Objective 6: Minimize Disturbance to Wintering Deer and Elk

1) Within the portions of the Project Area that are inside the Big Game Winter Range Area (USDI 1995, p. 48), all roads, except major collector and arterial roads, and harvesting activities would be closed between November 15 and April 1 to avoid disturbance to wintering deer and elk. Roads and units affected are listed in Table 2-16.

Table 2-16. Roads and Units Requiring Seasonal Restrictions to Minimize Disturbance to Deer and Elk in the Big Game Winter Range Area.

Road or Unit #	Township-Range-Section	Restriction Date
37-2E-5.0	37S/02E/05	Any portion of road not normally open to year round traffic will be closed November 15th to April 1st.
37-2E-7.4	37S/02E/05	
37-2E-3.0	37S/02E/09	
37-2E-11.0	37S/02E/11	
37-2E-15.0	37S/02E/15	
37-3E-18.7	37S/03E/18	
37-3E-18.5	37S/03E/18	
5-4	37S/02E/05	No harvesting activities would occur from November 15th to April 1st
17-4	37S/02E/17	
15-1a	37S/02E/15	
15-1b	37S/02E/15	
15-3	37S/02E/15	
15-5	37S/02E/15	
11-2	37S/02E/11	
11-3	37S/02E/11	
14-1	37S/02E/13 & 14	
14-2a	37S/02E/13 & 14	
14-2b	37S/02E/14	
14-2c	37S/02E/14	
13-1a	37S/02E/13	
18-4a	37S/03E/18	
18-4b (N ½ of unit)	37S/03E/18	
18-3	37S/03E/18	
17-2a	37S/03E/17	
17-2b	37S/03E/17	
17-2c	37S/03E/17	
17-1a	37S/03E/17	
17-1c	37S/03E/17	
17-1d	37S/03E/17	

2) Within the portions of the Project Area that are inside the Big Game Winter Range Area maintain at least 20 percent of the area in thermal cover, 70 percent canopy closure, canopy height of at least 40 feet, and large enough to avoid edge effects.

Objective 7: To Protect Gray Wolf Den and Rendezvous Sites

1) Forest management activities would be prohibited within a 1.0 mile radius of active gray wolf dens and rendezvous sites from April 15th through August 31st. Prior to the spring, communication between U.S. Fish and Wildlife Service, Oregon Department of Fish and Wildlife, and the BLM will occur to determine if any wolf activity has expanded or moved into the Project Area.

j. Botanical Resources

Objective 1: Minimize the Spread of Noxious Weeds

(1) Mechanical equipment (e.g. skidders, yarders, etc.) would be power-washed and cleaned of all soil and vegetative material before entering the Project Area.

(2) In coordination with the timber sale contracting officer and the contractor, harvest unit sequence shall follow as deemed practical: weed-free units and lightly infested units first, infested units last.

(3) If determined necessary by the Authorized Officer, in consultation with the project Botanist, equipment moving from a weed-infested work site to or through a non-infested area will be field-washed before moving. The field washing station would include a system to contain all solid weed waste for subsequent landfill disposal. Units adjacent to BLM road 37-2E-33.0 (33-1, 33-2, 33-4, 33-8, 33-9, 33-10, 33-11, 33-12, 33-13, and 33-15) would either 1) be harvested after all other units in the Project Area have been harvested, or 2) immediately after harvesting these units and before moving off-site, all equipment would be washed and free of mud and debris that could carry invasive plant materials elsewhere.

(4) Seeding with approved native seed species and/or approved seed mix and mulching with weed free straw on highly disturbed soil (e.g., landings, temporary roads, etc.) would occur as determined by the project Botanist.

(5) Noxious weed populations along haul routes and in work areas shall be treated prior to soil-disturbing activities, with subsequent treatments as necessary and as funding is available.

(6) Noxious weed populations in existing quarries or stockpiles used for road rocking shall be treated prior to use and avoid infested areas as designated in T. 37 S., R. 1 E., Section 13; T. 37 S., R. 3 E., Section 18; and T.38 S., R. 3 E., Section 21.

(7) Areas identified as “no disturbance weed areas” would be delineated (flagged and/or posted) and harvest trees would be felled and yarded away from areas. No mechanized equipment or vehicles would be allowed in these areas. Two locations have been identified in T37S, R02E, Section 33 and T38S, R03E, Section 21. Surveys are ongoing; any new noxious weed populations identified prior to implementation would be treated and/or designated as described above.

Objective 2: Protect Bureau Special Status and Survey and Manage Plants

(1) Bureau Special Status and Survey and Manage plant sites shall be protected as prescribed by the project Botanist by one or a combination of the following protection measures: no-treatment buffers, seasonal restrictions, or silvicultural prescription modification. Surveys are ongoing. Any new sites identified prior to implementation would be protected as described above.

(2) The Contract Administrator would work with the project Botanist if any new areas identified for operational needs outside previously surveyed areas.

(3) Harvest trees shall be directionally felled away from plant protection buffers.

k. Recreation

Objective 1: Maintain Heavily Used Multiple Use and Nordic Trails for Winter Recreation

(1) Do not snowplow roads 38-3E-29.3 and 39-3E-19.0 from the intersection of 38-3E-33.6 and Dead Indian Memorial Highway to provide for Nordic trail use.

l. Rangeland Resources/Grazing

Objective 1: Protect Rangeland Improvements

(1) During logging operations use of techniques such as directional falling will be used to prevent damage to fences, cattle guards, livestock watering troughs and other improvements (Table 2-17 and Map 3-9).

(2) If damage to range improvements does occur, the BLM shall be notified and proper repair or replacement will occur within two weeks of the completion of logging activities. Proper repair of fences and gates includes keeping wire properly attached to posts, splicing or replacing broken wire in kind, repairing structures such as corners, stress panels or gates, and any other work necessary to keep improvements functional. Repair of structures such as stress or corner panels and gates requires pre-approval by BLM staff. Repair or cleaning of cattle guards damaged of filled with sediment by logging activities will require approval of BLM Road Engineering Staff for structural integrity and public safety compliance.

Objective 2: Prevent Livestock Trespass

(1) During logging activities, operators will keep all gates closed and all livestock containment systems functional to keep livestock in authorized areas (Table 2-17).

Table 2-17. Range Improvements Within or Adjacent to Treatment Units[2]

Unit or Road #	Improvement	Comments
5-1	Fence	Along the western border of the unit
6-3	Fence	Along southern border of the unit, along the road
15-1a	Fence	Along the western border of the unit
15-3	Fence	NW tip of the unit
17-6	Fence	Bordering portions of the unit in the north, east, and south, through the unit in the western portion of the unit
18-4b	Fence	Within the unit
20-1	Fence, Pond	Fence is along the northern border of this unit, pond is within unit.
20-3	Fence	Along the western border of the unit
21-4	Fence	At points along the western border of the unit
22-3a	Fence	Along the western border of the unit
38-3E-19.0	Cattle guard	Along this road in T38S-R03E-S19
38-3E-9.0	Cattle guard	2 cattle guards along this road in T39S-R03E-S04

[2] The units in Table 2-17 are reflective of treatment areas proposed in Alternative 2.

m. Cultural Resources

Objective 1: Avoid Impacts and Protect Cultural Resources

(1) Archaeological sites eligible to the National Register of Historic Places and paleontological sites occurring within activity areas would be flagged for avoidance and identified to the operator/BLM Ashland Resource Area Timber Manager mapped as reserve areas where no activities are allowed. Site flagging would be placed 25 feet from the site perimeter. No disturbance would occur in the buffered areas.

(2) If avoidance is not possible, BLM in consultation with the State Historic Preservation Office (SHPO) and federally recognized Tribes would design appropriate mitigation measures to avoid adverse impacts to the identified site.

(3) Trees proposed for timber removal would be directionally felled away from site boundaries for up to one average tree length (165 feet) and no skidding would occur through the site boundary.

(4) If during project implementation the contractor encounters or becomes aware of any objects or sites of cultural value on federal lands, such as historical or pre-historical ruins, graves, grave markers, or artifacts, the contractor shall immediately suspend all operations in the vicinity of the cultural value and notify the COR. The project may be redesigned to protect the cultural resource values present, or evaluation and mitigation procedures would be implemented based on recommendations from the Resource Area Archaeologist with concurrence by the Ashland Field Manager and State Historic Preservation Office.

5. Policy Level Project Design Features

These following PDFs are required under the Medford District Resource Management Plan (RMP) (USDI 1995).

a. Riparian Reserves

Northwest Forest Plan (NWFP) Riparian Reserves, as incorporated by the Medford District RMP, are located on federal lands throughout the Planning Area. A BLM stream survey crew conducted surveys within the SFLB Planning Area in order to ensure that all areas needing Riparian Reserve protection were identified. The survey crew assessed stream conditions, documented the location of wetland and unstable areas, and determined whether stream channels were perennial, intermittent, or dry draws (USDA and USDI 1994, pp. C30-C31). Stream maps were updated with the new information. Riparian Reserves are excluded from commercial treatment units by clearly marking unit boundaries on the ground.

Riparian Reserve widths were determined using the NWFP Standards and Guidelines (USDA and USDI 1994, pp. C-30-31) and the *Little Butte Creek Watershed Analysis* (USDI and USDA 1997, p. 181), and are based on a site potential tree height of 165 feet. See Maps 2-1 to 2-10 for Riparian Reserve locations within the SFLB Forest Management Project Area. Site-specific widths for each Riparian Reserve have been mapped in GIS and would be implemented under the Action Alternatives. Riparian Reserve widths in the SFLB Project Area are as follows:

(1) Fish streams: 330-foot slope distance on each side of the stream.

(2) Perennial non-fish-bearing streams: 165-foot slope distance on each side of the stream.

(3) Intermittent non-fish-bearing streams: 165-foot slope distance on each side of the stream. Intermittent streams have a defined channel, annual scour and deposition, and are further described as short-duration or long-duration:

> ***Short-Duration Intermittent***: A stream that flows only during storm or heavy precipitation events. These streams can also be described as ephemeral streams.

Long-duration Intermittent Stream: A stream that flows seasonally, usually drying up during the summer.

(4) Unstable and potentially unstable ground: the extent of the unstable and potentially unstable ground.

(5) Springs, seeps and other non-stream wetlands less than one acre in size: the wetland and the area from the edges of the wetland to the outer edges of the riparian vegetation.

(6) Constructed ponds and reservoirs, wetlands greater than one acre in size: Riparian Reserves consist of the body of water or wetland and the area to the outer edges of the riparian vegetation; or the extent of the seasonally saturated soil; or the extent of unstable or potentially unstable areas; or to a distance equal to the height of one site potential tree; or 150 feet slope distance from the edge of the wetland greater than 1 acre; or the maximum pool elevation of constructed ponds and reservoirs, whichever is the greatest.

b. Special Status and Survey and Manage Species

(1) Reserve from harvest the designated 100-acre core area for northern spotted owl sites designated as known sites on January 1, 1994 (USDI 1995, p.47).

(2) One known site of the Mardon skipper butterfly, a Federal Candidate for listing and a Bureau Sensitive species, occur in meadow areas adjacent to the Project Area but outside of any treatment areas. Natural meadows are identified as special habitats and receive protection from disturbance as directed in the Medford District RMP (USDI 1995, p. 45).

(3) Known great gray owl nests would be protected with a ¼ mile protection zone. A no-harvest buffer of 300 feet has also been established around meadows and natural openings within the Project Area (USDA and USDI 2001, p. 39).

(4) Protect special habitats for plants and animals, such as meadows, cliffs, caves, and talus slopes with a no-harvest buffer ranging from 100 to 200 feet depending on site-specific circumstances and the objective to protect the special habitat values; and new road locations would avoid special habitats (USDI 1995, pp. 45, 49).

E. COMPARISON OF THE ACTION ALTERNATIVES

Table 2-18. Comparison of the Action Alternatives

	Alternative 2	Alternative 3
Forest Management (acres)		
Proposed Commercial Treatment Total	1,676	960
▪ Selective Thinning	1,060	507
▪ Group Selection	109	14
▪ Density Management	31	12
▪ Regeneration Harvest – Structural Retention	73	61
▪ Regeneration Harvest – Insect & Disease Management	60	60
▪ Mortality Salvage	342	306
Proposed Non-Commercial Treatment Total	1,553	1,133
▪ Understory Reduction	812	619
▪ Understory Reduction in Commercial Units	741	514
Timber Harvest Method (acres)		
Tractor Yarding	1,005	643
Cable Yarding	268	114
Helicopter Yarding	332	145
Bull-Line Yarding	70	57
Transportation Management (miles)		
Proposed Permanent Road Construction	0.80	0
Proposed Temporary Road Construction	3.04	0
Proposed Decommissioning	4.05	4.05
Proposed Long-Term Closure	7.27	7.27
Proposed Haul Routes	122.28	109.28
Designated Skid Trails and Landings (number of)		
Designated Skid Trails	11	7
Potential Helicopter Landings – Total	26	18
Potential Helicopter Landings – New	12	12
Potential Helicopter Landings – Existing	14	6

F. ALTERNATIVES AND ACTIONS CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

In the development of the Proposed Action, BLM considered numerous ways to meet the Purpose and Need. What is presented in this Environmental Assessment (EA) as the Proposed Action reflects what the planning team determined to be the best balance and integration of resource conditions, resource potential, competing management objectives and expressed interests of the various communities that have a stake in the project. Other actions or alternatives were discussed and eliminated from detailed study for the reasons given below.

1. ***Alternate routes to access potential treatment units were considered but eliminated from detailed analysis for the following reasons:***

- Road 37-2E-15.00, segments B and C, was initially identified as an access route to reach proposed units in T.37 S., R. 2 E., Section 15.

  Rationale for Elimination: Segments B and C of road 37-2E-15.00 were considered but eliminated due to unstable terrain and the presence of five active landslides along their lengths. These segments of road would need geotechnical investigations and extensive stabilization measures to ensure that reconstruction and renovation would not increase landslide potential. The costs of the geotechnical investigations and subsequent work necessary to stabilize deep seated landslides would be substantial and may not guarantee that further landslides would not occur. If additional slope failures were to occur, large volumes of sediment could adversely affect water quality and fish habitat within South Fork Little Butte Creek, a Tier 1 Key Watershed.

- An alternate route to access Units 27-5a and 27-5b was considered in T. 37 S., R. 2 E., in the SW ¼ of Section 22.

  Rationale for Elimination: The route would have mostly utilized an existing non-system road, but would have required some new road construction in a Riparian Reserve and the use of a temporary bridge across Lost Creek. In order to use the temporary bridge, equipment would need to cross the creek to level out the stream bank. It was determined by the Resource Area fisheries biologist that the action would likely adversely affect ESA listed fish habitat. Road construction would have removed trees that provide shade and wood input to the stream, which is Coho Critical Habitat. Formal consultation with the National Marine Fisheries Service (NMFS) would be required and could delay the project by at least one year. Lost Creek is also listed for sediment and the proposed actions would be in conflict with the Water Quality Restoration Plan for the watershed.

- A non-system road off the end of 37-2E-33.00 traveling north to road 37-2E-17.00 Segment E and East to Road 37-2E-3.00 Segment E then North into Segment D to access proposed treatment units in T.37 S., R.2 E., Section 21 was considered but eliminated.

  Rationale for Elimination: This route was eliminated due to the substantial amount of road renovation that was needed to make it accessible as a haul route. Two switchbacks at road junctions would also have needed to be constructed to allow timber haul. Road 37-2E-3.00 Segment D would need a stream crossing and a temporary crossing over an existing irrigation ditch. The costs associated with those renovations were determined to be substantial and not economically practical.

- Road 37-2E-17.00 Segment E beyond the junction of Road 37-2E-3.00 was considered as an access route to reach units in T. 37 S., R. 2 E., Section 27.

  Rationale for Elimination: This route was considered but eliminated due to major road damage from the 2005 storm event. A large portion of this road was washed away do to a culvert that diverted the water down the road. The stream channel would need a major crossing to be constructed and significant road renovation would need to be done. It was determined that the cost to renovate this road would not be economical and was therefore dropped from further consideration as a means of access.

- Road 37-2E-25.2 was initially considered as a potential access route to reach proposed units in T. 37 S., R. 2 E., Section 30.

  Rationale for Elimination: This road was considered but eliminated due to major road failures as a result of the 2005 storm event that washed away a large section of the road. Several stream channels would need crossings to be constructed and significant road renovation would need to be done. This road is now proposed for full decommissioning under the proposed action.

- Two roads were initially identified to be constructed in T. 37 S., R. 3 E., Section 20 with a total length of 0.32 miles.

  Rationale for Elimination: These roads were considered but eliminated when it was discovered that they were located in a great gray owl buffer. Great gray owl buffers are reserved from timber harvest activities, including road construction, which would remove habitat.

- In T. 37 S., R. 2 E., Section 27 a road was proposed to be constructed with a length of 0.14 miles.

  Rationale for Elimination: This route was considered but eliminated as it entered into an area determined to be RA32 habitat. Areas designated as RA32 were deferred from forest management activities, including road construction.

- About 0.28 miles of new road was proposed to be constructed in T. 38 S. R. 3 E. Section 23 to reach proposed treatment units in that area.

  Rationale for Elimination: This route was considered but eliminated because it would have entered into an area designated as a 200-foot Special Habitat Buffer. Per the Medford District RMP, new road locations would avoid special habitats (USDI 1995, p.45)

- Three new roads were proposed to be constructed, totaling 0.36 miles, in T. 38 S., R. 3 E., Section 27 and one more new road (0.39 miles) was proposed in T. 37 S., R. 2 E., Section 21 to access proposed units.

  Rationale for Elimination: These proposed new roads were considered but eliminated due to issues regarding access to the proposed road locations. Access to reach these proposed road locations would have required significant road renovation on private lands in T. 37 S., R. 02 E., Section 28. Several sections of road are washed out due to debris torrents and road failures, and construction of two switchbacks at road junctions within riparian areas would have also been required. The costs associated with the needed renovation and construction would have been extensive.

- Two new roads were initially proposed to be constructed with a total length of 1.0 miles in T. 37 S., R. 2 E., Section 11.

  Rationale for Elimination: These proposed new roads were considered but eliminated as an easement was acquired that would allow for better access to proposed treatment units on existing roads, making these roads unnecessary to construct.

2. Avoid regeneration harvest.

Rationale for Elimination: The purpose and need identified for this project (see Chapter 1) include improving conifer forest growth and vigor, reducing impacts to forests from insects and disease, and providing timber products,. In order to meet these objectives, silvicultural prescriptions, as described in the Medford District RMP (USDI 1995, Appendix E) were proposed depending on current forest conditions. Stands in the Planning Area were identified as having declining growth rates or experiencing deterioration due to high density stands levels, insects, disease, or other factors. Regeneration harvest would create growing space for a new cohort of trees and/or increase the growth of existing understory trees while maintaining structural complexity with the retention of 16-25 trees per acres greater than 20 inches DBH; reduce understory stem density in the current stand and control the growth rates of existing understory trees for long-term survivability; create regeneration opportunities for species that are shade intolerant and provide long-term success or survival of less prominent species (e.g., sugar pine); and reduce the long-term effects of forest disease by reducing the spread of disease to existing overstory and understory trees (Insect and Disease Management prescription only).

By avoiding regeneration harvest, the BLM would not be able to meet forest health objectives and would therefore not meet the purpose and need identified for this project.

G. MONITORING

Much of implementation monitoring is accomplished in the day to day work by BLM employees. Project supervisors, contract inspectors, and timber sale administrators review the work being done and assure compliance with the regulations and stipulations in the applicable administrative documents. The majority of actions described under the alternatives are implemented through a timber sale, service, or stewardship contract. In the case of contracts, implementation monitoring is accomplished through BLM's contract administration process. PDFs included in the project description are carried forward into contracts as required contract specifications. BLM contract administrators and inspectors monitor the daily operations of contractors to ensure that contract specifications are implemented as designed. If work is not being implemented according to contract specifications, contractors are ordered to correct any deficiencies. If unacceptable work continues, suspension of contracts and/or monetary penalties can be applied.

The following monitoring would occur as required by the USFWS (USDI FWS 2015, p.50). The BLM will monitor the extent of spotted owl habitat affected by the proposed SFLB Project to ensure that those effects are consistent with description of the Proposed Action; the findings in the Effects of the Action analysis, and the incidental take limits presented in the USFWS Biological Opinion (USDI FWS 2015). The BLM will report the results to the Service using the Project Implementation and Monitoring Form (USDI FWS 2015, Appendix C) by November 30 each year during the term of the Project. Implementation of Projet Design Criteria (PDC) is monitored through the BLM sale-contracting program in coordination with the Resource Area wildlife biologist. For units where the silvicultural prescription is expected to result in Treat and Maintain habitat condition of NRF stands, the BLM will conduct post-treatment monitoring of canopy cover and basal area consistent the District's monitoring plan. These results will be reported to the Service as they become available.

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

A. INTRODUCTION

This chapter describes the present conditions of each affected resource, followed by a comparison of the estimated environmental effects of implementing the No Action Alternative, the Proposed Action Alternative (Alternative 2), and an Alternative 3. The Environmental Effects portion of this chapter provides the analytical basis for the comparisons of the alternatives (40 CFR § 1502.16) and the reasonably foreseeable environmental consequences to the human environment of each alternative on the relevant resources. Impacts can be beneficial, neutral, or detrimental. The affected environment is described to the level of detail needed to determine the significance of impacts to the environment of implementing the Proposed Action. The analysis of the direct, indirect, and cumulative effects is organized by resource and the Analysis Areas for actions proposed under this EA vary by resource. Analyses for all resources include the Project Area, which encompasses the areas where actions are proposed for the South Fork Little Butte (SFLB) Forest Management Project.

1. Project Area and Analysis Area

The terms **Project Area, Planning Area** and **Analysis Areas** are used throughout this chapter. The following defines each term:

> The terms **Project Area** and treatment area are used interchangeably to describe where action is proposed, such as units where forest thinning is proposed and where road construction or road improvements are proposed.
>
> The term **Planning Area** is used to describe the overall area of consideration that was reviewed for the development of the SFLB Forest Management Proposed Action.
>
> **Analysis Areas** vary by resource and include those areas that could potentially be affected by the Proposed Action Alternative. In some cases the Analysis Area is confined to the Project Area and in others the Analysis Area extends beyond the Project Area.

2. Consideration of Past, Ongoing, and Reasonably Foreseeable Actions in Effects Analysis

The current condition of the lands in the Planning Area is the result of a multitude of natural processes and human actions that have taken place over many decades. A catalogue and analysis, comparison, or description of all individual past actions and their effects which have contributed to the current environmental conditions would be practically impossible to compile and unduly costly to obtain. Ferreting out and cataloguing the effects of each of these individual past actions would be a time consuming and expensive task which would not add any clearer picture of the existing environmental conditions.

Instead of incurring these exorbitant costs in terms of time and money, it is possible to implement simpler, more accurate, and less costly ways to obtain the information concerning the effects of past actions, which is necessary for an analysis of the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions." (See the definition of "cumulative impact" in 40 CFR § 1508.7.) For the South Fork Little Butte Forest Management Project, aerial photograph analysis and GIS databases were utilized in helping to determine past actions on both federal and private lands.

43 CFR § 46.115 states that when considering cumulative effects analysis, the agency must analyze the effects in accordance with relevant guidance issued by the Council on Environmental Quality (CEQ). As the CEQ points out in guidance issued on June 24, 2005, the "environmental analysis required under NEPA is forward-looking," and review of past actions is required only "to the extent that this review informs agency

decision-making regarding the Proposed Action." Use of information on the effects of past action may be useful in two ways according to the CEQ guidance: for consideration of the Proposed Action's cumulative effects, and as a basis for identifying the Proposed Action's direct and indirect effects.

The CEQ stated in this guidance that "[g]enerally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." This is because a description of the current state of the environment inherently includes the effects of past actions. The CEQ guidance specifies that the "CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions." The importance of "past actions" is to set the context for understanding the incremental effects of the Proposed Action. This context is determined by combining the current conditions with available information on the expected effects of other present and reasonably foreseeable future actions.

Effects analyses completed for resources potentially affected by the SFLB Forest Management Project describe indicators of importance along with the spatial (Analysis Area) and temporal scale of importance for determining the effects of multiple actions (past, current and reasonably foreseeable) on affected resources. As discussed above, the current condition assessed for each affected resource inherently includes the effects of past actions.

The analysis of the effects of other present and reasonably foreseeable actions relevant to the effects of the Proposed Action is necessary. How each resource analysis uses information concerning other ongoing or reasonably foreseeable activities is, however, dependent on the geographic scale of concern and attributes considered during each resource analysis.

The following listing of activities is only presented to provide an overview of land management activities occurring within or adjacent to the SFLB Planning Area or associated Analysis Areas.

Timber Harvest on Private Lands

Under reasonably foreseeable future actions for private lands, it is assumed that private forest lands would continue to be intensively managed for timber production on approximately a 60-year rotation (USDI 1994:4-5). The actual timing of any private lands timber harvest is dependent on many factors, including valuations based on supply/demand, ownership, etc. We developed a reasonably foreseeable future scenario for private lands by using 2005 aerial photos to establish current forest conditions on these lands and assumed a 60-year rotation for private timber lands within the analysis area. Most areas that could be harvested on private lands are accessible by existing roads, so no new road construction is included in the reasonably foreseeable future scenario.

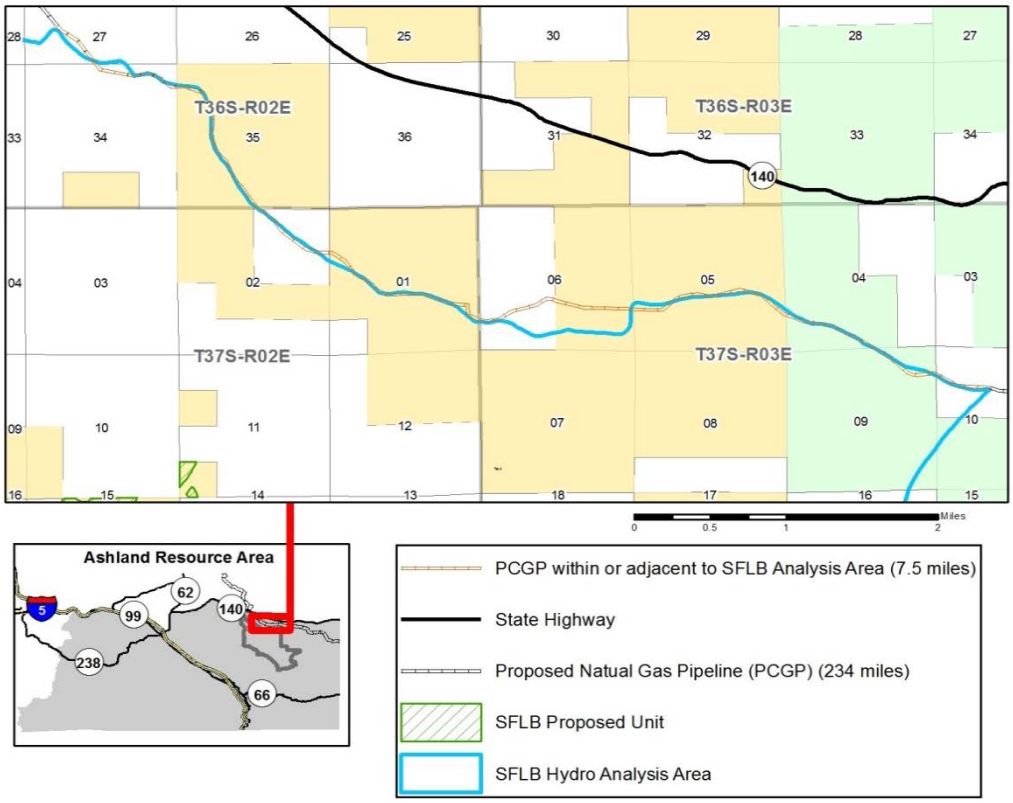
Hancock, 2014

Timber harvest on private lands owned by Hancock began in 2014 in T.38 S., R. 03 E., in sections 7 and 8, and T. 37 S., R. 02 E., in section 24. It is unknown if harvesting will continue in 2015. However, forested lands will be considered as timber harvest is reasonably foreseeable if they meet the 60-year rotation age discussed above.

Pacific Connector Gas Pipeline (PCGP)

The PCGP Project is a proposed 234-mile long interstate natural gas transmission line designed to transport natural gas from the Jordan Cove Energy Project (JCEP) terminal to markets. The proposed pipeline right-of-way (ROW) crosses through (or is adjacent to) approximately 7.49 miles of the South Fork Little Butte Hydrology Analysis Area, through the following sections: T. 36 S., R. 02 E., in sections 27, 34, and 35; T. 37 S., R. 02 E., in sections 1 and 2; and T. 37 S., R. 03 E., in sections 4, 5, 6, 9, and 10, Willamette Meridian, Jackson County, Oregon. The nearest proposed treatment unit is about 2 miles away (Figure 3-1).

Map 3-1. Pacific Connector Gas Pipeline in the South Fork Little Butte Analysis Area



In addition to various above-ground facilities located throughout the extent of the proposed transmission line, the PCGP proposal includes the construction of a 95-foot wide right-of-way (ROW) wherein a 36-inch steel pipeline would be installed below-ground. The proposal also includes use of both existing and newly-constructed roads.

The Federal Energy Regulatory Commission (FERC) is the federal agency responsible for authorizing interstate natural gas transmission facilities, as specified in section 311(e)(1) of the Energy Policy Act of 2005 (EPAct) and the Natural Gas Act (NGA). For the PCGP Project, in accordance with section 313(b)(1) of the EPAct, the FERC is the lead federal agency for the coordination of all applicable federal authorizations, and is also the lead federal agency for the preparation of the Project EIS in compliance with the requirements of NEPA, as outlined in the CEQ regulations for implementing the NEPA (40 CFR Parts 1500-1508), and the FERC's regulations (18 CFR Part 380).

Various other agencies, including the BLM, are cooperating agencies for the development of the Project EIS. A cooperating agency has jurisdiction by law or special expertise with respect to environmental impacts involved with the proposal, and is involved in the NEPA analysis, including the development of mitigating measures.

The FERC and the cooperating agencies each have their own actions related to the review and approval of the PCGP. In addition to analysis conducted by cooperating agencies, various federal, state, and local permits, approvals, and consultations identified for construction and operation of the JCEP and PCGP must be acquired and completed prior to the start of pipeline construction. Agencies included in this process include (but are not limited to) the Federal Communication Commission (FCC), U.S. Army Corps of Engineers (COE), Oregon Department of Fish and Wildlife (ODFW), Oregon Department of Environmental Quality (ODEQ), Department of Transportation and the Federal Aviation Administration (DOT/FAA), Bureau of Reclamation (BOR), the National Marine Fisheries Service (NMFS), and Douglas, Jackson, Klamath and Coos counties.

A Final EIS was prepared and completed in 2009; however, FERC withdrew the associated certificate and modified their proposal for the direction that the liquefied natural gas (LNG) will travel through the pipeline. A new Draft EIS was published in November, 2014 and the new Final EIS is scheduled to be published in June 2015.

BLM Grazing Leases

Open range grazing occurs on almost all BLM-managed land within the South Fork Little Butte Planning Area (15,071 acres of 18,035 acres). The Planning Area encompasses all or parts of 8 allotments (8 active and one inactive) that support 1,162 cattle. Season of use varies by allotment but in general this area is open to season-long (May through mid-October) grazing. Six of the seven grazing leases are expired and are up for renewal. An environmental review for the Conde and Deadwood allotment lease renewals is anticipated to be completed in 2015. The timing of the environmental reviews for the remainder of the lease renewals is unknown at this time. Until the expired leases are renewed, leases are operating under their current lease as approved under the Omnibus Bill signed in December 2014. Refer to the Rangeland Resources/Grazing section for more details.

BLM Transportation Management Projects

BLM Road Maintenance Activities (Ongoing and Reasonably Foreseeable)

The following road maintenance activities are ongoing or anticipated to occur on BLM roads in the Little Butte Creek Watershed. These activities are:

- Rocking about 5.88 miles of road and 12 stream crossing approaches using allocated Title II funds. Aggregate surfaced BLM roads have become degraded and worn over time to the point that additional aggregate surfacing material is needed to replace surfacing lost from wear and erosion. These roads are used by general public, government agencies, and private industry.
- Roadside brushing along 84.23 miles of roads using Deferred Maintenance funds and an additional 24.15 miles of roadside brushing using allocated Title II funds. BLM roads have become overgrown with trees and brush. Roadside brushing is essential to maintaining safe access to our public lands by the general public, government agencies, and private (residential and industry lands)..
- Converting 10.60 miles of existing crowned and insloped road sections to outsloped sections, removing existing ditch relief culverts, constructing armored drainage structures, and placing rock for surfacing, and replacing four culverts. These activities will reduce the long-term maintenance costs of these roads. Outsloped roads shed rainwater across the road surface rather than collecting it in ditchlines. It will reduce the erosion potential by removing culverts that tend to plug and allow water to run down the road. This will reduce the erosional impacts as the water is spread across a larger part of the forest floor rather than concentrated in the ditches and passed through the culverts.

BLM Forest Management Projects

BLM Young Stand Management (Ongoing and Reasonably Foreseeable)

Management of young stands on BLM-managed lands is ongoing across the Ashland Resource Area. The resource area has identified about 348 acres of silvicultural treatments within the Planning Area that is currently under contract or is planned for implementation in the near future (2015/2016). Silvicultural treatments include commercial thinning, pre-commercial thinning, gopher trapping, and planting, scalping, and netting.

MC Thin Timber Sale (Ongoing)

The MC Thin timber sale was sold in December 2011 and awarded in 2012. The timber sale entails commercial thinning and post-harvest fuels reduction activities on 178 acres. No harvesting has occurred to date on the MC Thin timber sale, but it is anticipated that harvesting would begin in the spring or summer of 2015.

Pine Plantation Thinning Project (Reasonably Foreseeable)

The approximately 157 acre proposed Pine Plantation Thinning Project would thin over stocked, small diameter pine and Douglas-fir stands to reduce competition and increase growth in the residual trees. Trees would be utilized for commercial timber production and biomass removal. Merchantable trees would be sold at fair market value. The proposed logging method would be to use a harvester to fall, process, and bunch the trees. A skidder may operate on designated skid trails to bring the trees to a landing. Designated skid trails would be located on slopes less than 35 percent. The harvester and forwarder may leave skid trails to access trees to be cut. The trees would be processed in the woods using a cut-to-length system. The harvester would walk on the slash created by the processing of logs. The project would be located on Bureau of Land Management land in the Ashland Resource Area; T.38S., R.03E., Sec 17 SE ¼ and Sec 27 S ½, and T.38S., R.04E., Sec 32 E ½. Approximately 127 acres of this project overlaps with the SFLB Planning Area. It is anticipated the project would be implemented in the fall of 2015.

Howard-Hyatt Roadside/Campground Clearing and Hazard Tree Removal (Recent Past)

A recent storm occurred on February 6, 2015. The storm blew down numerous trees which are now blocking roads accessing private property and BLM-administered lands (including campgrounds). Some trees are partially uprooted and leaning towards the road. The BLM proposes to remove trees blocking or creating safety hazards along system roads, including the removal of hazardous trees leaning toward the road that could fall onto the road. This action would provide private land owners with access to their land and would allow for access to federal lands for resource management and fire protection, and would provide the public with safe passage along roads and in developed campgrounds. Only trees lying fully or partially within the road prism or blocking campground facilities would be removed. Hazard trees leaning toward the road or campground facilities that threaten the public or forest workers would be felled and removed. The intent of this project is to allow scattered individual or small clumps of down trees to be removed to provide the opening of road systems and campgrounds. The project is located along BLM roads within the Ashland Resource Area in the Vicinity of Howard Prairie and Hyatt Lake (Outside of the CSNM) Medford District, Oregon. Approximately 1,100 feet of roadside hazard tree removal occurred within the South Fork Little Butte Planning Area and the Water Resources Analysis Area in March/April 2015. Within the Wildlife Analysis Area, approximately 8.6 miles of roadside hazard removal occurred as well during that time.

Other Timber Sales (Ongoing)

Timber sales awarded under the Heppsie (EA #DOI-BLM-OR-M060-2012-0017-2REA) and Rio Climax (EA #DOI-BLM-OR-M060-2011-0010-REA) Forest Management Projects are currently ongoing. These sales are occurring in catchments adjacent to the proposed South Fork Little Butte Aquatic Analysis Area, within the greater Little Butte Creek Watershed. Refer to the Aquatic Habitat and Fisheries Resource section for more details.

B. SILVICULTURE

a. Issues

- Ground-based logging could lead to higher incidences of root damage and scarring of residual trees.
- Forest management activities may affect late-successional habitat and individual large trees. People expressed their concerns for maintenance of old-growth forest and large-diameter tree structure capable of becoming old-growth forest over the next century, including large snag and down woody debris recruitment.
- Forest management activities should harvest across all age classes to thin out the understory fuels and to provide for timber resources.

b. Affected Environment

The SFLB Forest Management Project proposal is located in the Little Butte Creek watershed, which is a tributary of the Rogue River. For purposes of analyzing the affected environment and the proposed project;

the Analysis Area for silvicultural resources considers BLM-administered lands within portions of the Middle and Lower South Fork Little Butte Creeks sub-watersheds, or 6th field hydrologic units (HUC6s) (Map 1-1). The total size of the Planning Area is 35,383 acres, or approximately 55 square miles. BLM-administered lands comprise 18,035 acres within this area (Table 3-1).

a. Landscape Pattern

The SFLB Analysis Area lies between 2,000 and 6,000 feet in elevation. The SFLB Analysis Area lies within the Interior Valley, Mixed Conifer, and White Fir Zone as described by Franklin and Dyrness (1973). Moisture and temperature gradients will differ between forest zones creating a unique pattern of various vegetation types throughout the Analysis Area, which are broadly correlated with elevation. The vegetation native to the watershed is a result of time, the unique geology of the area, and anthropogenic influences. Over the course of thousands of years, native inhabitants regularly used fire on the landscape for a wide variety of purposes (USDI and USDA 1997). Natural disturbance such as lightning fires, windstorms, and drought contributed to the variation. The lower elevation areas would have been dominated by grassland, oak savanna, and open oak/pine woodland. In the upper valley/canyon area, prime black oak woodland probably existed. Many mixed-conifer stands of the canyon and high plateau sections were comparatively open, with a higher proportion of mature ponderosa and sugar pine than at present (USDI and USDA 1997). Infrequent, stand-replacing natural fires on the high plateau may have played a dominant role overall. There is a natural diversity of vegetation condition classes[1] within stands and between stands whose patterns and boundaries are generally dictated by soils, aspect, past disturbance, and fire suppression. The present-day vegetation pattern across the watershed landscape results from the dynamic processes of natural and human influences over time. As a consequence, the variation and scales of landscape components are innumerable (USDI and USDA 1997). Vegetation disturbance mechanisms (abiotic and biotic) that influence the watershed's forest stand structure are logging, fire and fire suppression, bark beetles, pathogens, and dwarf mistletoe species associated with Douglas-fir and true fir species (USDI and USDA 1997).

Vegetation condition classes can be used to describe the relative distribution of seral stages[2] across a watershed or landscape. The seedling/sapling and early condition classes most often represent the early seral stages of forest succession. The poles and mid condition classes are best represented as the mid seral stage, while the mature condition class represent more late seral stages of forest succession. Due to the fact that water, rock, and urban/agricultural are not considered vegetation Table 3-1 below does not include them.

Table 3-1. Vegetation Condition Classes – SFLB Vegetation Analysis Area (BLM-administered lands)

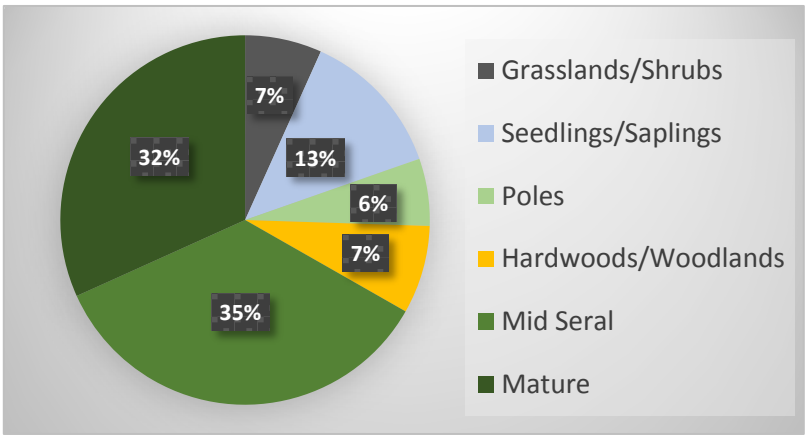
Vegetation Condition Class	Acres
Grassland, Shrubs	1,213
Hardwood/Woodlands	1,393
Seedlings/Saplings (0-4.9 inches DBH)	2,327
Poles (5-11 inches DBH)	1,062
Mid (11-21 inches DBH)	6,315
Mature (21+ inches DBH)	5,725
Total Acres	**18,035**
Total Forest Land Acres	**15,429**

[1] Vegetation Condition Class - The BLM Medford District Watershed Analysis Committee designated 8 vegetation condition classes to describe the types of and size of vegetation present on the landscape. The condition classes are as follows: grass and herbaceous vegetation; shrub lands; Hardwood/Woodlands; early seral stage trees (0 to 5 years of age); seedlings/saplings (0 to 4.9 inches DBH); poles (5 to 11 inches DBH); mid (11 to 21 inches DBH); and mature (21 inches DBH and larger trees). (DBH=diameter at breast height)

[2] Seral stages - The series of relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage (USDI 1995, p. 112)

Vegetation condition classes are used to describe landscape patterns and are more easily measured by size of vegetation than by age of vegetation. Micro*storms[3] stand age or birth date is not correlated directly with Vegetation Condition Class because age and size are only roughly correlated. The above condition classes in themselves do not describe the structural characteristics of the vegetation and its degree of intactness (open vs. closed canopy, partial cut previously, never entered, etc.) Since most of our stands naturally exist with several cohorts, lumping them into one diameter range, such as the condition class definitions do, will often not permit us to assess the functional characteristics of the class for vegetative and habitat assessments. They also do not allow us to separate functional old growth from mature stands. For that reason, three optional descriptors have been added which can provide additional information for the condition classes. These are: 1) McKelvey Rating for the operations inventory (OI) unit; 2) whether the OI unit is intact or not; and 3) dominant age class for the OI unit entered in Micro*storms (USDI 1994c, p. 26).

Figure 3-1. Vegetative Condition of BLM-administered lands in the Planning Area



Since landscape vegetative patterns are in constant development, current observations of the landscape vegetation are a snapshot at one single point in time. Although current vegetation stem densities are high and are mostly in the mid- and mature-seral stages, the vegetation condition classes of today are atypical when compared to historic patterns. Natural disturbances, such as fire, have historically controlled stand densities. With or without silvicultural management, the vegetation will continually change due to natural succession. Natural succession is a process in which vegetation types and conditions change over time in a given site. Species that appeared at an early stage of a site are almost entirely nonexistent in future successional stages. The species that initially appear on a site are largely dependent on the seed availability (windblown seed sources, seed bank, serotinous cones, etc.), the type and severity of disturbance that brought the stand into an early seral stage (either following a fire, wind event, harvest, insect infestation, disease, or other disturbance), and other biotic or abiotic factors.

b. Plant Series and Associations

There are four plant series types in the SFLB Analysis Area: Douglas-fir, ponderosa pine, white fir and white oak (Table 3-2). Plant association (a stand or group of stands made up of plants characterized by a definite floristic composition consisting of uniformity in physiognomy and structure and uniform habitat conditions) descriptions within these series can be found in the Field Guide to the Forested Plant Associations of Southwestern Oregon (USDA 1996).

[3] Micro*Storms - A micro-computer database system providing background information and recommended treatment for each operations inventory unit (stand) (USDI 1995, p.107)

Table 3-2. Tree Series and Plant Associations Common to SFLB Analysis Area

Douglas-fir Series / Plant Associations	White fir Series / Plant Associations	Ponderosa Pine Series / Plant Associations	White Oak Series/Plant Associations
PSME-ABCO	ABCO/SYMO	PIPO–PSME	QUGA4-PSME/RHDI6
PSME-ABCO/SYMO	ABCO/BENE2	PIPO-QUKE	QUGA4/CYEC
PSME-CADE27/BEPI	ABCO-CADE27/TRLA		
PSME-PIPO/RHDI6			

Abbreviations:
PSME: Douglas-fir
PIPO: Ponderosa pine
BEPI: Piper's Oregon grape
ABCO: White fir
HODI: Oceanspray
QUKE: Black Oak
BENE2: Oregon grape
RHDI6: poison oak
SYMO: Creeping snowberry
CADE27: Incense cedar
QUGA4: Oregon white oak
CYEC: Hedgehog dogtail
TRLA: Starflower

The Douglas-fir plant series comprise 73 percent of forestland in the Analysis Area. This series is predominantly found in cool and dry site conditions and is often described as the mixed conifer zone. Ponderosa pine is commonly found in the drier and warmer Douglas-fir sites; however, Douglas-fir dominates the understory component of this series. The Ponderosa pine (4 percent) and white oak (8 percent) plant series comprise 12 percent of forest/woodland in the Analysis Area. Both of these forest types are found in the driest and warmest sites of the Analysis Area, usually in the lower elevations on south to west facing slopes. Contrary to these sites, in the higher elevations, is the white fir plant series. The white fir plant series comprise 15 percent of the forest/woodland in the Analysis Area. In acreage, the PSME-CADE27/BEPI plant association is the largest represented forestland plant association in the Project Area. According to the Field Guide to the Forested Plant Associations of Southwestern Oregon (USDA 1996), this is a drier, cooler Douglas-fir association. White fir is frequently present in the understory without a disturbance mechanism, such as fire. Douglas-fir, ponderosa pine, sugar pine, and incense-cedar are the dominant tree species observed in this mixed conifer zone. The PSME-PIPO/RHDI6 plant association is the second-largest represented plant association in the Project Area. This association is dominated by Douglas-fir and is slightly warmer and drier than the PSME-CADE27/BEPI plant association. Pacific madrone, ponderosa pine, sugar pine, and California black oak are generally observed in this association.

c. Forest Stand Condition

Forest fires have played a major role in creating the present day landscape pattern in the SFLB Analysis Area. Fire is recognized within the Northwest Forest Plan as a key natural disturbance process throughout the Klamath Geologic Province (USDI and USDA 1997). As a result of fire exclusion, the Analysis Area has missed multiple cycles over the last 100 years, most noticeably in the interior valley and mixed conifer forest. The absence of fire has converted open savannahs and grasslands to hardwood woodlands and initiated the recruitment of conifers. As hardwoods and shrubs encroach into open savannahs and grasslands over time, shade tolerant conifers begin proliferating through the understory and converting the site to a mixed hardwood/conifer woodland condition. As a result, Oregon white oak is now a declining species largely due to fire suppression and encroachment by Douglas-fir on most sites. These sites generally do not support shade tolerant conifers in terms of stocking densities, soil composition, moisture, and aspect. Douglas-fir, therefore, does not grow to normal size, form, and vigor. Conversions from pine to fir are also evident and occur in the same sequence as the conversion from hardwoods to conifers. The conversion from pine to fir has created stands that are stressed for both upland and riparian areas. These non-vigorous conifers become susceptible to insect and disease mortality or prematurely die off due to overstocked conditions. The absence of fire due to suppression efforts has changed the forest composition from a fire dependent ecosystem to a densely forested fire intolerant condition. Shade-tolerant conifers have decreased the numbers of ponderosa pine, Oregon white oak, and sugar pine in the Analysis Area.

The absence of disturbance has altered the structural complexity, health, and fire resiliency of the forest. Throughout southwestern Oregon and most of the western United States, fire is no longer a natural agent of ecosystem stability and has resulted in major shifts in forest structure and function. A lack of disturbance, either natural or manmade, alters the vegetation condition of the forest. Frequent fires prevent fuel from accumulating and prepare a seedbed favorable for perpetuating pine species (Waring & Schlesinger,1985). High severity fire regimes on the other hand, exhibit infrequent, intense, large, stand-replacing fires that denude entire forests. These occur when tree densities and surface and ladder fuels build up to a level where fire resiliency is compromised and the entire stand is threatened by intensified burning conditions. Without disturbance, Douglas-fir now dominates most sites because of its higher tolerance to shade and understory competition than pine species. These long-lived shade tolerant species accumulate to abnormally high densities and, together with an increase of dead material, can easily transmit fire to the upper canopies. Fire exclusion has been associated with high survival rates in Douglas-fir recruited during the late 19th and early 20th centuries, resulting in the establishment of a closed-canopy forest (Messier 2012). Douglas-fir recruitment since the mid-20th century has been declining and those that have recruited have been growing very slowly in the shaded understory (Messier 2012).

Competition in a stand has been directly correlated with stand density. The more stems (i.e., trees) that exist per acre on a site, the fewer resources are available per stem to sustain it. Each stem draws water and nutrients from the soil and occupies a place in the stand that captures sunlight. Absent disturbance, resulting from fire suppression, these sites become occupied by shade tolerant species capable of outlasting their shade intolerant neighbor trees. Various scientific methods have been developed over the decades that can predict or identify a threshold when a forest stand will decline in production and health due to factors such as competition. Relative Density Index (RDI: the ratio of actual stand density to the maximum stand density attainable in a stand with the same mean tree volume) and the Waring Tree Vigor Index are two such measures of both stand and tree level health and productivity. Undisturbed populations eventually compete for growing space and gradually reduce the population as individuals die in a self-thinning process (Barbour, et al., 1987). Drew and Flewelling (1979) concluded that the correlative density index rating of 0.55 for any given stand marks the initial point of imminent mortality and suppression. A productive forest stand absent of natural or human density control will continue growing until it reaches a condition where the vegetation in the stand occupies all the available growing space. The aftermath results in widespread competition and declining productivity as evident in dense stem exclusion stands. A decrease in stand vigor is expected with continued overstocking and increasing stand age.

Forest stands were inventoried for all plant associations and seral stages in the Project Area. Currently, the relative densities of stands throughout the Project Area are high for Interior Valley, Mixed Conifer, and White Fir Zone described by Franklin and Dyrness (1973).The relative density index of conifer stands in the Analysis Area should range between 0.25 and 0.55. Stand densities in the Mixed Conifer Zone and White Fir Zone should average 0.35-0.45 RDI rating, while pine sites and stands in the Interior Valley Zone should average 0.25-0.35 RDI rating in order to maintain maximum health and stand resiliency. Relative density indices between 0.55 and 1.00 bound the zone of imminent competition-mortality (Drew and Flewelling 1979). Over seventy percent of the forested stands that were inventoried in the Analysis Area have relative density indices between 0.55 and 0.99, which bounds the zone of imminent competition mortality (Drew & Flewelling, 1979). The overall average relative density for the forested stands inventoried is 0.70, indicating that physiologically the trees have entered the zone of imminent competition induced suppression and mortality.

d. Tree Growth and Vigor

A decrease in growth, quality, and vigor is expected and considered forthcoming with continued overstocking and increasing stand age. A productive forest stand, absent of natural or human density control, will continue growing unleashed until it reaches a condition where the vegetation in the stand occupies all the available growing space. The aftermath results in widespread competition and declining productivity as evident in dense single canopy stands. Tree vigor is decreasing because forest stands are significantly overstocked. Decreases in tree vigor and growth have contributed to an overall decline in forest health. Forest health is quantified by assessing the physical environment itself, the forest's resistance to catastrophic

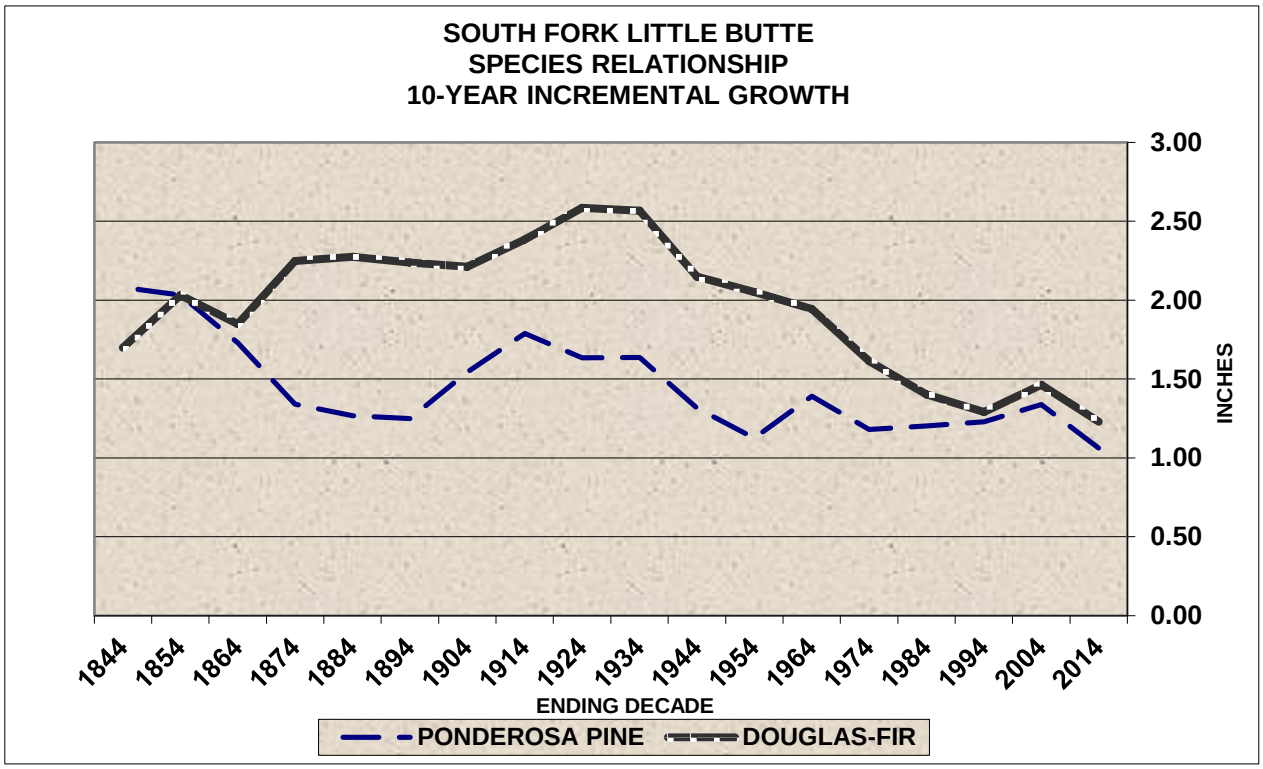
change, tree mortality, changes in tree growth and vigor, changes in species composition, erosion, water drainage, stream flow, and nutrient cycling (USDI 1995b). A healthy forest ecosystem has the physical environment, biotic resources, and trophic networks necessary to sustain processes and viable populations of indigenous species. When these criteria are met, the ecosystem is able to maintain its productivity and resilience over time when exposed to drought, wildfire, insect attack, or human-induced changes. As mentioned earlier, vegetation densities are very high and ladder fuels are abundant for both upland and riparian forest stands in the Project Area. Stand species composition and structure shifts previously discussed in the vegetation class description sections could also be considered unhealthy. The replacement of ponderosa pine by Douglas-fir increases the percentage of drought-susceptible trees in a stand; therefore, the risk of beetle infestation and/or wildfire also increases.

Waring and others (1980) developed a vigor rating using a physiological index of growth efficiency. The Waring Tree Vigor Index is a measure of health defined as the ratio of annual growth of stemwood to the area of leaves present to capture sunlight (Waring et al., 1980). The vigor ratings can be accurately applied to individual trees and are comparable among conifers (Larsson et al., 1983). Vigorous trees have higher levels of productivity and increased incremental growth. Trees with high ratios of live crown will have more photosynthetic surface area and thus more photosynthetic capacity, subsequently increasing carbohydrate production for storage, seed production, and stem wood growth. Vigorous trees can also fight off beetle attacks with greater success. Waring and Pitman (1985) concluded that trees attacked and killed by bark beetles had such low carbohydrate reserves that they lacked the ability to produce sufficient oleoresins which protect the tree against beetles.

Vigor rating index numbers are calculations of stem growth per unit of leaf area expressed as grams of stem growth per meter squared per year ($g/m^2/yr$). Trees with vigor ratings below 30 ($g/m^2/yr$) will succumb to attack from bark beetles of relatively low intensity. Trees with vigor ratings from 30-70 can withstand progressively higher attacks but are still in danger of mortality from infestation. Trees with a vigor rating of 70-100 can generally survive one or more years of relatively heavy attacks and trees with ratings above 100 cannot be killed by bark beetles (Christiansen et al., 1987; Waring & Pitman, 1985).

Core measurements were taken from 197 Douglas-fir sample trees representing all vegetation condition classes. Sample tree cores were taken from forest stands across the Analysis Area representing all vegetation condition classes, major conifer species, and plant association groups across the Analysis Area. Individual tree vigor of Douglas-fir was determined from these measurements. The current average Douglas-fir tree vigor rating is 70 g of annual wood production per square meter of foliage. Of the 197 trees measured in these stands, 54 percent of the trees had vigor ratings below 70 and only 13 percent had ratings over 100. These vigor ratings were derived using the Waring Tree Vigor Index. Growth rates were also measured from 121 sample trees and were tabulated by decade. Each core was measured to determine individual tree age and growth rates. The 10-year incremental growth data for Douglas-fir reveals a current rate of 1.23 inches per decade (Figure 3-2). Figure 3-2 illustrates the 10-year growth rate of all Douglas-fir sample trees, spanning a period from the year 1844 to 2014.

Figure 3-2. Species Relationship of 10-Year Incremental Diameter Growth



Core measurements were taken from 45 ponderosa pine sample trees representing all vegetation condition classes. Sample tree cores were taken from forest stands across the Analysis Area representing all vegetation condition classes, major conifer species, and plant association groups across the Analysis Area. Individual tree vigor of ponderosa pine was determined from these measurements. The current average ponderosa pine tree vigor rating is 28 g of annual wood production per square meter of foliage. Of the 45 trees measured in these stands, 71 percent of the trees had vigor ratings below 30 and only 2 percent had ratings over 100. These vigor ratings were derived using the Waring Tree Vigor Index. Growth rates were also measured from 32 sample trees and were tabulated by decade. Each core was measured to determine individual tree age and growth rates. The 10-year incremental growth data for ponderosa pine reveals a current rate of 1.06 inches per decade (Figure 3-2). Figure 3-2 also illustrates the 10-year growth rate of all ponderosa pine sample trees, spanning a period from the year 1844 to 2014.

The data indicates that, based on Waring's vigor rating indices, last decade's growth rate, and relative density indices, ponderosa pine survival in the Analysis Area is threatened. Ponderosa pine species in the Analysis Area are growing at a rate that leaves them prone to and at increased risk of bark beetle attack. Pine species in the Analysis Area are becoming scarce. Forest stands in the Analysis Area that were identified as pine and Douglas-fir plant associations where pine are naturally encountered, shade tolerant species are encroaching and successfully competing against pine and oak species for soil nutrients, water, and growing space. Douglas-fir continues to advance into the shaded forest floor, occupying the growing space in the understory, and excluding the shade intolerant species from naturally regenerating. Pine species currently exhibit poor vigor and their individual tree growth rates are declining.

e. Forest Insects

Most conifers have an associated bark beetle that is capable of killing the tree under the right conditions (The Southwest Oregon Forest Insect and Disease Service Center). The bark beetles successfully colonize live trees when their host is under some form of physiological stress. Dolph (1985) found that bark beetle attack occurred in unmanaged stands when trees grew a slow, 20 or more annual rings per inch (less than or equal to one inch diameter growth per decade). Entomologists and silviculturists have found that at least 1.5 inches

of tree diameter growth per decade decreases the risk of bark beetle attack (Cochran 1992; Chadwick and Eglitis, 2007; USDA 1998). In the last decade the average diameter growth in the SFLB Analysis Area for Douglas-fir was 1.22 inches/decade. As a general rule, stands with growth rates equal to or greater than 1.5 inches of diameter growth per decade are less prone to bark beetle attack (USDA 1998). This growth rate falls short of the 1.5 inches of diameter growth per decade required to withstand bark beetle attack. If all influencing variables, temperature, precipitation, soils, elevation, and densities remain constant or worsen in terms of optimal forest productivity, diameter growth within the Analysis Area will continue to decline. The 10-year diameter growth rates of ponderosa pine and Douglas-fir in the last decade indicates that these species are predisposed to bark beetle attack in the SFLB Analysis Area.

Pine bark beetles are initially attracted to pines that are under stress. Once a stressed tree has been successfully invaded, pheromones emitted by invading beetles attract additional beetles to the same tree, overpowering its defenses. A vigorous tree is able to eject invading beetles with its pitch; a tree under stress has a reduced capability of responding to the invasion. As a general rule, stands where growth rates are greater than or equal to 1.5 inches of diameter growth per decade or with less than 150 square feet of basal area[4] per acre are less prone to pine bark beetle attack. Stands on south and east aspects below 3,500 foot elevations are particularly vulnerable when their densities are high (USDA 1998). Douglas-fir bark beetles and flat-headed wood borers are attacking Douglas-fir at low to mid elevations in the Analysis Area. Western pine beetle (*Dendroctonus brevicomis)* is attacking ponderosa pine in the Analysis Area, particularly in pine dominated stands and savannahs. According to DeMars and Roettgering (1982), western pine beetles "breed in and kill scattered, overmature, slow-growing, decadent, or diseased trees and trees weakened by stand stagnation, lightning, fire, or mechanical injury." The beetles can aggressively attack and kill ponderosa pine of all ages and vigor classes, including vigorous host trees from 6 inches in diameter and larger. Group mortality can occur in dense overstocked stands or in dense pockets within a stand. Extensive mortality adversely affects distribution of trees and stocking level, depletes timber supplies, and increases fuel loading which can lead to catastrophic fires. DeMars and Roettgering describe tree resistance as one of the biotic conditions affecting outbreaks and beetle caused mortality. Vigorous trees produce sufficient oleoresins to expel beetles from their boring chambers inhibiting larval and fungal development. They suggest that prevention is the preferred method of control. "By maintaining thrifty, vigorous trees or stands that do not afford a suitable food supply for the beetle," land managers can prevent susceptibility of hosts to insect damage.

The susceptibility of trees to damage by bark beetles can be mitigated by stocking control which is tied closely together with tree vigor (Larson et al. 1983). Stocking control increases growing space, water and nutrient availability, sunlight penetration, and photosynthesis rates. Altogether, site disturbance such as fire and thinning improves tree vigor. Trees with vigor ratings above 70 can emit sufficient oleoresins to repel invading beetles and survive even relatively heavy insect attacks. Beetle infestations are occurring in the Analysis Area and causing mortality in small pockets. Although there is not a current widespread beetle infestation, treatments are designed to improve the vigor of trees to withstand potential outbreaks. Treatments primarily bring the vigor of ponderosa pine to a level where they can withstand attacks of any intensity in order to ensure the survival and perpetuation of pine in the Analysis Area. DeMars and Roettgering (1982) recommend that "reducing stand stocking to 55 to 70 percent of the basal area needed for full site utilization will relieve the competitive stress among the remaining trees, improve their vigor, and make them less prone to successful bark beetle attack." The Goheens (1995) state that whenever stand basal area exceeds 120 square feet per acre on drier sites or 140 square feet per acre on moister sites, the risk of beetle infestation is high (USDI 1995b).

---

[2] Basal Area - a) Of a tree: the cross-sectional area, expressed in square feet, of a tree stem measured at breast height. b) Of a forest stand: the total cross-sectional area of all the trees in a stand, measured at breast height, expressed in square feet per acre. Measurement of how much of a site is occupied by trees; directly related to stand volume and density.

f. Forest Pathogens

Forest pathogens and subsequent beetle kill contribute to changing the forest stand structure and forest development pattern by creating openings of varied sizes and allowing light to reach the forest floor. In the Analysis Area, laminated (*Phellinus weirii*), annosus (*Heterobasidian annosum*) and Armillaria (*Armillaria ostoyae*) root diseases are present. In the Analysis Area white fir are the most susceptible and are readily infected and killed. Root disease centers within the Project Area are relatively small (<.5 acre), however these diseases expand radially at a rate of about one foot per year and can remain viable in large stumps for at least 50 to 60 years. Infections occur primarily in small pockets within the Project Area. These small pockets make up less than 1 percent of the Project Area. Disease centers are variable in size, containing dead standing trees, and occasionally wind thrown trees. Infections are found throughout the 4000-6000 ft. elevation gradient of the Analysis Area. These root diseases kill host cambium, decay root wood, plug water conducting tissue, or cause some combination of these effects. Tree mortality from root disease occurs when trees with decayed roots are wind thrown or by bark beetle attack on root disease-weakened trees.

Most root pathogens spread when the roots of susceptible uninfected trees directly contact the roots of diseased trees as in the cases with *A. ostoyae* and *P. weirii* root diseases. *A. ostoyae* is most common in stressed trees and often associated with compacted soils, in poorly planted areas, and where trees have been wounded. This disease can create large openings where highly susceptible tree species never attain large sizes. These openings eventually fill in with hardwoods, shrubs, and resistant conifers. Symptomatic trees will occur around the margins of these centers and exhibit various stages of decline. The most susceptible conifers (white fir) may regenerate and occupy the newly available growing space in the centers, but will probably contact inoculum and die at an early age, thereby perpetuating the cycle of mortality and keeping the source inoculum alive. If disease susceptible trees continue to recolonize infected sites, they, too, will become infected. The likelihood of infected trees to attain large sizes will be low and the pathogen will survive on the site unless immune species occupy the mortality gaps.

Douglas-fir dwarf mistletoe (*A. douglasii*) creates similar patterns in the Analysis Area, affecting Douglas-fir growth and vigor of all age and size classes. The most severe cases of Douglas-fir dwarf mistletoe appear to be more common on moist sites at elevations above 3000 feet in the Analysis Area. Infections are widespread throughout the 3000-5000 ft. elevation gradient of the Analysis Area. Infections are usually systemic and form bunched globose growths of branches called “witches’ brooms.” These brooms, occurring mostly in the lower third of the tree canopy, are produced by local physiological changes induced by the parasite to get the tree to transport food to the mistletoe. Heavy infections result in growth loss, wood quality reduction, top-killing, and mortality. Food needed for healthy tree growth becomes diverted to the brooms, significantly draining the host (Hull and Leonard 1964). Although the spread of the infection is slow, infected trees lose vigor and become increasingly susceptible to other infectious diseases and insect attack. Weakened trees emit a different chemical signature than healthy trees. Bark beetles consequently are drawn to trees in a weakened state and eventually kill the infected tree.

Forest stands in the SFLB Project Area were inventoried where Insect and Disease Management treatments are proposed. These selected stands were identified as having high levels of infection of Douglas-fir dwarf mistletoe in the canopy and were not currently providing habitat for the Northern Spotted Owl. These treatments are prescribed to slow the spread of the disease to the overstory and understory trees and reduce the effects from secondary agents (e.g. beetles) that cause rapid mortality. There are seven treatment units prescribed for such treatments in the SFLB Project Area. Table 3-3 below shows the inventory data from these units by the percent infection in the overstory and the average Douglas-fir mistletoe rating (DMR) for each unit. The higher the DMR the more severe the infection is on the tree. Table 3-3 only shows four treatment units because unit(s) 25-3a, 25-3b, 25-3c, and 25-3d are the same stand split only by harvest method.

Table 3-3. Insect and Disease Management Units - Percent (%) of mistletoe infection

Unit Number	Stand Level Inventory		
	EA Unit Acres	DMR average	% infection of overstory (DF)
1-3	20	3.2	90
25-3	33	3.8	71
33-8	2	3.6	56
35-7	5	4.2	80

g. Coarse Woody Material

Many ecological processes have created even and uneven-aged forest stand structure in the Analysis Area over the last century. These same processes are responsible for the variable amounts of coarse woody material (CWM) across the landscape. The Guidelines for Snag and Down Wood Prescriptions in Southwestern Oregon (White 2001) states that amounts of coarse woody material across landscapes are highly variable and should vary over time with stand development. Amounts of CWM are influenced by forest stand history, soils and respective plant associations, climate, and topography. "The Northwest Forest Plan and the ROD directed development of baseline down wood and snag levels based on plant association groups" (White 2001). These groups are described as an intermediate scale between plant series and plant associations, which are described earlier in this chapter. Plant association groups will reflect ecological processes, such as productivity, that directly influences the production of snags and down wood. Measurements of coarse woody material were taken in a variety of plant association groups within forest stands in the SFLB Analysis Area, totaling 6,500 feet of transect line and roughly 388 stand acres. CWM was measured in the Douglas-fir, white fir, and ponderosa pine plant association groups. The table below shows the relative amount of CWM measured among these groups.

Table 3-4. Coarse Woody Material

Metrics	Plant Association Group		
	Douglas-fir	Ponderosa pine	White fir
Pieces Per Acre	41.5	18.4	45.0
Tons Per Acre	13.7	6.0	15.7
Length Per Acre (ft.)	1103	1026	548
Average Diameter Range (in.)	10-19	6-9	10-19
Largest Diameter Measured (in.)	51	32	39

Coarse woody material was distributed across all decay classes, although decomposition classes 3 (twigs and branches gone but bole is still round, hard and in large pieces), 4 (losing form), and 5 (no form) were most common among Douglas-fir and white fir plant association groups (see table below). These amounts of CWM fall within the ranges discussed in White's (2001) publication for respective plant association groups.

Table 3-5. Coarse Woody Material Decay Classes

Log Characteristics	Decay Class				
	1	2	3	4	5
Bark	Intact	Intact	Trace	Absent	Absent
Twigs <3 cm.	Present	Absent	Absent	Absent	Absent
Texture	Intact	Intact to partly soft	Hard, large pieces	Small, soft blocky pieces	Soft and powdery
Shape	Round	Round	Round	Round to oval	Oval
Color of wood	Original color	Original color	Original color to faded	Light brown to reddish brown	Red brown to dark brown
Portion of log on ground	Tree elevated on support points	Tree elevated on support points but sagging slightly	Tree is sagging near ground	All of tree on ground	All of tree on ground
Invading roots	None	None	In sapwood	In heartwood	In heartwood

Information Bulletin No. OR-97-064 for the implementation of coarse woody material standards and guidelines (1996) states that, "prescriptions should account for current habitat conditions and the timing and development of subsequent snags and coarse woody material until the next stand once again begins to contribute CWM". Many of these trees will be available to supply future CWM or snags to the sites. To comply with both the Medford District RMP (USDI 1995, p.73) and with section C-40 of the Northwest Forest Plan for CWM retention requirements for regeneration or final harvest treatments, trees will be designated and reserved to provide for CWD where this management action/direction cannot be met with existing coarse woody debris. These trees designated for coarse woody material should have characteristics of decay class 1 and 2 (see table above). To meet the ROD/RMP guidelines, a minimum of 120 linear feet of logs per acre greater than or equal to 16 inches diameter and 16 feet long will remain following harvest (Information Bulletin OR-97-064 and Instruction Memorandum OR-95-028).

Measurements of snags were taken in a variety of plant association groups within forest stands in the SFLB Analysis Area, totaling 60 sample plots. Snags were measured in the Douglas-fir, white fir, and ponderosa pine plant association groups. The table below shows the relative amount of snags measured among these groups.

Table 3-6. Snags (standing dead)

Metrics	Plant Association Group		
	Douglas-fir	Ponderosa pine	White fir
Average Snags Per Acre	9.7	31.9	1.0
Average Snags Per Acre (>50 ft. ht. and >20 in. at 4.5' ht.)	1.4	1.4	1.0
Average Diameter (in.) at 4.5' ht.	16.8	14.5	26.3
Average Height (ft.)	76.7	67	90
Average Stage (decay class)	1.4	1	2
Largest Diameter (in.) Measured at 4.5' ht.	32	21	26

Due to a wide variety of plant association groups throughout the Analysis Area, sample plots revealed a wide range of snags. Snag concentrations were observed in large size pockets to individual isolated trees, depending on the topographic proximity and site productivity. The plot data ranged from 0-8 snags per acre (>50 ft. in height and >20 in. DBH), representing all deterioration stages (see table below) and sizes for all plant association groups, however sample plots for each plant association group revealed some distinct differences when averaged. Of the three plant association groups that range from warm (ponderosa pine) to cool (white fir) environments, snag size, abundance, and decay class were remarkably different. These standing dead trees will contribute to future down wood concentrations for their respective plant association group in the Analysis Area and provide short-term benefit to cavity nesting wildlife. To comply with both the Medford District RMP (USDI 1995, p. 73), all general forest management areas will "Retain snags within forest condition restoration treatments units at levels sufficient to support species of cavity nesting birds at 40 percent of potential population levels." These areas will meet this minimum requirement with per-acre requirements met on average areas no larger than 40 acres.

c. Environmental Consequences

a. <u>Alternative 1 - No Action</u>

The No Action Alternative would not meet the silvicultural objective to reduce stand densities to natural carrying capacities and create favorable growing conditions to improve individual tree health (vigor) for desirable species. Alternative 1 (No Action) would allow forest stands to remain at the overall average of 0.70 relative density index, allowing density dependent mortality to occur and leaving forested stands more susceptible to insect and disease agents. Stand densities would continue on their current trajectory of stand development and remain overpopulated. The current average relative density for the area indicates that, physiologically, the trees have entered the zone of imminent suppression and mortality. Tree vigor and growth will continue to decline as these stands continue on this trajectory. Growing conditions become stagnant (at or above stand density index of 0.55), resulting in intensified competition and the stand begins excluding the weakest trees. If stand densities remain in this condition, large diameter trees decline in number and individual tree vigor will be reduced. "Individual trees have smaller crowns in dense stands, and thus each tree has less capacity for diameter growth than trees with larger crowns in less-dense stands" (Tappeiner 2007). Leaf area index would decline as live tree crowns decrease in size from tree competition. No action would allow forest stands to remain overstocked and individual tree vigor and growth would remain poor. Lack of disturbance in fire-adapted systems, such as those found in the Analysis Area, has resulted in higher stocking densities than the site is capable of maintaining. The data indicates that, based on Waring's vigor rating indices, last decade's growth rate, and relative density indices, forest stands will remain overstocked and individual tree vigor and growth would remain poor in the Analysis Area.

Without silvicultural treatments to control the establishment and growing space of trees, forest structure and species composition can shift. On pine sites that require at least 25 percent full sunlight, shade-tolerant white fir and Douglas-fir would continue to encroach and stands would remain in a dense stand condition in the absence of disturbance. Shade intolerant pine and oak species would continue to decline in number from competition with encroaching shade tolerant white fir and Douglas-fir. Because shade tolerant species (white fir) are growing on sites better suited to early seral species (ponderosa pine), the shade tolerant species exhibit poor vigor and require more moisture than the site can deliver, becoming easily stressed and succumbing to density mortality or beetle kill. The No Action Alternative would result in higher numbers of white fir and Douglas-fir trees that may cause long-term ecological impact to the conifer forests of the SFLB Analysis Area. A shift in species composition has major implications on forest processes and function. These shade tolerant trees will become a large component of the canopy that will contribute to a dense forest structure prone to a perpetual cycle of overcrowded stand densities (competition mortality), drought induced mortality, and/or mortality caused from insect and disease agents. Without management action, shade intolerant species like ponderosa pine and trees of large diameter, would continue to decline in number from such competition. The No Action Alternative would not meet the silvicultural objective to promote the growth and establishment of tree species that are well adapted or most resilient to environmental conditions and natural disturbance regimes.

In regard to species and biological diversity, forested stands in the Analysis Area have become predisposed to stand-replacing fires and insect and disease epidemics. The relative densities also present a high fuel hazard across the landscape. A decrease in stand vigor is expected with continued overstocking and increasing stand age. In regard to species and biological diversity, forested stands in the Analysis Area have become predisposed to stand-replacing fires and insect and disease epidemics. Fire suppression has altered the landscape pattern of forest structure, density, and species composition. Without any form of density control, and the predicted periods of drought in the region, slow tree growth and poor vigor would result in individual tree and stand mortality. Wildfires have functioned as a natural tool for thinning out the understories and removing dense pockets of forest. Without this tool, Douglas-fir trees in the Analysis Area have increased in number, along with other species such as true fir (white fir). This increase for example can perpetuate forest pathogen effects that may result in a less resilient forest. The increase of Douglas-fir in southern Oregon coincides with the increased levels of dwarf mistletoe seen today. Without the cleansing effect of fire on densities of Douglas-fir seedlings, the pathogen is consequently perpetuating on the infected sites and spreading into previously uninfected stands.

The amount of Douglas-fir dwarf mistletoe present in Southwest Oregon is at unprecedented levels (Goheen 2010). The spread of the parasite can infect nearby stands of Douglas-fir and decrease growth rates of trees, thereby reducing stand volume production and promoting poor forest health. The presence of dwarf mistletoe can contribute to increased fire behavior during wildfire events. This is due to a century of fire suppression on forestlands. Higher levels of insect and disease infestation/infection are expected as stand density increases (Fetig et al. 2007). Tree mortality represents a reduction in stand volume production, a loss of revenue, and poor forest health. Diseases such as Douglas-fir dwarf mistletoe would persist and perpetuate the infection cycle on sites currently infected. Disease-susceptible trees continue to recolonize these sites and understory trees become infected and their likelihood of attaining large sizes is low. The pathogen survives on the site unless disease resistant species occupy the forest openings. The No Action Alternative would allow the unchecked spread of disease to continue on the sites. The Medford District RMP (USDI 1995, p. 194) instructs to “design silvicultural treatments so that within-stand endemic levels do not increase and where possible, the affected trees contribute to the achievement of land use allocation objectives.” The No Action Alternative would not meet the stated need to maintain and promote vigorously growing conifer forests, reduce tree mortality, and provide timber resources, in accord with sustained yield principles, on BLM-Administered Matrix lands within the SFLB Project Area.

The 1995 Medford District RMP describes the Forest Condition (Forest Health) Restoration Objective that requires management emphasis on treatments and harvests that restore stand condition and ecosystem productivity. It directs management actions to include density management and understory reduction operations that reduce competition, increased use of understory prescribed fire, and fertilization (USDI

1995). The No Action Alternative does not meet the forest health objectives as defined in the 1995 Medford District Resource Management Plan.

Past Actions

Since the implementation of the Medford District ROD/RMP in 1995, commercial harvest has occurred on 1,605 acres of the 15,429 acres of BLM-administered forested lands within the SFLB Planning Area of the Little Butte Creek fifth field watershed. Over ninety percent of all harvest treatments since 1995 have been exclusively mortality salvage treatments or individual tree selection. Individual tree selection has removed trees across all diameter classes and has reduced tree competition. Less than ten percent of all harvest treatments have been commercial thinning and regeneration harvest treatments. The remaining trees on these 1,605 acres of harvest have adequate site resources to maintain good growth rates with tree vigor at levels necessary to minimize mortality from competition or insects and disease. Additionally, 4,440 acres of pre-commercial thinning has been completed since 1995 on BLM-administered lands within the SFLB Planning Area of the Little Butte Creek 5th field watershed (based on Micro*Storms query).

As a result of a recent storm event in February 2015, approximately 1,100 feet of roadside hazard tree removal occurred within the South Fork Little Butte Planning Area in March/April 2015.

Present Actions

No current commercial forest management projects are occurring on BLM-administered lands in the SFLB Planning Area, other than the MC Thin timber sale. The MC Thin timber sale consists of 178 acres of commercial timber harvest. No harvesting has occurred to date on the MC Thin timber sale, but it is anticipated that harvesting would begin in the spring or summer of 2015.

Vegetative treatments such as protection, maintenance, pre-commercial thinning, and release are presently being planned for a total of 348 acres in the Planning Area. These treatments would reduce stand densities, increase conifer growth, and redirect forest stands towards conditions that would be more resilient to landscape disturbances. These treatments would also enhance seedling survival, reduce vegetative competition, and allow for increased conifer growth.

Future Actions

A plantation thinning project is anticipated to occur as soon as the summer of 2015. The project would thin overstocked, small diameter pine and Douglas-fir stands to reduce competition and increase growth in the residual trees on approximately 157 acres of BLM-managed lands within and adjacent to the SFLB Planning Area.

Additional vegetative treatments such as protection, maintenance, pre-commercial thinning, and release would likely continue to occur as needed in young stands. Within such stands, brush and hardwood control and pre-commercial thinning are the two primary management activities most likely to occur.

b. Alternative 2

Refer to Chapter 2 for descriptions of the Silvicultural Prescriptions.

Table 3-7 shows the difference in stand conditions between a “No Treatment” (Alternative 1) and a treatment or action (Alternative 2), within a 30-year time period. The stand data below was collected and averaged from all vegetation condition classes (poles thru mature) and vegetation types (PP, DF, MC, WF) collected in the project units, were modeled to capture the differences in effects to northern spotted owl habitat. The table also highlights the trends associated with stand density and canopy cover as silvicultural prescriptions are applied. Table 3-7 displays the current canopy cover to demonstrate the relationship of relative density index (RDI) of a stand and the number of trees occupying that same stand with and without management intervention. Stands were modeled in a growth and yield modeling system called ORGANON edition 9.1 (Hann 2013). Developed at Oregon State University, College of Forestry, the model predicts forest growth outputs based on scientific formulas programmed into it. This model was used to better capture the difference

of effects of forest treatments vs. no forest treatments. The southwest Oregon variant was used to model stands in the Project Area.

Table 3-7. Current and Future Stand Conditions and Effects on Habitat

	QMD (inches)	BA (ft^2)	TPA	Crown Ratio (%)	Canopy Cover (%)	Relative Density
Dispersal Maintain						
Current Conditions	11	178	353	38	65	57*
30 years No Action	14	219	263	35	67	64*
Post-Treatment	13	110	140	37	45	32
30 Years Post-Treatment	16	145	121	36	50	40
Dispersal Removal						
Current Conditions	12	150	378	33	59	52
30 years No Action	14	182	280	31	60	59*
Post-Treatment	13	90	122	33	38	29
30 Years Post-Treatment	16	118	107	33	43	36
Roosting and Foraging Maintain						
Current Conditions	11	219	410	43	74	75*
30 years No Action	13	271	330	35	76	85*
Post-Treatment	13	176	221	41	63	56*
30 Years Post-Treatment	15	223	189	34	67	66*
Roosting and Foraging Downgrade						
Current Conditions	13	199	238	39	67	59*
30 years No Action	16	242	189	35	69	65*
Post-Treatment	15	127	137	40	49	37
30 Years Post-Treatment	17	164	118	38	53	44

*Relative Density (Curtis 1982) indices above 0.55 = zone of occurrence of suppression mortality. Without stand treatments that reduce trees per acre, RDIs that remain above the 0.55 RDI threshold leaves stands more vulnerable to drought, insect, and disease mortality. Reducing stand density is critical in meeting the stated purpose and need of the South Fork Little Butte Creek Forest Management Project.

Table 3-7 reveals that 30 years following treatment these stands would have less canopy cover than a "No Action" in 30 years; however, stand densities would be reduced and the largest trees in the stand would have more optimal growing conditions than a "No Action" 30-year projection. A treatment to reduce stand densities now would set the stand on a more desirable stand development trajectory to create a multiple canopy, multi-age stand for the future (refer to Figure 3-3a). These treatments would accelerate the development of forest stand conditions that meet long-term management objectives for northern spotted owl habitat and shift stand trajectories to encourage key habitat components for the future. Leaving stands at their current condition would not reduce stand densities to their natural carrying capacities and would not improve individual tree vigor in the next 30 years. Reducing stand densities through thinning treatments would promote the growth and establishment of tree species that are well adapted or most resilient to environmental conditions and natural disturbance regimes. Stands in which treatments are not applied would maintain a higher relative density and would remain in a homogenous and uniform stand structure of less complexity for at least 30 years (refer to Figure 3-3b).

Figure 3-3 illustrates the differences in stand structure conditions in a mature Douglas-fir stand in the SFLB Project Area modeled with Organon and SVS over a 30 year time period. The Stand Visualization System (SVS) illustrates the prescriptions, portraying what existing forest stands look like today and after application of the proposed prescriptions (USDA and University of Washington, 1995). ORGANON plot data was entered into the SVS program for the simulations. The SVS images below simulate the two modeled

scenarios. The figure(s) below show the long-term change in stand condition following a Selective Thinning treatment and a “No Treatment”.

Figure 3-3. Stand Structure Conditions of a Project Stand over a 30 year Period

a): Stand structure 30 yr. post-treatment **b): Stand structure 30 yr. No Treatment**

In summary, stands under the SFLB Forest Management Project would benefit immediately from forest management treatments. These silvicultural treatments would improve and/or maintain vigorously growing conifer forests, reduce tree mortality, and encourage a mixture of tree species that are more fire-resilient and drought tolerant than its current condition. The reduction in stand densities, preference of shade intolerant species over shade intolerant (white fir), and increasing growing space for residual trees would result from such treatments. Table 3-8 below shows the amount of treatments proposed under Alternative 2.

Table 3-8. Percent Commercial and Non-Commercial Treatments under Alternative 2

Silvicultural Prescription	Alt. 2 Proposed SFLB Treatment Acres	% of SFLB BLM Land
Understory Reduction*	**1,553**	**9**
Selective Thinning	1,060	6
Density Management	32	<1
Group Selection	109	<1
Regeneration Harvest	133	<1
Mortality Salvage	342	2
Commercial Treatment Total	**6**	**9**

Alternative 2 would break up surface and crown fuels that have been created under a regime of fire exclusion. The excess tree stems would be thinned to a desired stocking level to improve the growth and vigor of the remaining trees. These thinning treatments would also help to accelerate the development of heterogeneous stand structure, increase species diversity, and reduce hazardous ladder fuels. Additionally, these treatments would aid in reducing cumulative effects of insect and disease and there rate of spread to adjacent lands. Tree species diversity would continue to decline without treatments to maintain shade intolerant species such as pine. Maintaining these drought resistant species ensures the resiliency of forest stands during a period of climatic uncertainty. The No Action Alternative would leave forest stands in the Project Area vulnerable to severe drought cycles. The relatively high levels of conifer trees and mortality of untreated forest stands as a result of competition would leave stands more susceptible to disease and insect mortality. The effects would be as described above in the No Action Alternative.

Alternative 2 allows for active forest management in conifer stands to occur that will meet multiple stand and landscape level objectives discussed in Chapter 2. There is no single stand level objective under this prescription. The prescribed treatments under this alternative allow flexibility in managing stands in the long-term. The retention of drought tolerant and fire-resilient species and reducing the abundance of more shade tolerant species in the area like white fir, allows for a greater abundance of trees better adapted to local site conditions. In these conifer stands, a reduction of trees per acre 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. Alternative 2 would reduce the impacts of the disease at the stand level by controlling the spread of the disease through the removal of heavily-infected trees and by maintaining and encouraging species such as pine and incense cedar that are resistant to Douglas-fir dwarf mistletoe. Tree species diversity would be maintained or enhanced with these proposed treatments to maintain shade-intolerant species such as pine. Alternative 2 would limit the effects described above in the No Action Alternative. These treatments, combined with past and potential future density reduction treatments in the watershed, would improve stand and landscape resistance and resiliency to environmental disturbances. Commercial and non-commercial 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.

Alternative 2 would meet the timber management assumptions and conifer growth and timber yield projections provided for in the 1995 Medford District RMP on approximately 94 percent of the acres commercially treated. Of the remaining 6 percent of commercially treated acres, where silvicultural treatments maintain a canopy cover greater than 60 percent, it is likely that conifer growth and yield projections would not be met on these acres. However, these silviculture treatments would reduce short-term impacts to forest stands described previously in this section. Mortality salvage treatments are excluded from these calculations due to the fact that these trees are dead and dying and contribute little to no growth.

Alternative 2 proposes permanent road construction in order to access forest stands for treatment. This permanent road construction would remove all vegetation within the road prism and would convert forest land (if present within road prism) to non-forested lands. Approximately 0.80 miles of permanent road construction would convert about 2.4 acres of forested lands (if present) to non-forested lands.

c. Alternative 3

Under Alternative 3, the stand level effects are the same as those described in Alternative 2 with some differences in landscape level effects. Since Alternative 3 proposes less acres of commercial and non-commercial treatments than Alternatives 2, the total footprint for these vegetation treatments are less than Alternatives 2. Table 3-9 below shows the amount of treatments proposed under Alternative 3.

Table 3-9. Percent Commercial and Non-Commercial Treatments under Alternative 3

Silvicultural Prescription	Alt. 3 Proposed SFLB Treatment Acres	% of SFLB BLM Land
Understory Reduction*	**1133**	**6**
Selective Thinning	507	3
Density Management	12	<1
Group Selection	14	<1
Regeneration Harvest	121	<1
Mortality Salvage	306	2
Commercial Treatment Total	**960**	**5**

Alternative 3 proposes treatments that would be beneficial to forest stands and for the habitat it creates, rather than detrimental. These treatments would aid in reducing the cumulative effects that are described earlier this section; however, there would be considerably less acres proposed than in Alternative 2. These effects are described in detail under Alternative 1 or the "No Action Alternative." Similar to Alternative 2, 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. Commercial treatments would promote more drought-tolerant and fire-resilient species over shade-tolerant species, such as white fir. Variable stand structure would be created through individual tree selection that retains a proportionate array of species and tree physical characteristics.

Alternative 3 would meet the timber management assumptions and conifer growth and timber yield projections provided for in the 1995 Medford District RMP on approximately 98 percent of the acres commercially treated. Of the remaining 2 percent of commercially treated acres, where silvicultural treatments maintain a canopy cover greater than 60 percent, it is likely that conifer growth and yield projections would not be met on these acres. Mortality salvage treatments are excluded from these calculations due to the fact that these trees are dead and dying and contribute little to no growth.

d. Cumulative Effects

There is no potential for adverse cumulative effects to forest vegetation when considering forest thinning treatments proposed under Alternatives 2 and 3 along with current conditions and ongoing and reasonably foreseeable actions in the analysis area. Other forest management projects (past, ongoing, and reasonably foreseeable) within the analysis area are improving tree vigor, reducing risk for insect and disease impacts, and improving fire resiliency in forest stands. This project only increases the acreage within the analysis area of forest stands treated. Alternative 2 would treat 2,488 acres (1,676 acres of commercial forest management and 812 acres of non-commercial understory management) representing slightly over 16 percent of the Analysis Area. The proposed action when combined with past, ongoing, and reasonably foreseeable silviculture actions on BLM-administered lands within the Analysis Area have or will improve tree vigor, reduce the impacts of disease, and improve fire resiliency on about 60 percent of forested lands within the Analysis Area.

There would be no effects to conifer vegetation (including the establishment of conifer trees), insects and disease, or snags and coarse woody debris from the one ongoing/reasonably foreseeable grazing with in allotments that fall within the analysis area and therefore no potential for adverse cumulative effects when combined with the effects of Alternatives 2 and 3.

e. Consideration of Douglas-fir Dwarf Mistletoe as a Beneficial Disturbance Agent

Douglas-fir dwarf mistletoe (*Arceuthobium douglasii*) is a parasitic plant that infects Douglas-fir and is widespread in Southern Oregon dry forests. It is one of the primary diseases (besides root rot) that affects the growth and health of Douglas-fir. Douglas-fir dwarf mistletoe evolved with its host species over the past 10,000 years. The benefits of dwarf mistletoe as wildlife habitat and a food source are well known (Mathiasen 1996). Not only does the presence of mistletoe contribute to stand diversity through the creation of gaps, structural irregularity, and the accumulation of snags and down wood, it also serves as habitat for a variety of mammals, birds and arthropods. In particular, in the Siskiyou Mountains, large witch's brooms serve as nest platforms for spotted owls and raptors. There is evidence that groups of mistletoe-infected trees are the most likely areas for spotted owls to nest in the white fir and Douglas-fir forests of the Siskiyou Mountains (Marshall et al. 2003; Mallams and Goheen 2005).

Dry Douglas-fir stands (Douglas-fir/poison oak) and pine-oak stands historically were shaped by frequent fire, and because of fire suppression, the number of Douglas-fir trees is far in excess of historical ranges (Brown et al. 2004; North et al. 2004). The proposed forest management project does not attempt to eradicate dwarf mistletoe from the landscape; rather, it attempts to minimize it in specific areas so that the Forest Health objectives and management direction pertaining to all land use allocations as defined by the

1995 Medford District Resource Management Plan can be attained. Specifically, treatments occurring within mistletoe-infected stands meet the following objectives and direction:

- Reduce tree mortality and restore the vigor, resiliency, and stability of forest stands that are necessary to meet land use allocation objectives (USDI 1995, p. 62).
- Design and implement silvicultural treatments in stands that are in a condition, or that will soon be in a condition, which prevents management objectives from being achieved. Treatments are intended to restore the ability of stands to respond to other management and to reduce the risk of mortality from insects, disease, and wildfire (USDI 1995, p. 62).
- Design forest condition restoration treatments to be consistent with the long-term objectives of the allocation in which the treatment is proposed. Develop treatments in an interdisciplinary manner (USDI 1995, p. 62).

The aforementioned objectives and direction are in addition to the SFLB Forest Management Project's stated purpose and needs that would be attained through mistletoe treatments:

- Ensure sustainable forest production, and the renewable resources they provide, by managing forests to improve conifer forest vigor and growth (USDI 1995, pp. 72-73).
- Provide timber products from Matrix land allocations in accordance with the direction in the Medford District's 1995 Resource Management Plan (USDI 1995, pp. 72-73).

The Medford District's 1995 RMP does not direct to manage for the survival of pathogens. Management efforts are focused towards minimizing the impacts of Douglas-fir dwarf mistletoe by maximizing tree species diversity and by reducing canopy layering. Stands composed of mixed tree species of all size classes provide barriers that inhibit the horizontal and vertical spread of mistletoe. Ponderosa pine, sugar pine, incense cedar, white fir and hardwoods are not susceptible to Douglas-fir dwarf mistletoe. Suppressed and intermediate size classes of Douglas-fir are targeted for removal, reducing the canopy height structure and reducing the potential for the vertical spread of mistletoe. With or without management activities, dwarf mistletoe will continue to be a stand and landscape feature on lands managed by the BLM, and Douglas-fir mistletoe will occur at natural rates within these conifer-dominated forest types.

C. FIRE AND FUELS

This section describes the current condition of the landscape and discloses the effects of forest management activities on fire hazard. Smoke impacts, as a result of prescribed fire, are discussed in the "Air Quality" section.

1. Assumptions

Analysis Area: Includes all lands within the Planning Area (35,383 acres).
Project Area: Where appropriate, refers to units proposed for treatment under the Proposed Action.

2. Issues/Concerns

Scoping (external and internal) generated the following issues related to implementing the proposed actions. These effects may or may not occur as a result of proposed actions but were of concern to members of the public or ID team specialists.

- Timber harvesting could increase surface fuels over the short-term (6 months to 2 years) in stands treated.
- Leaving untreated logging slash, even if only for a short period of time, could lead to increased wildfire behavior and increased risk of escape from initial attack.
- Management of forest stands usually results in altered microclimates. Increasing spacing between the canopies of trees can contribute to increased wind speeds, increased temperatures, drying of

topsoil and vegetation and increased shrub and forb growth. These changes in microclimates and vegetation structures can alter wildfire behavior and its effects on the land (fire severity).

- New road construction could lead to increased fire risk.
- Some comments were received suggesting that untreated forest stands with closed canopy conditions result in lower fire severity when burned by wildfire than open and non-forest vegetation conditions. This information was also correlated, by commenters, to a conclusion that long absence of fire is a predictor of low severity fire effects.

3. Affected Environment

a. Fire Disturbance History

Fire is recognized as a key natural disturbance process throughout Southwest Oregon (Atzet and Wheeler 1982). The landscapes that comprise the Analysis Area evolved with frequent fires affecting the vegetation and other key components of the ecosystem. Human-caused and lightning fires have been a source of disturbance to the landscape for thousands of years. Native Americans influenced vegetation patterns for over a thousand years by igniting fires to enhance values that were important to their culture (Pullen, 1995). Early settlers to this area used fire to improve grazing and farming and to expose rock and soil for mining.

Fire has played an important role in influencing successional processes. Historically, frequent, low intensity fires maintained dry Douglas-fir and pine forest types in more open conditions than exist today (Agee, 1993). Frequent, low intensity fires served as a thinning mechanism, thereby, naturally regulating the density of the forests. A more open crown structure would have allowed fire to travel more rapidly across the site with intensities that were short-lived. The light flashy surface fuels (grasses, shrubs, and conifer/hardwood litter), the repeated reduction of conifer reproduction underneath the overstory, and the repeated consumption of large fuels and duff build-up, would have reduced the post-fire effects (also described as fire severity) found on these sites historically. The qualities of the open crown structure would also provide better avenues for the heat intensity to vent out of the site without scorching the crowns to the lethal limit.

b. Fire Exclusion/Suppression

Since the establishment of Euro-settlement in this area, human relations and interactions with these landscapes have affected many of the processes that had previously played a large part in the evolution of the site. Of these interactions one management decision that has affected one of the evolutionary processes has been that of fire exclusion. In the early 1900s, uncontrolled fires were considered to be detrimental to forests. Suppression of all fires became a major goal of land management agencies.

In ecosystems that historically burned frequently, particularly the ponderosa pine and the dry mixed-conifer forest types found in the lower and mid elevation areas of the Medford District BLM (Sensenig 2002; Huff and Agee 2000), the exclusion of fire combined with periods of higher than normal precipitation has promoted increases in fuel quantity and changes in fuel continuity and arrangement. As a result of the absence of fire, there has been a buildup of fuels and a change to a more fire-prone vegetative condition. This is particularly true for ponderosa pine, dry Douglas-fir, and mixed-conifer forest types.

Trees facing more intense competition often become weakened and are highly susceptible to insect epidemics and tree pathogens. Increased tree mortality contributes to increased dead and down fuel loadings and increased fire behavior. The additional surface fuels provide for longer duration heat intensity (residence time), which in turn affects the severity with which the site burns, and the increased canopy closure along with the lower canopy heights allow for more scorching in the canopy and when environmental conditions are conducive to crown fire initiation and sustained crown fire runs. High intensity fires can damage soils and can impact riparian vegetation as well.

Ponderosa pine trees that thrive in fire prone environments are being shaded out by the more shade tolerant Douglas-fir or white fir species in the absence of fire. As a result, more fire-resilient pine species are

declining across the landscape. Trees growing at lower densities, as in ponderosa pine stands, tend to be more vigorous and fire-resilient.

Sites that have a less frequent fire regime (higher elevation white fir stand types in the southern end of the Analysis Area) display much the same fuel quantity and arrangement increase and possibly may burn with similarity in patch-size and intensity to their historical pattern under some weather conditions and with more severe characteristics and larger patch size under severe fire weather conditions.

Fire history recorded over the past 20 years in Southwest Oregon indicate a trend of more large fires which burn at higher intensities in vegetation types associated with low to mixed severity fire regimes. This trend is also seen throughout the western United States. Contributing factors are the increase of fuel loading attributed to the absence of fire, recent drought conditions, and past management practices.

The Bureau of Land Management has a master cooperative fire protection agreement with the Oregon Department of Forestry (ODF). This agreement gives the responsibility of fire protection of all lands within the Analysis Area to the Oregon Department of Forestry. This contract directs ODF to take immediate action to control and suppress all fires. Their primary objective is to minimize total acres burned while providing for fire fighter safety. The agreement requires ODF to control 94 percent of all fires before they exceed 10 acres in size.

Due to ownership patterns and political constraints in southwest Oregon, the use of wildfire to meet resource objectives is not possible. There are stipulations within the protection agreement with ODF that allows BLM to designate areas that require special fire management activities during suppression efforts in order to insure damage to resources are minimized. It is recognized that restrictions could increase the cost of suppression which the Bureau of Land Management would incur and would require a modification of the contract. During suppression activities conducted on BLM-administered lands the following guidelines would be followed:

> BLM resource advisors will be dispatched to fires which occur on BLM-administered lands. These resource advisors are utilized to ensure that suppression forces are aware of all sensitive areas and to insure damage to resources is minimized from suppression efforts.
>
> When feasible, existing roads or trails will be used as a starting point for burn-out or backfire operations designed to stop fire spread. Backfires will be designed to minimize fire effects on habitat. Natural barriers will be used whenever possible and fires will be allowed to burn to them.
>
> In the construction of fire lines, minimum width and depth will be used to stop the spread of fire. The use of dozers should be minimized and resource advisors will be consulted when appropriate. Live fuels will be cut or limbed only to the extent needed to stop fire spread. Rehabilitation of fire lines will be considered.
>
> The felling of snags and live trees will only occur when they pose a safety hazard or will cause a fire to spread across the fire line.
>
> The construction of helispots should be minimized. Past locations or natural openings should be used when possible. Helispots will not be constructed within riparian reserves, or areas of special concern.
>
> Retardant or foam will not be dropped on surface waters or on occupied spotted owl nests.
>
> Resource advisors will determine rehabilitation needs and standards in order to reduce the impacts associated with fire suppression efforts.

c. Past Logging Practices

Commercial timber harvesting has occurred in the Analysis Area on BLM-administered lands since the 1970s. The intensity and acres harvested increased in the 1970s and 1980s (USDI and USDA 1997). Past

harvest techniques such as clearcutting, which were conducted before 1990 have resulted in stands of young and more flammable trees, which contribute to the current fire hazard ratings for the Analysis Area.

Plantations are more susceptible to severe fire effects than unmanaged older forests (Weatherspoon and Skinner 1995). However, the same study indicated substantially less damage from wildfires where surface fuels were also treated. The structural attributes of young trees (crowns close to ground, crown consisting mostly of fine fuels), and the amount and location of forest floor fuels (logging/thinning debris, forest floor vegetation) are important factors.

From 2002 to 2004 approximately 810 acres of BLM-administered lands were logged within the Analysis Area as part of the Indian Soda Forest Management Project (and associated timber sales). Timber harvest can increase fire severity by increasing surface dead fuels if not accompanied by adequate reduction of fuels (SNEP, 1996, pp. 61-72). Studies that correlate logging with increased fire behavior (Weatherspoon and Skinner 1995) are mostly based on the forest practice of not treating logging and thinning debris (slash). Thus it is the added ground fuel which in a drier, hotter microclimate, as a result of opening forest canopy that significantly contributes to fire behavior in a wildfire situation.

All of these acres were followed up with fuels reduction work and prescribed burning to mitigate the surface fuel hazard that was created by the logging.

d. Past Fuels Reduction Treatments

From 2002 to present, fuels treatments have occurred on approximately 1,395 acres of BLM-administered land within the Analysis Area. Approximately 810 of these acres were commercially thinned and followed up with prescribed burning. The fire hazard on all the treated acres has been reduced.

e. Fire Regimes

Climate and topography combine to create the fire regime found throughout the Analysis Area. Fire regime refers to the frequency, severity and extent of fires occurring in an area. Agee (1993) suggests that variable fire history, complex geology, land use history and steep environmental gradients of Douglas-fir hardwood forests of southwest Oregon and Northern California Siskiyous prevents generalizations about fire and its ecological effects (Agee 1993 p. 283-284). Plant association groups are a credible link to historic ecological process, including fire regimes that occurred on sites in the past (Franklin and Agee 2003). Historic fire regimes and the departure from them, correlate's to the change from historical to current vegetative structure. The change in vegetation also helps to describe the difference in fuel loading (dead fuels and live in the form of increased vegetation) from historical to current conditions.

These changes in vegetation and fuel conditions help to determine the expected change in fire behavior and its effects. This difference in many respects is attributed to fire exclusion, but also includes all human practices that would affect the extent, severity, or frequency of fire events compared to historical accounts. These practices include road building, livestock grazing, and some logging practices as well as fire suppression.

Three historic fire regimes are found within the Analysis Area (Schmidt et al. In press):

Fire Regime 1: 0-35 years fire return interval, Low Severity

Typical climax plant communities include ponderosa pine, pine-oak woodlands, and oak woodlands. Large stand-replacing fire can occur under certain weather conditions, but are rare events (i.e. every 200 years).

Fire Regime 2: 0-35 years fire return interval, High Severity

This regime includes true grasslands and savannahs with typical return intervals of less than 10 years and ceanothus and Oregon chaparral with typical return intervals of 10-25 years. Fire severity is generally high to moderate.

Fire Regime 3: < 50 years fire return interval, Mixed Severity

Typical plant communities include mixed conifer and dry Douglas-fir forests. Lower severity fire tends to predominate in many events. This regime usually results in heterogeneous landscapes. Large, stand-replacing fires may occur but are usually rare events.

The stands that are proposed for treatment under this project are in the low severity and mixed severity fire regimes (Map 3-2).

f. Predicted Climate Changes

Several studies that model climatic change into the next century also caution land managers in the Pacific Northwest to plan for increased temperatures and possibly some increase in winter moisture in the form of rain over the coming years in the Pacific Northwest (The JISAO Climate Impact Group- Mote et al 2003; Drought and Pacific Decadal Oscillation Linked to Fire Occurrence in the Pacific Northwest Hessl 2004; Preparing for Climatic Change: The Water, Salmon, and Forests of the Pacific Northwest- Mote et al 2003). These forecasts would indicate and suggest that climatic factors may, in the future, have a more dramatic impact on wildland fire extent and severity. With increases in warmer winter moisture to inspire vegetation growth along with warmer and dryer conditions in the summer months what is considered to be extreme drought conditions now, could easily be experienced with Pacific Dacadal Oscillations (PDO) or El Nino Southern Oscillation (ENSO) in the first half of this century. Change in ecosystem structure and spatial distribution is expected to result from this climatic variation, and wildland fire will be one of the agents that cause the changes in the ecosystems. Silviculture and fuels management treatments are one way land managers can enhance ecosystem resilience and protect private property.

g. Condition Class

The process for making an assessment on how much fire exclusion, along with other management activities, has affected an ecosystem is through classifying the current condition of the site based on a reference usually pre-dating when fire exclusion became an influence. Condition class descriptions are used to describe these affected ecosystems. Condition classes are a function of the degree of departure from historical fire regimes resulting in alterations of components such as species composition, structural stage, stand age, and canopy closure. There are three condition classes:

Condition Class 1 - Fire regimes are within or near an historic 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.

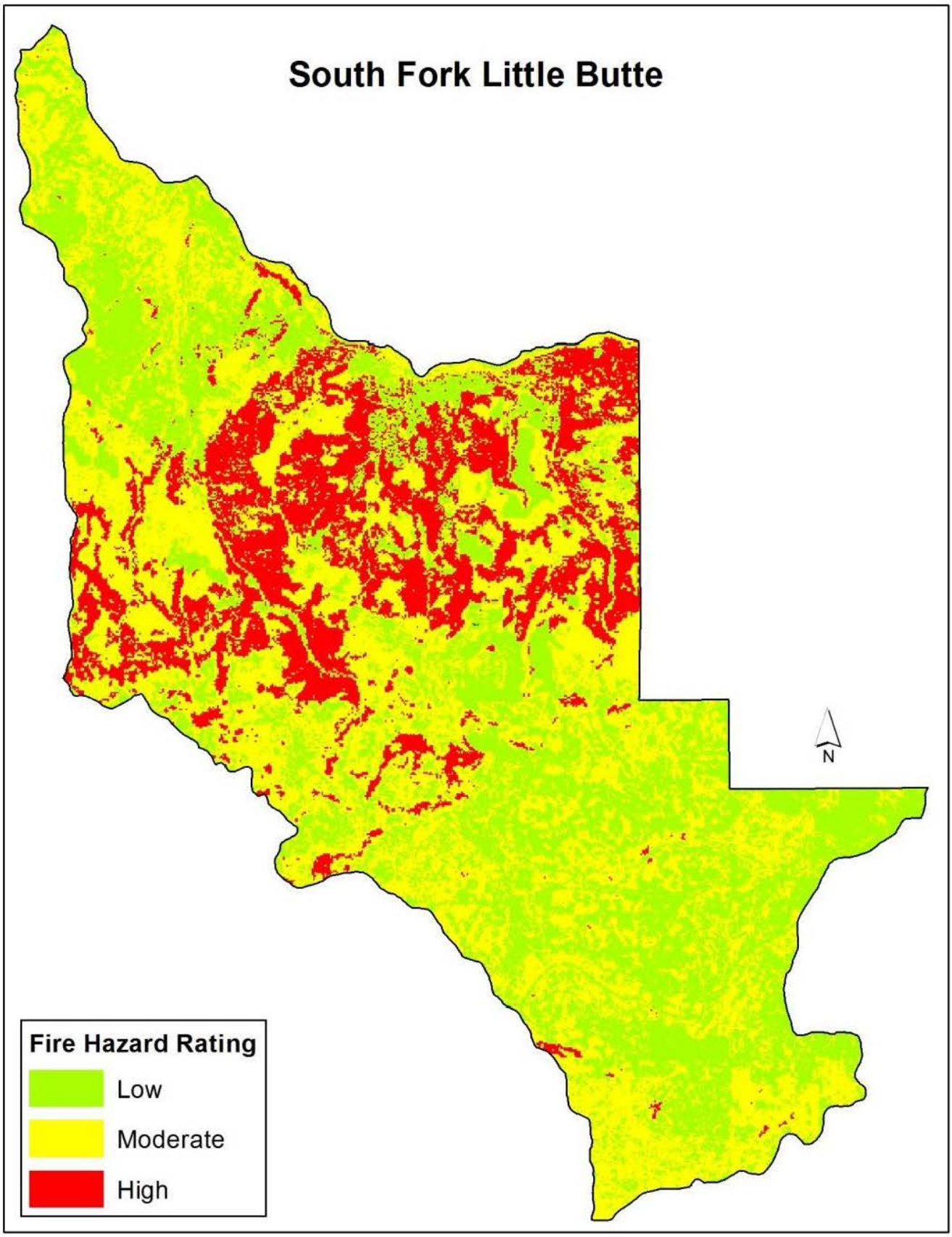
The timber stands proposed for treatment are in condition classes 2 and 3.

h. Fire Risk and Fire Hazard Assessment

Fire Risk

Fire risk is the probability of when a fire will occur within a given area. Historical records show that lightning and human caused fires are common in the Analysis Area. Activities within this area such as increased development of homes in the wildland urban interface dispersed camp sites, recreational use, and major travel corridors add to the risk component for the possibility of a fire occurring from human causes. The time frame most conducive for fires to occur in the Analysis Area is from July through September.

Map 3-2. Fire Hazard in the South Fork Little Butte Planning Area



Information from the Oregon Department of Forestry database from 1960 to 2011 show a total of 87 fires occurred throughout the Analysis Area. Lightning accounted for 57 percent of the total fires and human caused fires accounted for 43 percent. Sixty six percent of the fires started on BLM-administered lands. Lightning accounted for 53 percent of the fires which started on BLM-administered lands.

Over the past 51 years the Analysis Area has averaged 1.7 fires per year. Eighty two percent of the fires were less than 0.25 acres in size. Only two fires were greater than 10 acres in size and both of these fires occurred on private land. The average acres burned per year over the past 51 years is less than 6 acres.

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 BLM-administered lands within the Analysis Area and reflect the results of past human and natural disturbances. The existing fuel profile within the Analysis Area represents a moderate to high resistance to control under average climatic conditions. The timber stands that are proposed for treatment are in the moderate to high fire hazard.

i. Fuels Reduction and Fire Restoration

Restoration to an historical range is inappropriate because the same set of historical conditions no longer exist (i.e. climate, population, species mix. A forest that is fire-resilient has characteristics that limit fire intensity and increase resistance of the forest to mortality. Increasing forest resiliency means managing surface fuels to limit the flame length, removing ladder fuels to keep flames from transcending to tree crowns where trees have no defense against fire; decreasing crown density making tree to tree crowning less probable; and keeping large diameter trees, which are more fire resistant.

Logging is not a surrogate for natural fire process. No mechanical means of fuel reduction (e.g. grazing, timber harvest, thinning, or biomass utilization) can duplicate the unique ecological effects of wildland fire, such as soil heating, nutrient cycling and alteration of community composition and structure (Kauffman and others 2004).

A number of ecological functions can be corrected by simply re-introducing fire in the ecosystem. However, reintroduction of prescribed fire without thinning can be problematic in stands with overly dense conditions (Agee and Huff 1986).

Fuel composition, amount and structure are the only drivers of wildfires that can be modified through management activities. Thinning alters the vertical and horizontal vegetative structure. Prescribed fire alters the amount and arrangement of forest floor fuels. There is little peer-reviewed research to support thinning alone as a treatment to reduce unwanted fire behavior. However, there is general consensus from more than 90 years of fire research that fires burn hotter and spread faster when there is more fuel available to feed it. The basic objective of thinning is to remove material from the stand, thereby reducing the amount of fuel available for burning.

In a recent study on the effects of thinning on fire behavior, Graham and others (1999) concluded that "depending on intensity, thinning from below and possibly free thinning can most effectively alter fire behavior by reducing crown bulk density, increasing crown base height, and changing species composition to lighter crowned and fire-adapted species." Thinning accompanied by removal of thinning residues and slash and followed by periodic prescribed burning are effective (Omi and Martinson 2002; Pollet and Omi 2002*;* Agee 1993). Treatments that result in forests with a lower density and larger trees show lower potential for crown fire initiation and propagation and for less severe fire effects (Pollet and Omi 2002).

Thinning is most apt to be appropriate where understory trees are sufficiently large or dense that attempts to kill them with fire (alone) would run a high risk of also killing the overstory trees. Low-elevation pine and mixed-conifer forests offer the highest priorities for thinning, in conjunction with prescribed fire, to

contribute to restoration of wildlife habitat while making forests more resistant to uncharacteristically severe fire. Principles of fire-safe forest are most effective within plant groups assigned to the ponderosa pine series, the Douglas-fir dry plant association group and the grand fir dry association plant group (Brown and others 2004).

4. Environmental Consequences

a. Alternative 1 – No Action

Because no new management is proposed under this alternative, the effects described reflect current conditions and trends that are shaped by ongoing management and events unrelated to the project described under the Affected Environment.

The current trend of increasing stand density which results in increased mortality to stands would continue for the timber stands that are proposed for treatment. Trees growing under these conditions often become weakened and are highly susceptible to insect epidemics and tree pathogens. High numbers of younger trees (mostly conifers) contribute to stress and mortality of mature conifers. Without treatment, the condition class of these acres would continue to deteriorate to a condition class 3.

With no forest management actions, there would be no temporary increase in surface fuels from timber harvest activities. Although there would be no harvest created slash, the existing surface, ladder, and canopy fuels would remain untreated for stands that are proposed for treatment.

Fire suppression would continue because there are no policies in place or being proposed that will allow fires to burn naturally within the Analysis Area. The entire Analysis Area is within the Wildland Urban Interface (WUI) and is a priority for fire suppression. BLM's 1995 RMP assumes that all suitable forested lands on industrial forest land ownership would be logged at about 60 year tree-growing rotations, although, there are no private industrial lands that are known to be scheduled for timber harvest at this time. Any private land timber harvest would meet Oregon Department of Forestry standards for post- harvest fuels reduction. Defensible space and driveway treatments would likely continue by private land owners, but the amount is unknown. As a result of ongoing programs to implement defensible space around structures, driveways and roads for potential escape/evacuation routes, the risk of structure and human loss during wildfire events continually decreases.

b. Alternatives 2 and 3

All fuels reduction work proposed under Alternatives 2 and 3 are consistent with the objectives identified in the Jackson County Wildfire Protection Plans and the Medford District RMP. (USDI 1995).

Activity Fuels / Surface Fuels

Timber harvest can increase fire severity, if not accompanied by adequate reduction of fuels, by increasing dead surface fuels (SNEP 1996). Treatments designed to reduce canopy fuels through density management, increase and decrease fire hazard simultaneously. Slash generated from the commercial thinning of timber stands, if not treated, would create surface fuels that would be greater than current levels. The existing surface fire behavior fuel models of the stands proposed for treatment are represented by a Timber Group fire behavior fuel model. Fuel amounts are measured in tons per acre for different size material. Material up to 3 inches in diameter has the greatest influence on the rate of spread and flame length of a fire, which has direct impacts on fire suppression efforts.

It is anticipated that fuel loadings (material 3 inches and less) after logging would be temporarily increased by approximately 3-11 tons to the acre prior to the scheduled fuel disposal activities to be completed. This would change the existing surface fuel model of most of the timbered stands to a Logging Slash Group which in turn would create higher rates of spread and greater flame lengths in the event of a wildfire. However, despite the temporary increase in ground fuels, research indicates that a reduction in crown fuels outweighs any increase in surface fire hazard (Omi and Martinson 2002). This temporary increase in surface fuels

usually last less than one year (but can be up to two years); which is the time period that it takes to implement the fuel treatments to dispose of the surface and ladder fuels in these stands.

Any areas planned for fuels treatment may be reexamined by resource specialists at any stage of treatment to determine if the planned fuels treatment is still applicable. At the discretion of resource specialists, planned treatments may be changed to better meet the objectives outlined in this EA. Proposed changes will be limited to treatments and their anticipated effects analyzed under this EA.

Utilizing the modeling tool BEHAVE, with the parameters of a 6 mph wind speed and one hour fuels moisture of 6 percent , flame lengths in a slash fuel model are four feet compared to a one foot flame length in a timber litter model. Direct attack can be used under both of these scenarios. The rate of spread of a fire increases by 5 chains per hour in a slash fuel model. The size of a fire in a one hour period for a fire that is not suppressed would be 0.3 acres in a timber fuel type versus two acres in a slash fuel model. This difference is minimal in regards to impacts to the stand. Less than 14 percent of the BLM-administered land in the Analysis Area is proposed for treatment. Fire history in the area shows that 87 fires have occurred on BLM-administered lands in the Analysis Area over the past fifty one years. Due to the small amount of acres being treated and the rare occurrence of a wildfire in the Analysis Area (1.7 fires/year), the probability of a fire occurring in a harvested unit is very remote.

Fuels treatments proposed for stands that are commercially harvested would occur within one year after a unit is harvested. Units that are handpiled by the timber sale purchaser are required, by contract, to be completed within four weeks after a unit has been harvested. Treatments would take place where slash created from thinning operations exceeds 3 tons per acre. Treatments should ensure that under most climate conditions, flame lengths would be less than three feet allowing for direct attack of a wildfire. The reduction of this material, along with reduced fire ladders and canopy fuels from forest thinning, would reduce fire behavior such as flame length, rate of spread and fire duration. With the reduction of flame length and fire duration the chance of a crown fire initiating in treated stands would be greatly reduced. Also, mortality of the smaller diameter conifers would be reduced.

In a study on the effects of thinning on fire behavior, Graham and others (1999) concluded that “depending on intensity, thinning from below and possibly free thinning can most effectively alter fire behavior by reducing crown bulk density, increasing crown base height, and changing species composition to lighter crowned and fire-adapted species.” Thinning accompanied by removal of thinning residues and slash and followed by periodic prescribed burning are effective (Omi and Martinson 2002; Pollet and Omi 2002; Agee 1993; Graham 1999; VanWagtendonk 1996). Treatments that result in forests with a lower density and larger trees show lower potential for crown fire initiation and propagation and for less severe fire effects (Pollet and Omi 2002).

Anecdotal observations should not be applied the same as rigorously tested scientific study, but they can be used to report and interpret trends. Anecdotal evidence on the Squires fire, which occurred in Southern Oregon, showed that treatments to reduce fire behavior may have merit. Fire weather conditions during the Squires Peak fire, as measured by the Energy Release Component Indices, were in the 89th to 90th percentile during the Squires fire event as measured by the Star and Provolt RAWS stations. This percentile is recognized as high but not extreme fire weather conditions. Even though winds were reported the evening the fire reached the treated area in the Kin’s Wood Project Area, fire behavior decreased when it reached the treated area. Mortality to the residual stand was minimal due to the decreased fire behavior.

Fire resiliency

A forest that is fire-resilient has characteristics that allow it to readily recover from a fire event. A forest’s resiliency to fire can be increased by applying fire safe principles. This means managing surface fuels to limit the flame length, removing ladder fuels to keep flames from transcending to tree crowns where trees have no defense against fire; decreasing crown density making it less probable for a crown fire to move from tree to tree; and keeping large diameter trees that are more fire resistant (Agee and Skinner 2005 In Press; Agee 1996; Agee 1993).

The implementation of thinning under Alternatives 2 and 3 would promote fire-resilient forest stands by thinning overly dense forest stands removing suppressed, diseased, and/or over crowded intermediate and co-dominant trees while retaining the larger co-dominant and dominant trees within treated stands. These forest thinning prescriptions would result in a reduction in ladder fuels, an increase in the height to the base of tree crowns, and the reduction of crown bulk density (canopy fuels). All of these are important factors in reducing the potential for initiating and sustaining a crown fire in these stands (Omi and Martinson 2002) (Agee 1996: Agee and Skinner 2005). Over time, tree diameters would continue to increase with the growth of the residual stand. Larger diameter trees are more tolerant to surface fires so there would be less tree mortality in the event of a surface fire. Commercial thinning would also favor more fire tolerant species such as pine. Lowering basal area through thinning and prescribed fire can increase the long-term vigor in the residual trees within a stand. Alternative 2 would have the greatest benefits for fuels reduction and fire resiliency with about 1,092 acres of thinning(1060 acres of selective thinning and 32 acres of density management); acres thinned under Alternative 3 less than half of the acres treated (507 acres of selective thinning and 12 acres of density management) in comparison to Alternative 2. However, fire hazard would still be reduced on the acres treated and fire resiliency would improve.

Regeneration harvesting is necessary to provide renewal of forest conditions that will grow the next stand of trees for timber harvest (Medford District RMP, p. 181,194). Under Alternative 2, approximately 133 acres of regeneration harvest units and group select patches within 109 acres of group select units would be more fire-resilient in the short-term (about 10 years). This is because these prescriptions call for leaving the larger healthier trees and treating post-harvest slash (surface fuels). In the long-term (after 10 years) these stands would begin to increase in flammability and decrease in fire resiliency as young trees begin to establish and grow beneath the overstory and in group select openings. There would be slightly fewer acres under Alternative 3 (121 acres of regeneration harvest and 14 acres of group select units).

While the silvicultural prescriptions and objectives vary by prescription type, they are all designed to retain healthy large trees (see Chapter 2). The maintenance of pine species on dry Douglas-fir and pine sites contributes to the fire resiliency of forest stands. The larger the ponderosa pine, the greater its resilience to fire due to increasing bark thickness (Agee 1993; Agee 1996). Its bark is one of the key defense mechanisms against mortality from low intensity fire. Thus, removal of larger non-pine species, in this context, actually improves the ecological role of fire and subsequent fire resiliency of the stand by reducing competition for moisture and growing spaces. The fire resilience of the Analysis Area as a whole is improved due to the overall reduction in fire hazard within treatment units and previous fuels reduction treatments that have occurred on BLM-administered lands within the Analysis Area.

In the study Patterns of Fire Severity and Forest Conditions in the Western Klamath Mountains, California, Odion et al. (2004) found closed canopy forests had less high-severity fire than open canopy forests and non-forest vegetation types. Based on this finding, they also concluded that a long absence of fire is also a predictor of low severity fire effects. However, this study used no local and specific weather data except for an acknowledgement that a multi-year drought preceded the 1987 wildfires. The known inversion conditions during these fires may have had a distinctive effect on the way these landscapes burned.

Weatherspoon and Skinner (1995), who studied the same fires and area, also reported lower fire severity in uncut forests, and stated their finding was likely attributable to the absence of activity fuels and the relatively closed canopy conditions which reduces wind speeds and fuels drying of fuels. They admitted some findings to be less than conclusive due to the lack of local weather information from the time of the fires, reporting that the reconstruction of the highly variable weather conditions was not possible due to the smoky inversions and shortages of people during the first few days of the fire when much of the area burned. However, their findings emphasized the need for effective fuels treatments after management actions. They found partial cut stands with some fuels treatment suffered less damage than partial cut stands with no treatment.

Changes in micro-climate and effectiveness of fuels treatments

Management of forest stands can result in altered micro climates (Agee 1996). Increasing spacing between the canopies of trees can contribute to increased wind speeds, increased temperatures, drying of topsoil and

vegetation, and increased shrub and forb growth (Agee 1996). A more open stand allows more wind and solar radiation resulting in a drier microclimate compared to a closed stand. A drier microclimate generally contributes to more severe fire behavior.

The degree of effects of microclimate change on fire behavior is highly dependent on stand conditions after treatment, mitigation to offset the effects of microclimate change, and the degree of openness. For example, Pollet and Omi (2002) found that more open stands had significantly less fire severity, while Weatherspoon and Skinner (1995) found greater fire severity. In Pollet and Omi's study, more open stands had significantly less fire severity compared to the more densely stocked untreated stands. The degree of openness in the studied treated stands may not have been sufficient to increase fire activity. Weatherspoon and Skinner found commercially thinned stands in a mixed-conifer forest in the South Fork Trinity River watershed of the Klamath NF in northwest CA burned more intensely and suffered higher levels of tree mortality than unlogged areas (Weatherspoon and Skinner 1995). The partial cuts they examined were typically overstory removals, where large (mature and old growth) trees were removed leaving smaller trees. The study simply validates that smaller trees, due to thinner bark and crowns closer to the ground, will suffer more damage than large trees. Logging slash was not treated in the study areas. The Proposed Action for this project proposes to treat slash generated by the treatments and forest thinning would harvest some commercial sized ladder fuels.

Moisture content of live vegetation is an important consideration. The moisture content of live fuels compared to fine dead and down fuels is generally much greater. Where overstory canopy reduction results in the growth of live understory vegetation could contribute to reduced or increased surface fire behavior. Live fuels with higher moisture content can have a dampening effect on fire behavior compared to dead fine fuels (Agee et al. 2002; Agee 1996). Cured grasses and forbs can increase fire line intensity (Agee 1996); however, due to project design where ladder fuels have been removed and crown base heights increased, the risk of crown fire initiation and fire severity is reduced (Agee 1996; Omi and Martinson 2002; VanWagtendonk 1996).

Effects of canopy reduction on fuel moistures

Silvicultural prescriptions proposed for stands under alternatives 2 and 3 vary on how much canopy cover will remain after commercial thinning occurs. Under alternatives 2 and 3 there are approximately 23 percent percent of the stands proposed for commercial treatment that currently have canopy cover that is less than 40 percent. Approximately 50 percent of the stands that are proposed for commercial harvest under these two alternatives would reduce the current canopy cover to less than 50 percent.

Estimates of fuel moisture can be made from the measured ambient air temperatures and relative humidity within a stand. The following example is used to demonstrate the effects of canopy cover on fuel moisture. An ambient air temperature of 90 to 109 degrees and a relative humidity of 15 to 19 percent would result in 3 percent fuel moisture for 1-hour time lag fuels. The fuel moisture of 10-hour fuels would be 5 percent; and the 100-hour fuel moisture would be 7 percent.

Corrections to fuel moistures are then needed to account for slope, aspect, time of day, month, and percent shading. Percent shading is calculated by using greater than 50 percent shading (shaded) or less than 50 percent shading (exposed). Cloud cover as well as timber overstory (canopy closure) is utilized in calculating percent shading.

Utilizing the example from above (one hour time lag fuels at 3percent) to correct fuel moisture on a site that has the attributes of (a) north slope, (b) slope greater than 31 percent, (c) 12:00 pm in August, (d)no cloud cover, would add 3percent to the fuel moisture for a total of 6 percent.

Utilizing the same parameters but for an area that has shading greater than 50 percent would add 4 percent for a fine fuel moisture of 7 percent. The difference between the two sites is one percent, and would have minimal impacts to fire behavior.

Effects of Roads on Fire Risk

Human caused fires could increase with more roads. This can be mitigated to a large degree by blocking roads. However, for both Alternatives 2 and 3 there would be a net decrease in road access in the Planning Area. Under Alternative 2 there would be 0.8 miles of permanent road construction and about 4.05 miles of road decommissioning for a net decrease of about 3.25 miles of permanent roads. The new permanent roads would be gated or barricaded to prevent public access. About 3.05 miles of temporary roads would be constructed and then decommissioned following use. Under Alternative 3, there would be about 4.05 miles of road decommissioning and no new road construction. Under both alternatives there may be a short-term increase in open roads during timber harvest operations; however, there would be a decrease in open roads once the project is completed. Under both Alternatives about 7.27 miles of roads would be placed in long-term closure status. Roads also play an important role in the suppression of fires. Access into an area allows for quicker response time to a fire which can help minimize the size of a fire. Roads that were proposed for decommissioning and long-term closure were reviewed by BLM fire/fuels specialist to determine if there were critical needs from a fire management perspective prior to proposing for long-term closure or decommissioning.

Cumulative Effects Fire Hazard

While there would be a short-term increase in fire hazard (1 to 2 years) from harvest activity fuels, there is low potential for adverse cumulative effects to fire hazard in the Analysis Area (i.e., Planning Area) due to the relatively low percentage of the analysis area treated (<4% of the Analysis Area). Within one to two years following timber harvest, there would be an over-all beneficial effect due to the decrease in fire hazard on 1,334 acres treated under Alternative 2 with selective thinning, group selection, density management, regeneration harvest prescriptions, and post-harvest activity fuels treatments. When combined with past fuels reduction treatments, hazardous fuels are reduced on 7.7 percent of the Analysis Area. With Alternative 3, there would be a decrease in fire hazard on about 654 acres or 1.8 percent of the Analysis Area. When combined with past fuels reduction activities areas of reduced hazardous fuels represents 5.7 percent of the Analysis Area.

Over time (in about 10 to 20 years) fire hazard would increase within 133 acres of Regeneration Harvest units and about 28 acres of the Group Select units (where group openings occur estimated to be 25 percent of the total Group Select unit acres). In 10 to 20 years, regrowth of young trees representing a more flammable vegetation condition would increase fire hazard an a very small portion of the Analysis Area: about 0.45 percent of the Analysis Area under Alternative 2 and 0.35 percent of the Analysis Area under Alternative 3.

D. SOIL RESOURCES

Definitions of relevant terms:

Short-term: less than 10 years
Long-term: 10 years or more

1. Issues

- Soil-related issues associated with the South Fork Little Butte Project have been identified through public scoping or interdisciplinary team specialists and will be addressed in this document. These relevant issues are:
- Activities associated with timber harvest, road building and decommissioning, and prescribed fire may have impacts on soils and site productivity from compaction, displacement, and change in organic matter and soil chemistry.
- Unstable and fragile soils are prevalent in the Planning Area; consider how project activities would affect the stability of soils in the area.

2. Affected Environment

The proposed South Fork Little Butte Forest Management Project is located within the Lower South Fork Little Butte Creek and Middle South Fork Little Butte Creek sub-watersheds of the Little Butte Creek 5th Field Watershed. Elevation ranges from approximately 2,000 to 6,000 feet in the area.

Soils identified in the Project Area are the Bybee, Carney, Farva, Medco, McMullin, McNull, Pinehurst, Rustlerpeak, Shippa, Sibannic, Straight, and Woodseye soil series. The Farva, McMullin, McNull, Shippa, Straight, and Tatouche soils on slopes over 60 percent may exhibit signs of instability.

a. Description of Soils Series

A table of the predominant soils identified in proposed treatment units is listed below (Table 3-10), followed by a general description of the soil series recognized by the Natural Resource Conservation Service. See the soils map (Map 3-3) for the location of the soils on the landscape. There may be minor amounts of other soil series included within the proposed units.

Table 3-10. Soil Series and Characteristics

Soil Map Unit #	Soil Series Name	Depth (in.)	Soil Texture	Soil Sensitivity Category	Plastic Limit between 2 and 6 inches depth*
18C, 19E, 20E	Bybee	60+	Loam, clay loam, clay	3	LL: 34.8 PI: 14.8
27D, 28D, 28E	Carney		Clay__ sometimes cobbly clay	3	LL: 60 PI: 45
56C, 57E, 57G, 58E, 58E, 58G,	Farva	35	Very cobbly loam, extremely cobbly loam. In some areas, the surface layer is stony.	2	LL: 20 PI: 2.5
110E, 111G, 112F, 113E, 113G, 125C, 125F	McMullin	17	Gravelly loam, gravelly clay loam	1	LL: 25 PI: 2.5
114E, 114G, 115E, 115G, 116E, 116G, 117G, 119F, 126F	McNull	32	Loam, clay loam, cobbly clay	3	LL: 27.5 PI: 10
120C, 121E, 122E, 123F, 124F, 125C, 125F, 126F	Medco	30	Cobbly clay loam, clay,	3	LL: 40 PI: 15
142C, 143E, 144E	Pinehurst	60+	Loam, clay loam	3	PI: 7.5 LL: 25
159C, 160E, 160G	Rustlerpeak	23	Gravelly loam, cobbly clay loam	2	LL: 45 PI: 5
184G, 185G	Shippa	16	Extremely gravelly loam, extremely cobbly loam	1	LL: 30 PI: 7.5
182E, 184G, 185G	Straight	35	Extremely gravelly loam, very gravelly loam, very cobbly clay loam	1 (S), 2	LL: 30 PI: 7.5
19E, 20E, 190E, 190G, 191E, 191G	Tatouche	60	Gravelly loam, gravelly clay loam, clay, clay loam	3	LL: 30 PI: 10
207E, 207G 207E, 207G, 113E, 113G	Woodseye-Rock Outcrop	18	Very stony loam for Woodseye and Rock Outcrop	2 (E), 1 (G)	PI: 5 LL: 27.5

Abbreviations:
2= (moderately sensitive): burn only in spring-like conditions when soil and duff are moist. Maximize retention of duff layer. Assure retention of minimum levels of coarse woody debris and recruitment of snags as specified in the Medford RMP Standards and Guidelines (USDI 1995). Write fire prescriptions that reduce disturbance and duration and achieve low fire intensity.

3= (least sensitive): burn to avoid high-intensity (severe) burns to protect a large percentage of the nutrient capital. Maximize retention of duff layer. Assure retention of minimum levels of coarse woody debris and recruitment of snags as specified in the Medford RMP Standards and Guidelines (USDI 1995, p. 168).
S= slopes ≥ 65 percent
* The Plastic Limit is the soil water content at which soil acts as a plastic. The numbers are from the NRCS Jackson County Web Soil Survey (NRCS 1993). LL is the moisture content where soil acts as a liquid. PI is the range of moisture contents in-between liquid limit and plastic limit. The plastic limit can be estimated this way. This is volumetric water content.

Bybee Soil Series

The Bybee soil series consists of very deep, somewhat poorly-drained soils on plateaus and hillslopes. These soils formed in colluvium derived from igneous rock. Slopes are 1 to 35 percent. Typically, the surface is covered with an O-horizon (organic layer) that is 0 to ½ inches of needles, leaves, twigs and roots. Mineral soil from 0 to 4 inches is very dark grayish brown loam with fine and medium granular structure. The next horizon from 4 to10 inches is very dark grayish brown clay loam with medium sub-angular blocky structure. From 10 to14 inches is brown clay with medium and coarse sub-angular blocky structure. Depths of 14 to 38 inches are light yellowish brown clay with medium and coarse angular blocky structure. From 38 to 60 inches is variegated light yellowish brown clay with massive structure. Permeability is very slow in the Bybee soil. Available water capacity is about 9 inches. The effective rooting depth is limited by a dense layer of clay at a depth of 10 to 20 inches. Runoff is medium and the hazard of water erosion is moderate. The water table, which is perched above the layer of clay, is at a depth of 1 to 3 feet from December through May. Bybee has a low resistance to compaction. This soil has a high restoration potential. This soil is slightly susceptible to site degradation at slopes of 12 percent or less. On steeper slopes, it is highly susceptible due to water erosion potential. Moderate construction limitations are present for haul roads and landings due to low strength.

Carney Soil Series

The Carney series consists of moderately deep, moderately well-drained soils on alluvial fans and hillslopes. These soils formed in alluvium and colluvium derived from igneous rock. Slopes are 1 to 35 percent. There is no O-horizon. Mineral soil from 0 to 1½ inches is dark brown clay with fine granular structure. From 1½ to 6 inches is dark brown clay with fine and medium sub-angular blocky structure. From 6 to12 inches is dark brown clay with coarse prismatic structure and appears massive when wet. From 12 to 35 inches is dark brown clay with massive with vertical cracks 6 to18 inches apart from structure. This soil is very plastic. Weathered sandstone bedrock is at 35 inches. Permeability is very slow in the Carney soil. Available water capacity is about 4 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The water table is between 3 to 3½ feet from December through April. The Carney soil has a low resistance to compaction. This soil has a high restoration potential. The Carney soil ranges from slightly susceptible to moderately susceptible to site degradation. The cobbly clay loam at slopes below 20percent is where it is only slightly susceptible. Slopes higher than 20 percent, and where there are not surface cobbles, is moderately susceptible to site degradation. Moderate construction limitations are present for haul roads and landings due to stickiness/slope and low strength.

Farva Soil Series

The Farva soil series is a moderately deep, well-drained soil. It formed in colluvium derived from andesite, basalt, and volcanic ash. Typically, the surface is covered with a layer of needles, leaves, and twigs about one-half inch thick. The surface layer is dark brown, very cobbly loam about 12 inches thick with fine granular structure. The subsoil is brown, extremely cobbly loam about 15 inches thick with medium and fine sub-angular blocky structure. The substratum also is brown, extremely cobbly loam with massive structure. It is about 8 inches thick. Weathered Andesitic bedrock is at a depth of about 35 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas, the surface layer is stony. It has a low resistance to compaction. This soil has a high restoration potential. Permeability is moderately rapid in the Farva soil. Available water capacity is about 3 inches. The effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. Ranging from slight to severe, limitations for construction are based on increases in slope.

McMullin Soil Series

The McMullin series consists of shallow, well drained soils on hillslopes and plateaus. These soils formed in colluvium derived from igneous rock and altered sedimentary rock. Slopes are 1 to 70 percent. There is no O-horizon. Mineral soil from 0 to 2 inches is dark reddish brown gravelly loam with fine granular structure. From 2 to7 inches is dark reddish brown gravelly loam with fine sub-angular blocky structure. From 7 to17 inches is dark reddish brown gravelly clay loam with medium sub-angular blocky structure. Fractured Andesite bedrock is at 17 inches. Permeability is moderate in the McMullin soil. Average water capacity is about 2 inches. The effective rooting depth is 12 to 20 inches. Runoff is slow or medium, and the hazard of water erosion is slight to moderate. The McMullin soil series has a low resistance to compaction. This soil has a moderate restoration potential due to depth. The McMullin soil is moderately susceptible to site degradation due to water erosion.

McNull Soil Series

The McNull series consists of moderately deep, well-drained soils on hillslopes. These soils formed in colluvium derived from igneous rock. Slopes are 12 to 60 percent. Typically, the surface is covered with an O-horizon 0 to 1 inches thick with leaves, needles and twigs. Mineral soil from 0 to 2 inches is dark reddish brown loam with very fine granular structure. From 2 to 6 inches is dark reddish brown loam with fine subangular blocky structure. From 6 to 12 inches is a dark reddish brown clay loam with fine and medium subangular blocky structure. From 12 to 25 inches it is dark reddish brown cobbly clay with medium angular blocky structure. From 25 to 32 inches is dark reddish brown cobbly clay with medium angular blocky structure. Fractured Andesite bedrock is at 32 inches. Permeability is moderate in the McMullin soil. Available water capacity is about 2 inches. The effective rooting depth is 12 to 20 inches. Runoff is slow or medium, and the hazard of water erosion is slight to moderate. The McNull soil series has a low resistance to compaction. This soil has a high restoration potential. The McNull soil series is highly susceptible to site degradation due to water erosion.

Medco Soil Series

The Medco series consists of moderately deep, moderately well drained soils on hillslopes. These soils formed in alluvium and colluvium derived from igneous rock. Slopes are 1 to 50 percent. There is no O-horizon for this soil. Typically, the surface is a very dark brown cobbly clay loam with fine and medium granular structure. From 2 to 7 inches is very dark grayish brown cobbly clay loam with fine and medium sub-angular blocky structure. From 7 to 12 inches is very dark grayish brown cobbly clay loam with fine and medium sub-angular blocky structure. From 12 to 22 inches is brown clay with fine and medium angular blocky structure. From 22 to 30 inches is brown clay with medium angular blocky structure. Partially weathered tuff bedrock is at 30 inches. Permeability is very slow in the Medco soil. Available water capacity is about 4 inches. The effective rooting depth is limited by a dense layer of clay at a depth of 6 to 18 inches. Runoff is medium, and the hazard of water erosion is moderate. The water table, which is perched above the layer of clay, is at a depth of ½ to 1½ feet from December through March. The Medco soil series has a low resistance to compaction. This soil has a high restoration potential. The Medco soil ranges from slight to moderately susceptible to site degradation based on slope increases and its potential for water erosion.

Pinehurst Soil Series

The Pinehurst soil series is a very deep, well-drained soil. It formed in colluvium derived from basalt and andesite. Typically, the surface is covered with a layer of needles and twigs about one inch thick. The surface layer is dark reddish brown loam about 15 inches thick. The soil structure is a very fine granular structure at the first 4 inches then transitions to a very fine sub-angular blocky structure. The subsoil to a depth of 60 inches is dark reddish brown clay loam. The structure is sub-angular blocky which increases in size with depth. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony. It has a low resistance to compaction. This soil has a high restoration potential. Permeability is moderately slow in the Pinehurst soil. Available water capacity is about 10 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

Rustlerpeak Soil Series

The Rustlerpeak series consists of moderately deep, well-drained soils on plateaus and hillslopes. These soils formed in colluvium derived from igneous rock and volcanic ash. Slopes range from 3 to 70 percent. Typically the surface is covered in an O-horizon 0 to 1 inches thick with needles, leaves and twigs. Mineral soil from 0 to 6 inches is dark reddish brown gravelly loam with very fine and fine granular structure. From 6 to 12 inches is dark reddish brown gravelly loam with fine and medium granular structure. From 12 to 23 inches is dark reddish brown very cobbly clay loam with very fine and fine sub-angular blocky structure. Decomposed Andesite bedrock is at 23 inches. Permeability is moderately slow in the Rustlerpeak soil. Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The Rustlerpeak soil series has a low resistance to compaction. This soil has a high restoration potential. Slopes under 12percent are only slightly susceptible for site degradation. Slopes over 12percent are highly susceptible to site degradation.

Shippa Soil Series

The Shippa series consists of shallow, well-drained soils on hillslopes. These soils formed in colluvium derived from igneous rock. Slopes are 35 to 70 percent. There is no organic horizon. Mineral soil from 0 to 4 inches is dark brown extremely gravelly loam with moderate fine granular structure. From 4 to 16 inches is brown extremely cobbly loam with fine and medium subangular blocky structure. Bedrock is at 16 inches and is fractured Andesite. Permeability is moderately rapid in the Shippa soil. Available water capacity is about 1 inch. The effective rooting depth is 12 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The Shippa soil has a low resistance to compaction. This soil has a high restoration potential. It is highly susceptible to site degradation due to water erosion and depth.

Straight Soil Series

The Straight series consists of moderately deep, well-drained soils on hillslopes. These soils formed in colluvium derived from igneous rock. Slopes are 12 to 70 percent. Typically, the surface layer is 0 to ½ inches of twigs needles and leaves. Mineral soil, from 0 to 9 inches is dark reddish brown extremely gravelly loam with very fine and fine granular structure. From 9 to 19 inches, the soil is dark brown very gravelly loam with medium and fine granular structure. Between 19 to 30 inches is dark brown very gravelly loam with fine and medium sub-angular blocky structure. At 30 to 35 inches, it's also a dark brown very gravelly loam with moderate, fine and very fine sub-angular blocky structure. Decomposed Andesitic bedrock is at 35 inches. Permeability is moderate in the Straight soil. Available water capacity is about 3 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The straight soil has a low resistance to compaction. This soil has a high restoration potential. It is highly susceptible to site degradation due to water erosion.

Tatouche Soil Series

The Tatouche soil series consists of very deep, well-drained soils on hillslopes. These soils formed in colluvium derived from igneous rock. Slopes are 12 to 65 percent. Typically, the surface layer is 0 to 2 inches of twigs and needles. Mineral soil, from 0 to 5 inches is a very dark brown gravelly loam with very fine granular structure. From 5 to 11 inches it is the same but a very fine and fine sub-angular blocky structure. From 11 to 19 inches is dark brown gravelly clay loam with medium and fine sub-angular blocky structure. From 19 to 34 inches is dark brown clay with medium and fine sub-angular blocky structure. Soil from 34 to 60 inches is also dark brown clay, but with medium and coarse sub-angular blocky structure. From 60 to 73 inches is strong brown clay loam. Below that is bedrock. Permeability is moderately slow in the Tatouche soil. Available water capacity is about 8 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard or water erosion is moderate. The Tatouche soil has a low resistance to compaction. This soil has a high restoration potential. It is highly susceptible to site degradation due to water erosion potential.

Woodseye-Rock Outcrop Soil Complex

The Woodseye-Rock Outcrop complex is a shallow and somewhat excessively drained soil. It formed in colluvium derived from Andesite. There is no O-horizon. The surface layer is dark brown, very stony loam

with thin platy structure, about 2 inches thick. The next 16 inches are dark brown, very cobbly loam with fine sub-angular blocky structure parting to weak fine granular. Andesitic bedrock is at approximately 18 inches depth. The depth to bedrock ranges from 10 to 20 inches. Permeability is moderate in the Woodseye soil. Available water capacity is approximately 1 inch. The effective rooting depth is 10 to 20 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate, depending on the topography. Rock Outcrop consists of areas of exposed bedrock. Runoff is very rapid in these areas. The main limitations of the Woodseye-Rock Outcrop complex are the depth to bedrock, droughtiness, rock outcroppings, and the stones on the surface. This soil has a low resistance to compaction for various reasons (rock content, soil structure, content of clay). This soil complex is moderately susceptible to site degradation, with only a moderate potential for restoration due to the shallow soil depth and rock content.

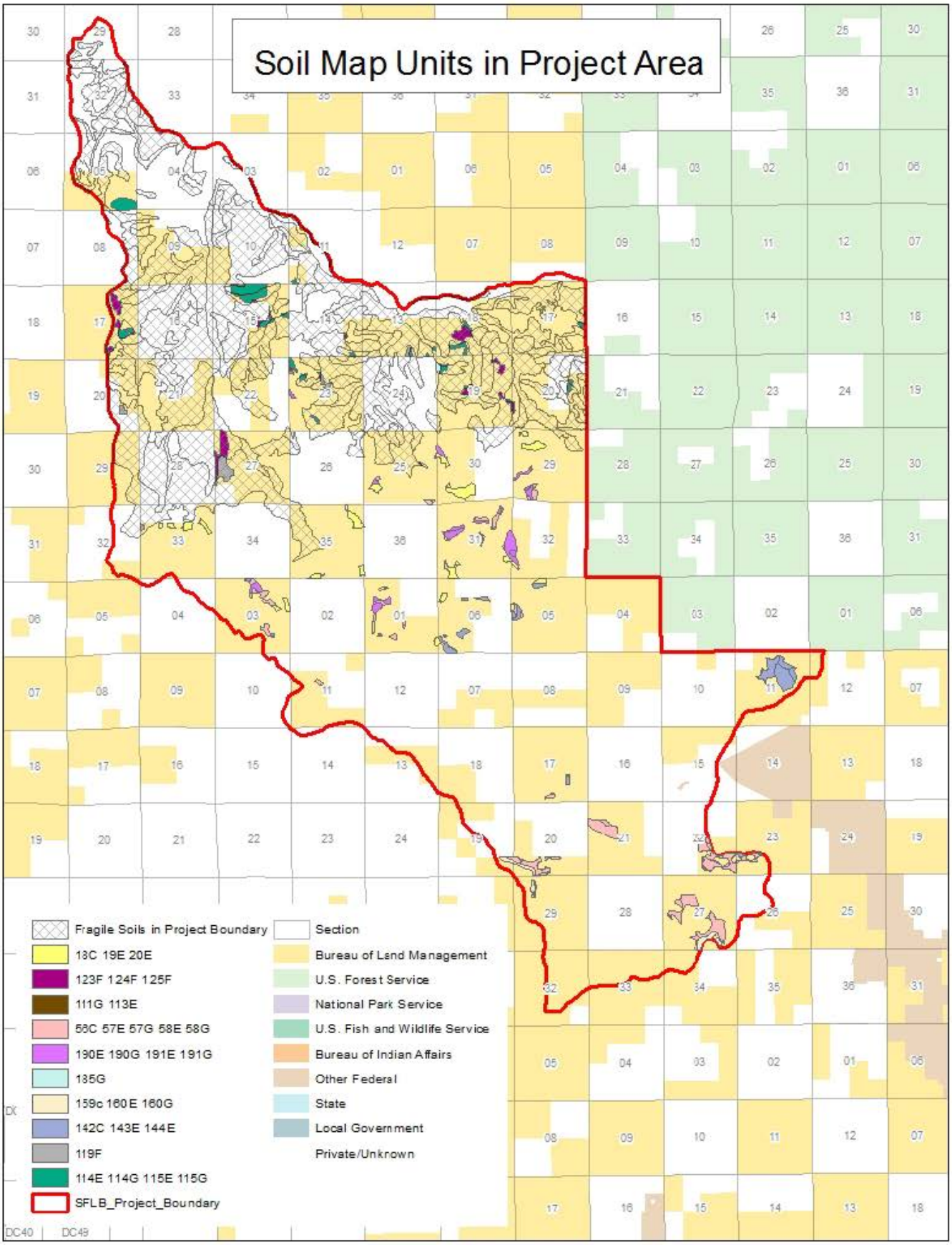
The Bybee, Carney, McNull, Medco, and Tatouche soil series consist of clays that have a high potential for shrinking and swelling mainly in the subsoil (depending on moisture content). The shrinking effect during the dry season can cause the soil to crack which results in additional pressure on tree root systems. The soil swelling during the wet season can cause soil movement particularly at the lithologic (soil/bedrock) contact zone resulting in soil "creep." This phenomenon causes small, localized slumping usually associated with road cut slope failures. Most of the major soil movement occurs in the form of debris slides. Debris slides often occur on steep slopes when the soil becomes highly saturated during rainfall events. The water infiltrates the pores between soil particles and reduces soil cohesion which can result in the soil slipping down the hill. Amaranthus et. al. (1985) lists natural erosion rates in the Cascade Range as being 0.19 and 0.24 $yd^3/ac/yr$ while erosion rates on harvested areas on the respective sites as being 0.70 and 0.62 $yd^3/ac/yr$. Erosion rates are highly dependent on the intensity and amount of rainfall that a particular site receives in a given time period. Other factors that affect erosion rates are steepness of slope, ground cover, soil particle cohesion and amount/degree of disturbance.

When soils have a low resistance to compaction, it means that under certain conditions, they could be easily compacted. This is based on a rating system by the NRCS, which is determined on several factors, including moisture content, depth to saturation, percent of sand, silt and clay, soil structure, organic matter content, and content of coarse fragments.

Some of the soils in the Project Area have a high potential for recovery from disturbance. The restoration potential is based on rainfall, soil depth, and other indicators that tend to have impacts on the time and ability for a soil to be restored. "This interpretation rates each soil for its inherent ability to recover from degradation, which is often referred to as soil resilience. The ability to recover from degradation means the ability to restore functional and structural integrity after a disturbance (NRCS 1993)." In this case, disturbance is not necessarily compaction, although compaction may be part of the disturbance. A moderate rating in this case is due to shallow soils or rocky subsoil.

Soils with the highest risk of surface erosion and landslide risk are in the northern portion of the Planning Area in and around the Lost, Lake, Deer and Soda Creek Drainages where the plateau breaks off into steeper topography. Proposed project units were reviewed to determine stability, especially in soils classified as fragile. There are 9,527 acres of fragile for mass movement (FP) soils in the entire Planning Area. It is not anticipated that the actions proposed in these areas will result in mass movement due to site specific indicators and the incorporation of PDFs. South of the break, slope instability in the Planning Area is not a likely concern.

Map 3-3. Generalized Soil Types in the South Fork Little Butte Forest Management Project Area.



b. Roads

There are approximately 293 total miles of road in the SFLB Planning Area. Many of the designed surfaced roads on private land appear to have been built more than 10 years ago and are in stable condition, but surfacing is below optimum to minimize road-related erosion, particularly during winter use. Soil loss from a lightly graveled roadbed is roughly equivalent to loss from an ungraveled one. By contrast, soil loss from fully graveled roadbeds (6 to 8 inches thick) was only 3 to 8 percent of that from the bare soil roadbed of otherwise similar construction (Swift 1988). In the Swift study, erosion rates from the natural surfaced and minimal surfaced roads were about 1.4 tons/acre/inch rain, while the adequately rocked roads yielded less than 0.1 ton/acre/inch rain. Although erosion rates vary depending on site hydrology, soil type, topography, climate, and engineering treatments, these figures provide an example of the relative amount of erosion that may occur.

Of the total roads in the Planning Area, approximately 107 miles are non-system roads located on both private and BLM-administered lands. Non-system roads include roads that are not included in the BLM transportation system database and do not have a maintenance level identified, or are roads of unknown origin identified on private lands. An inventory was conducted using aerial photos, google earth, and field verification to determine where non-system roads are located in the vicinity of the SFLB Project. Identifying non-system roads gives a clearer picture of actual road densities in the area.

Some of these non-system roads are currently drivable whereas some are overgrown. On most of these non-system roads, soil is compacted and the top soil and organic horizon have been physically displaced from traffic, resulting in bare, surface-compacted soil. The soil characteristics may influence the amount and distance these particles are displaced. Finer textured soils, which develop from basalt and sedimentary rock, are especially susceptible to puddling, compaction, and subsequent rilling. Heavy loam soils are usually the most resistant to erosion (Rice et al. 1972, p. 323). In the Project Area, most soils are a loam, clay loam and have cobbles, as well. These soils are susceptible to puddling, compaction and rilling, depending on soil moisture conditions, vegetative cover and topography (NRCS 1993).

It is estimated that every 1 mile of road occupies 4 acres. Therefore, approximately 1,172 acres (744 acres of system roads and 428 acres of non-system roads) in the Planning Area are removed from vegetative productivity due to roads.

c. Soil Productivity

Soil is a fundamental resource that controls the quantity and quality of such renewable forest resources as timber, wildlife habitat, forage, and water yield. Soil productivity is the inherent capacity or potential of a soil to produce vegetation, and the fundamental measure of soil productivity is the site's carrying capacity for plant growth. The key properties directly affected by management are site organic matter (OM) and soil porosity. These two properties regulate critical site processes through their roles in microbial activity, soil aggregate stability, water and gas exchange, physical restrictions on rooting, and resource availability (Powers et al. 2004, p. 194). Site organic matter and soil porosity are most important when measuring the effects of management, although other factors such as water regimes, soil biological types and populations, and soil loss can also affect long-term soil productivity.

A sustained flow of organic matter from primary producers to the forest floor and into the soil is vital to sustained site productivity through its influence on soil protection, the activity of beneficial soil organisms, soil water-holding capacity, soil structure and aggregate stability, and nutrient supply. Organic matter influences the interception and retention of solar heat by the soil. It dissipates the energy of falling water (rain). Organic matter is the ultimate source of substances that bind soil particles together into stable aggregates that resist erosion. Through its carbon compounds, organic matter constitutes the energy source for soil fauna and microbes, and is a concentrated reservoir of plant nutrients supplied to the soil.

In the Project Area, organic matter is present on most of the sites that are proposed for treatment. There are a total of about 121 acres of proposed units without a surveyed O-horizon. On the rest of the proposed units, most of the organic matter is in the form of down wood, leaf litter and needle cast, and was produced from trees, shrubs, grasses, and moss. Where it is present, soil organic matter appears typical for the region, with most of the sites having approximately 2 to ½ inch or less of litter (leaf and needles) Some of the soil series do not have an Organic horizon (Carney, Manita, McMullin, Medco, Shippa and Woodseye). The Carney, Manita and Woodseye are not present in units except for a 0.02 acre piece in a unit. There are approximately 110 acres of Medco in units and all are proposed ground-based yarding. There are 5 acres of McMullin in units and all are also proposed ground-based yarding. There are 6 acres of Shippa with 4 of the acres proposed for ground-based yarding and 2 of the acres proposed as bull-line yarding. Except for areas disturbed by roads and trails, and sites with gravel and cobble surfaces, most of the soil in the Project Area has at least a thin ground cover of organic material. On most sites, soil organic matter consumption appears normal, with a very thin layer of decomposing matter at the soil and litter layer interface.

The reduction in soil porosity (compaction) results in the loss of soil aeration and moisture availability, and increases the resistance of soil particles to root growth. Reduced soil porosity can also reduce water infiltration rates, thereby accelerating surface runoff and soil erosion. The size distribution of soil pores is also important for maintaining a productive site. Large pores and cracks are important for soil drainage, aeration, and root access; smaller pores store soil water and are the sites of nutrient retention and microbial activity. Both kinds of pores are required for productive soils.

Rapid gas exchange in soils is required for optimum microbial activity and growth of plant roots. Adequate supply of oxygen for root growth can be assured if there is a network of continuous, air-filled pores present in a soil. Soil water storage is very important because total site water use is generally positively correlated with growth. Factors that decrease soil water storage are detrimental to productivity, and those that increase it are beneficial (Childs et al. 1989).

d. Soil Stability

Soil stability is an issue in the SFLB Planning Area. There are fragile soils as well as areas withdrawn from the timber base for soil reasons. There are no proposed units in withdrawn areas. Fragile soils in the Planning Area are Pyroclastic Fragile Soils Susceptible to Mass Movement (FP) (Refer to Map 3-3 for locations of Fragile Soils). These soils have shrink-swell clay mineralogy that when wetted, the clays physically swell. On a slope, this can mean that the soils have poor strength when wetted and can, “creep”. The potential for this to occur is increased with road construction or other ground disturbing actions in poor locations. Soils that exhibit these characteristics are primarily in the northern portion of the Planning Area. In this area there are past debris flows in some draws, small, less than one acre, slumps, indicators of past large landslides and sag ponds. There are some lands within this area where ground-disturbing activities are not expected to decrease slope stability based on location on the landform, slope and site indicators.

e. Past Actions

The relevant part of analyzing past actions is determining what events or actions previously occurred, whether current proposals repeat those actions or events, and whether current proposals have similar or different anticipated effects. In addition, past events are manifested in current conditions, the starting point for the addition of cumulative effects. Past management activities including timber harvesting, road building and maintenance, broadcast burning and grazing prior to and in the 1980s created highly erosive conditions, especially when ground-based yarding systems were used without much regard for the location and number of skid trails, and/or tractor-piling of slash was incorporated. These sites have now been re-established with vegetation and, except for roads, erosion rates are at near natural levels.

Past timber harvest on BLM-administered lands in the Planning Area has been sporadic. An inventory of past actions with harvest dates and units of treatment was made using past timber harvest records, operations inventory data, and photo interpretation. A nearly-complete harvest data record was available from approximately 1975 to the present. An inventory of harvest activities prior to 1975 on BLM-administered

land was estimated using operation inventory records and aerial photo interpretation. An inventory of past harvest activities on private land was also conducted using aerial photo interpretation. The aerial photos used were from 1975, 1980, 1985, 1991, 1996, 2001, 2005, 2010, and 2012. The past actions were digitized in a Geographic Information Systems (GIS) layer and a corresponding database was established.

It is estimated that about 28,787 acres of the 35,383- acre Planning Area has had some type of timber harvest in the past. Logging systems associated with these past timber harvest activities included ground-based, skyline/cable, or helicopter yarding. Past harvest with ground-based equipment accounts for 27,375 acres within the Planning Area. Of that, 24,713 acres of land were logged using ground-based harvest methods prior to 1980. Most past harvest occurred before 1980 and it is assumed that designated skid trails were not used on both private and BLM-administered lands. It is estimated that unrestricted tractor logging resulted in about 25 percent of the area being compacted. During the 1970s and through the 1980s, clearcutting was often followed by broadcast burning of the logging slash on the site. During the 1980s, on BLM-administered land, tractor harvesting was restricted to designated skid trails that would impact about 12 percent of the harvest area.

Since 1980, there have been approximately 2,662 acres of ground-based yarding (i.e., tractor) on BLM-administered land in the Planning Area. Oftentimes, compaction is less than 12 percent in these units. However, assuming all tractor units on BLM-administered lands since 1980 are 12 percent compacted, the result is approximately 319 acres of land that is compacted from skid trails and associated landings. Approximately 2,709 acres of BLM-administered land were harvested prior to 1980 using ground-based equipment. Soil that was compacted before 1980 would likely still be compacted to some extent depending on the level of disturbance it last received. In these areas, soil productivity is either restored or in the process of being restored. In the past, ground-based harvest on fragile soils has occurred (approximately 6,940 acres total and 3,191 acres on BLM-administered lands). This is concentrated in the northern portion of the Planning Area in the Lower South Fork Little Butte Creek 6th Field Watershed.

Since 1900, there have been 1,648 acres harvested using skyline/cable methods and of that, 1,387 acres were on BLM-administered lands. All of past helicopter logging has been on BLM-administered lands with a total of 538 acres. Evidence of slope instability is present in some areas.

It is difficult to predict compaction's effects on soil productivity because of all the variables, but McNabb and Froehlich (1983) estimate that stand growth losses can range from 5 to 13 percent, and effects from compaction can last 30 years. In a 2004 compaction study of an Arkansas forest, Lucklow and Guldin found evidence that old disturbance areas have partially self-mitigated since the previous harvest entry. The old disturbance compaction observed in this study was caused from harvest equipment activities that occurred at least 15 to 20 years earlier. Old disturbance areas were composed of secondary or primary skid trails and areas that received 1 to 2 equipment passes. They estimate it would take from 50 to 80 years for skid trail soil density levels to recover to near-natural density levels (Lucklow and Guldin 2004). This estimated recovery period is in line with other findings. Perry (1964) (in Greacen and Sands 1980) estimated a 40-year recovery period for reduced infiltration rates on old compacted woods roads to approach natural rates on a southern Arkansas soil.

3. Environmental Consequences

As no new management is proposed under Alternative 1, the effects described for this alternative reflect current conditions and trends that are shaped by ongoing management and events unrelated to the South Fork Little Butte Forest Management Project.

For the action alternatives (Alternatives 2 and 3), discussions are focused on the direct and indirect impacts of proposed actions on soil resources. Effects discussion also includes the cumulative impacts of those direct/indirect effects of implementing proposed actions when added incrementally to past, present, and reasonably foreseeable actions, if applicable. This analysis focuses on how a particular proposed action would affect soil characteristics or soil erosion processes. The main concerns to the soils resource in this area is the effect to soil productivity (compaction) and unstable soils. Surface erosion is not as high of a

concern due to the slope and nature of the soils in the forested hillsides. However, surface erosion from road beds is a concern in parts of the watershed.

It would be futile to try to predict specific quantitative values for erosion as there are too many variables to consider such as rainfall amount, duration and intensity during storm events. The effects of implementing the proposed activities will be compared to natural rates.

The appropriate scale for measuring soil productivity criteria (i.e., compaction, erosion, and effects of burning) is site-specific or on a unit-by-unit basis. Therefore, the Analysis Area for determining effects to soil productivity encompasses the area where forest management and transportation management activities are proposed, also described as the Project Area.

The risk of erosion leaving the project site and compaction affecting water run-off are analyzed in the Water Resources section and will not be discussed further in this section.

The broader Planning Area (35,383 acres) is the scale at which effects to soil stability are considered. The Planning Area is the overall area of consideration that was reviewed for the development of the SFLB Forest Management proposal and is based on watershed boundaries, drainage boundaries, and ownership boundaries. At this scale, effects to unstable sites within and surrounding the Project Area can be analyzed for potential cumulative effects.

Short-term impacts (or effects) are those anticipated within less than ten years, and those impacts anticipated ten years or longer in the future are considered long-term. However, studies (Rice et al. 1972) and local observations by BLM soil scientists reveal that vegetation recovery and erosion rates can return to near-normal levels within approximately 5 years.

a. Alternative 1 — No Action

The effects of the No Action Alternative on soil resources would be the continuance of existing erosion rates currently occurring throughout the Analysis Area. Erosion rates are at near-natural levels throughout the Analysis Area, except in areas where roads and trails exist. Units that were harvested in the past have stabilized, with vegetation and erosion rates back to near natural levels. Roads that are currently in poor condition would not be improved and the amount of erosion presently occurring would likely continue.

There is no way to be certain what future actions may occur on private land, but it is presumed that all private lands having timber of commercial value would be harvested in the near future (within 10 years). These actions would increase the amount of disturbed soil in areas adjacent to the Project Area.

b. Alternative 2 - Proposed Action

Permanent Road Construction

Four permanent roads, totaling 0.80 miles, are proposed to be constructed under this alternative. Permanent road construction would have the greatest impact on soils as it will directly remove the soil from vegetative productivity and would alter natural erosion rates and infiltration rates. However, no net increase in road mileage would occur within the Analysis Area because a greater amount of road decommissioning is proposed under this alternative.

The construction of new roads has a direct effect on soil productivity on that site. The soils in these locations would be bladed and compacted. With the assumption that 1.0 mile of road equals approximately 4 acres, 3.2 acres of land would be removed from vegetative productivity.

Road construction would be limited to between May 15th and October 15th or during dry soil conditions. Following use, all newly constructed permanent roads would receive adequate rock surfacing or would be closed with a gate or blocked and winterized prior to the wet season. Soil erosion from road construction is

expected to be avoided or minimized due to the incorporation of these PDFs, and other PDFs identified in Chapter 2, which would reduce the potential for runoff and off-site erosion from intensive winter storms and saturated soil conditions.

The following paragraphs describe the site characteristics that exist at each of the proposed road locations. See Map 3-4 for specific road locations in relationship to soil map units.

Proposed road 37-2E-14.00C (0.10 miles) is located on a stable ridge top and is not in fragile soils. It is located in McNull soils (map unit 115G). This soil is typically poorly suited for roads due to slope. This is not expected to be this case in this location because the road would be located on a flat, broad ridge. The scale of the map units on the soil survey can be too coarse to account for subtle topographic changes. This road would be closed with a gate when not in use.

Proposed road 37-2E-5.00 (0.46 miles) is located on a flat ridge top. The first part of the road is in the McNull loams, soil map unit 115E, which are mapped as fragile soils. There is a short steep pitch of around 18 percent slope, but overall the slope of the road is approximately 12 percent. The road then follows a lower slope of approximately 5 percent on McNull (114E) soils, which are not identified as fragile. Both soil types are rated as moderately suitable for roads, primarily due to slope. Although a portion of the road is located on fragile soil, the road is located on the ridge top at the most stable location. The 114E soil map unit has lower strength than the 115E due to the difference in gravels. Soil strength can be a concern when working in wet conditions. This would be a natural surfaced road with proper drainage installed and would only be used in dry conditions. When not in use, this road would be gated, therefore no wet season use is expected to occur.

Proposed road 37-2E-24.04C (0.10 miles) is located on a ridge top and ends before the slope break. The road is on the boundary of fragile soils and typical soils, as the break in soil types occurs along the ridge. It is in Straight-Shippa soils (184G). This soil type is typically identified as poorly suited for roads due to slope. However, this rating does not apply to this location because the road would be located on a ridge top where the slope is less than 5 percent. Use would only occur during dry soil conditions, reducing the risk of surface erosion from the road along with the gentle gradient. This road would be barricaded after use and placed in long-term closure. The risk to slope instability is low due to the placement of the road (ridge top).

Proposed road 37-2E-15.00A (0.14 miles) would be constructed to avoid use of an existing road that goes through a meadow. The road would go up and around the meadow. The beginning half of the road would be in fragile soils Medco (123F) and the rest would be in McNull (114E), which are typical soils. The soil is moderately (123F) and highly (114E) susceptible to site degradation due to water erosion potential. The location of the road would be constructed in a stable location. Soil map unit 123F is rated as poorly suited and 114E as moderately suited for roads because of the low strength of 114E and slope/wetness and low strength in 123F.

Temporary Road Construction

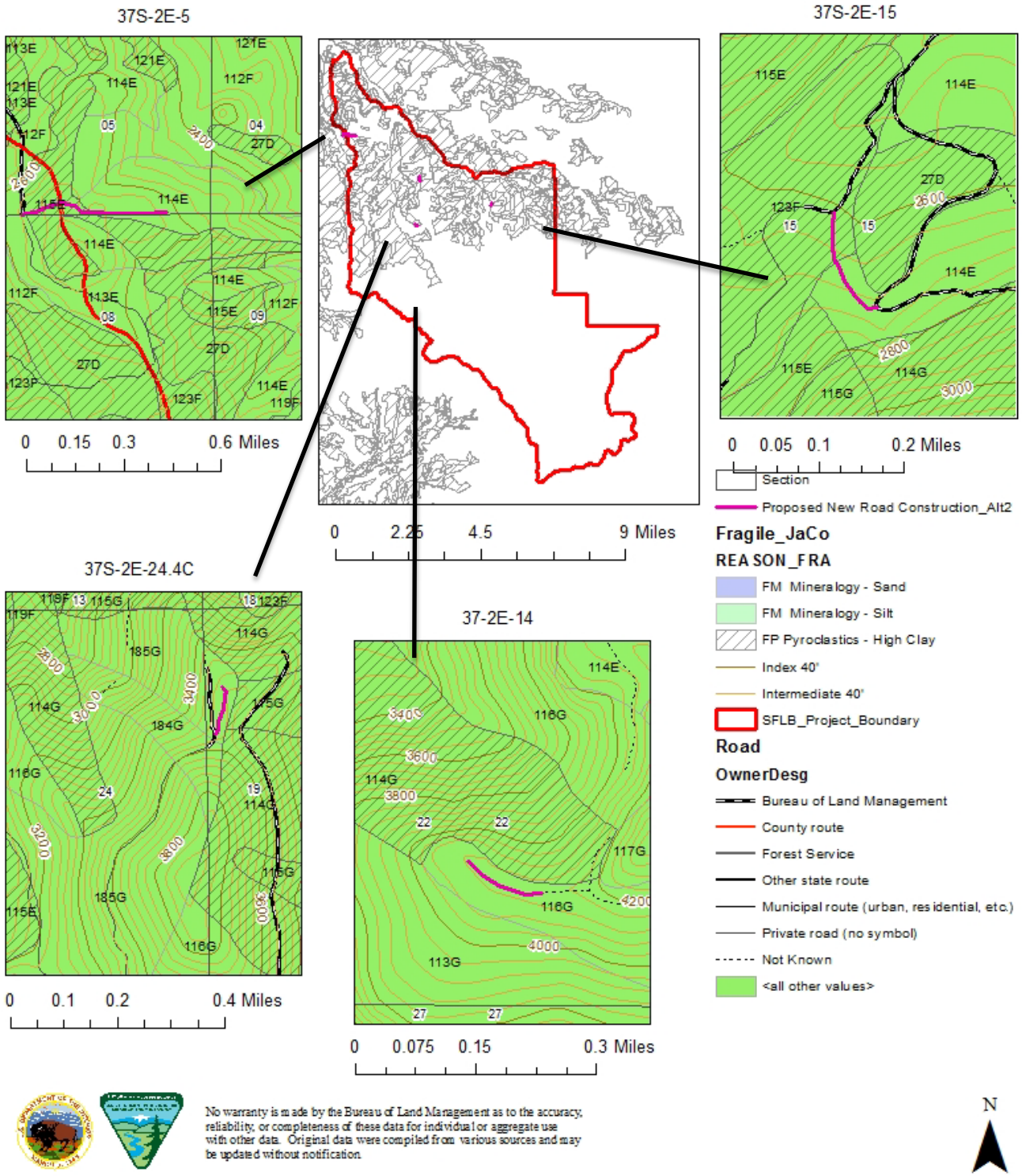
There are 16 temporary roads (totaling 3.04 miles in length) proposed in Alternative 2 (Map 3-3 and Table 2-6). The following paragraphs describe the site characteristics that exist where proposed temporary roads are located. Discussion is limited to proposed roads located on fragile soils or near unstable sites (Map 3-5).

Proposed temporary roads Spur 30-1, Spur 30-2, Spur 1-1, Spur 20-2 and Spur 23-1 are not proposed in areas with fragile soils and are located on either a ridge top, shoulder, or near a ridge-top. These roads are not discussed below at the site specific level.

Temporary roads Spur 17-1, Spur 17-2, and Spur 20-3 have portions of their length in fragile soils; however, the gentle grade and landscape features do not show signs of instability.

Proposed temporary road Spur 13-1 would be 0.05 miles in length. It is located in the McNull (115G) gravelly loam, which is considered fragile for mass movement due to pyroclastic clays. The proposed

Map 3-4. Proposed Permanent Road Construction



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 and may be updated without notification.

N

temporary road would be on low-gradient slopes (less than 5 percent). Construction of the temporary road would compact the soil. Approximately 0.2 acres would be taken out of vegetative productivity. Although this soil has a low resistance to compaction (based on different soil characteristics, such as percentages of different soil particle sizes, soil structure, organic material amount, soil productivity and percentage of coarse fragments), it has a high restoration potential. Therefore, when the road is mechanically decompacted, the affected soil is expected to return to its former productive state functionally in the long-term (10+ years). The soil horizons might get mixed during mechanical decompaction so this area may not recover as quickly. Full ripping would not occur where rock fragments greater than 10 inches are present in the soil.

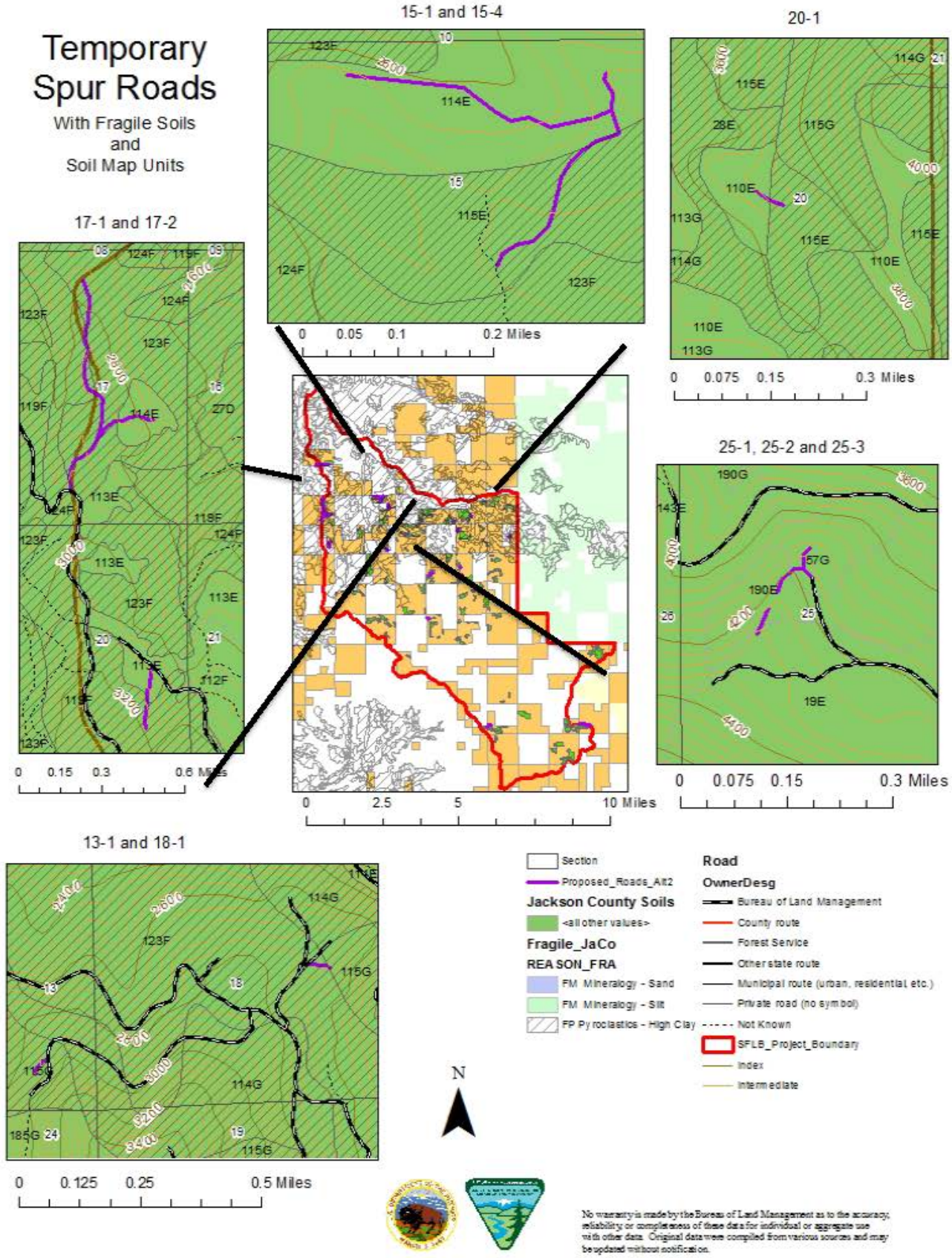
The proposed temporary roads Spur 15-1 and Spur 15-4 would be a total of 0.57 miles. They would be located in McNull soils (map units 114E and 115E). The beginning of Spur 15-1 is in soil map unit 115E, which is a fragile (FP) soil. Both map units 114E and 115E are McNull loams, but 115E is fragile due to the steeper slopes (35 to 60 percent). The proposed temporary road begins on gentle slopes (less than 10 percent). Spur 15-4 is located on slopes around 15 percent and the road would be located on a gentle contour. Approximately 2.28 acres would be removed from soil productivity. This road would be at or near ridge top and would avoid potentially unstable ground. Although this soil has a low resistance to compaction (based on different soil characteristics, such as percentages of different soil particle sizes, soil structure, organic material amount, soil productivity and percentage of coarse fragments), it has a high restoration potential. Therefore, when the road is mechanically decompacted, the affected soil is expected to return to its former productive state functionally in the long-term (10+ years). Full ripping would not occur where rock fragments greater than 10 inches are present in the soil. This soil is rated highly susceptible to site degradation due to water erosion and moderately suited for roads due to slope and low strength. Map unit 114E soils are moderately suited for roads due to lack of gravels as well.

Proposed temporary road Spur 18-1 would be a total of 0.05 miles. It is located in map unit 123F, Medco clay loam. The Medco soil is fragile (FP). This soil has no O-horizon. The road would extend along the ridge and avoid any unstable areas. Approximately 0.20 acres would be temporarily compacted mechanically. It has a high potential for restoration and is moderately susceptible to site degradation (due to water erosion). This soil type is typically poorly suited for roads due to low strength, slope and wetness. This is not expected to be an issue due to the road's proposed ridge top location and the incorporation of PDFs that would limit construction, use, and decommissioning of the roads to the dry season when wetness would not be an issue.

Proposed Temporary roads Spur 25-1, Spur 25-2, and Spur 25-3 would not be located in fragile soils; however, there is evidence of past instability in the general area and the Deer Creek drainage has a history of instability. These roads would be located in Farva, map unit 57G (Spur 25-2) and Tatouche, map unit 190E (Spurs 25-1 and 25-3). Spurs 25-1 and 25-3 extend past the 37-2E-36 road and switchbacks onto a stable ridge. Spur 25-2 would follow the same ridge downslope. Due to the location on the slope, this area is expected to be stable. There are no mid-slope cuts or ground disturbance of head walls. The unstable slopes in the general area are in the Bybee soil series and the proposed temporary roads, Spurs 25-1, 25-2, and 25-3, are not located in these soils.

Proposed temporary roads Spur 20-1 would be 0.05 miles in length, located off of a private road. Its proposed location is in McMullin (110E) and McNull (115E) soils on a contour side slope along a bench. Both soils are moderately suited for roads and have a high restoration potential.

Map 3-5. Proposed Temporary Roads Located on Fragile Soils or Near Unstable Sites



The effects of temporary and permanent road construction are the same both during construction and during use. However, differences in effects to soil resources between temporary and permanent road construction occur once a project is completed, as temporary roads would be fully decommissioned at the close of project activities. For this project, temporary roads would be mechanically decompacted and blocked during the same operational season, unless needed for other purposes, such as access for firewood, etc. If this occurs, the road would be effectively blocked during the wet season to prevent motorized use. Blockage at the entrance would consist of placing earthen berms, logs, slash, boulders, and other material so the entrance is camouflaged and vehicle use is precluded.

Soil erosion from the construction and decommissioning of temporary roads is expected to be avoided or minimized due to the incorporation of PDFs. For example, seasonal restrictions during all road construction activities would reduce the potential for runoff and off-site erosion from intensive winter storms and saturated soil conditions. All proposed temporary roads are located on upland ridges or flat, stable slopes, which decreases the potential for eroded soil particles from leaving the site.

Decommissioning would likely not return the soil to the original bulk density in the short-term. However, seeding and mulching would discourage soil displacement, surface sealing, reintroduce organic material and rooting systems into the soil, and facilitate the vegetative recovery of the soil. Soil productivity is expected to return in the long-term (10+ years).

There would be a noticeable increase in soil erosion the first few significant rain events after construction. Erosion rates from roads and landings on the Cascade geomorphological unit (similar to that of the Analysis Area) were reported to be approximately 9.36 $yd^3/ac/yr$ (Swanson and Dyrness 1975 in Aramanthus et al. 1985, p. 233). This estimate includes mass slope failures from roads and landings on unstable slopes. Because all of the proposed temporary roads would be located on gentle topography and stable slopes, it is anticipated that under average rainfall conditions, the erosion rates would be less than one-half of those reported by Swanson (<4 $yd^3/ac/yr$) the first few substantial storm events after construction, and would decrease to about three times that of natural rates after three years. Typically, newly constructed roads lose the most soil primarily during the short period before grass becomes established and the roadbed is graveled or compacted. Soil loss from fully graveled roadbeds was 3-8 percent of that from the bare soil roadbed of otherwise similar construction (Swift 1988, p. 321).

Road Decommissioning/Long-Term Closure

Road decommissioning and long-term road closures are proposed in this project. Refer to Chapter 2 for the list of roads proposed and definitions. Approximately 4.05 miles of road are being analyzed for full decommissioning and 7.27 miles of road for placement in long-term closure (Tables 2-7 and 2-8). Not all roads that the BLM proposes to decommission or place in long-term closure are guaranteed to occur as reciprocal right-of-way agreements and funding availability is still uncertain for select roads. These roads are included so that the effects are analyzed in concurrence with other activities proposed in the Planning Area. At this time, 1.66 miles of road would be available for decommissioning as funding is either secured or not needed (natural decommissioning) (Tables 2-7). Approximately 4.22 miles of road proposed for long-term closure have been cleared by reciprocal landowners and have funding secured at this time (Table 2-8).

The roads proposed for full decommissioning would be either mechanically decommissioned, naturally decommissioned or a combination of both. Mechanical decommissioning would involve equipment decompacting the road bed and the removal of all drainage structures. Refer to Chapter 2 for the full description of mechanical road decommissioning. Natural decommissioning means that the current road has vegetation reestablished and mechanically accessing the road to decompact the surface would set back restoration and recovery of the soil. Roads proposed for full decommissioning using both treatments would include a combination of mechanical treatment, such as decompacting the surface, removing drainage structures, and blocking the entrance of the road, and natural treatment where roadbeds have overgrown and are considered naturally decommissioned and recovering.

The effects to soils from road decommissioning are direct. Mechanical decommissioning will physically alleviate soil compaction by breaking up the massive soil structure that resulted from road construction and use. This would allow for better water and air infiltration, reduce erosion, and increase the rate of re-vegetation (Switalski, Bissonette, DeLuca, Luce, & Madej, 2004). Soil erosion from road decommissioning is expected to be avoided or minimized due to the incorporation of PDFs. For example, seasonal restrictions for all road decommissioning activities would reduce the potential for runoff and off-site erosion from intensive winter storms and saturated soil conditions.

The roads identified for natural decommissioning are currently overgrown and would be removed from the BLM transportation database because they have been or are on the path to be naturally decommissioned. The soil surface on roads that are naturally decommissioning would not be loosened in the road bed, so it may take longer for soil productivity to improve compared to mechanical decommissioning. The above ground condition of the soil on these naturally decommissioned roads may be recovered or will be near natural levels soon. However, the below ground condition of these roads may continue to have constrained roots, lower levels of organic matter and slower infiltration rates (Lloyd, Lohse, & Ferre, 2013).

Neither natural decommissioning nor mechanical decommissioning would return the soil to its undisturbed, unroaded state in the short-term, but it will improve the condition of the soil.

Refer to Table 2-7 for the list of roads that would be decommissioned using mechanical treatments, as well as treatments identified as both, which would receive some level of mechanical treatments in addition to natural treatments, depending on the site. Soil productivity recovery would be accelerated where mechanical treatments occur.

Assuming, one mile of road length equates to approximately 4 acres of land, approximately 16 acres of soil that currently has no or very little vegetative productivity would be restored moving it towards its natural productivity, of which 11.7 acres would occur at a more accelerated rate due to mechanical treatments.

Road decommissioning activities would follow the applicable Best Management Practices as described in Appendix D of the 1995 RMP (USDI 1995, p. 165), as modified by the Resource Management Plan Maintenance dated July 12, 2012. According to the NRCS (1993), the soil in these existing road beds has a "high potential" for restoration. Restoration of soil productivity would occur in the long-term (10+ years).

There is one road proposed to be fully decommissioned because of road instability issues. Road 37-2E-25.02 had soil movement above and across the road. It is proposed for both mechanical and natural decommissioning. The portion of road proposed for natural decommissioning is located beyond the road failure.

All of the non-system roads that would be used as haul routes would be either fully decommissioned or closed after use, except for Spur 22-2 which would be rocked and kept open for recreation uses. These non-system spurs are not accounted for in the official BLM transportation database; however the road mileage and reduction of these miles, where applicable, are reflected in the road density calculations used for this project. Non-system roads are discussed further in the road improvement section.

Road Improvements

The effect of road improvements to the soil resource is that some of the work (e.g., water dips, grading, shaping roads, replacing and installing culverts, and cleaning ditches) would displace soil from the current location. This soil, however, is already disturbed due to the presence of the road. Work involved with improvement would result in minimal disturbance, and would ultimately improve the road due to improved shaping, drainage and spot rock surfacing, which would reduce future soil erosion.

Some of the roads are currently blocked and the existing barricades would be removed. There would be disturbance on the road bed surface and where some of the roads have overgrown, vegetation would be uprooted and the soil surface re-bladed. Some roads would also need to be widened as.

Some of the roads needed for log haul would require more improvements than others. Some roads currently having erosion issues would have improvements from this project that otherwise may not occur.

There are roads proposed for haul that are not currently within the BLM transportation database (0.78 miles total). All of these non-system roads would need some degree of vegetation clearing. The soil is already compacted and had been used in the past. Grass on the surface would not be bladed off unless it poses a fire hazard. These non-system roads are in varying states; some are fairly open and need minimal improvements for haul, whereas some are overgrown and would require brushing and removal of an existing barricade. The soil on these non-system roads is in the process of recovering. Although vegetation is growing currently, the soil is likely still compacted and roots may be inhibited at some point in the soil profile. All of the non-system roads except for Spur 22-2 would be either mechanically decommissioned and/or blocked after use. Soil productivity would not be fully restored in the short-term but it is expected that in the long-term, soil productivity would be improved compared to the current status.

Spur 22-2 would not be decommissioned after use but would be improved to a rocked road. The effects to soils are slight since this soil is already compacted.

Road Work Summary

Permanent road construction would remove about 3.2 acres of land from vegetative productivity. Soil erosion from road construction is expected to be avoided or minimized due to the incorporation of PDFs, which would reduce the potential for runoff and off-site erosion from intensive winter storms and saturated soil conditions.

Soil productivity from the proposed temporary road construction and road decommissioning is not expected to be recovered in the short-term; however, full recovery would occur in the long-term (10+ years). The amount of time needed for soil recovery following natural decommissioning would be longer than that needed for recovery following mechanical decommissioning; however, short-term impacts would be avoided with natural decommissioning as no ground-disturbing activities would occur.

Road densities would not be increased as the amount of proposed decommissioning exceeds the amount of proposed permanent road construction.

Soil disturbance due to road improvements would be minimal, as actions would be confined to the existing disturbed road prism. Additionally, associated PDFs would help to minimize soil erosion, minimize movement of soil particles from the road to local streams, and discourage future use of the roadbed by OHVs (blocking/camouflaging following use).

The effects to slope stability from road construction are largely avoided due to avoidance of unstable landscape features. Regardless, the soil in the northern portion of the Planning Area is prone to soil creep when saturated. This can be exacerbated by road construction either by cutting into low strength soil on a hillside or through improper road drainage, concentrating water on soil that has not historically received it. Only three proposed roads would have consistent cutting into the slope (temporary roads Spur 15-1 and Spur 25-1 and road 37S-2E-15). These locations were field and office reviewed for slope stability and are expected to be stable even though there would be cutting into the slope. Road improvements, decommissioning and closures are expected to decrease the effects of roads on slope stability.

To summarize, some soil disturbance would occur under Alternative 2. However, the end result would be a net decrease in total road miles, and implementation of associated PDFs would minimize the potential for resulting impacts from road construction, road decommissioning, and road improvements.

Landings

The construction of landing areas would disturb less than one-half acre (each) and would be associated and managed consistent with the temporary road construction and decommissioning. The landings would be

decommissioned (e.g., scarified, seeded and mulched, or other approved methods) before the winter rains. Potential erosion from the proposed new landings would be less than twice the natural erosion rate immediately after construction, and would return back to near-natural rates within three to five years. This small increase in erosion rates is predicted due to the gentle topography of the landscape and required PDFs addressing the treatment of landings for erosion control during and after use.

Helicopter yarding requires the use of helicopter landings generally one acre or less in size. Helicopter landing construction (26 total: 12 new, 14 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 (USDI 1995, p. 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.

Forest Management

Refer to Chapter 2 for a description of the proposed treatments. 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.

Soil disturbance from timber harvesting is not avoidable, but it can be minimized. Preventative measures are more effective in minimizing impacts on soils than remedial mitigation because of the remedial expenses, loss of productivity until mitigation occurs, and the possibility that the original soil conditions may never be restored (Miller et al. 2004). The commercial timber harvest activities proposed in Alternative 2 would disturb, on average, about 15 percent of the ground in the proposed harvest units. As a result of implementing designated skid trails, the units harvested with ground-based systems (1,005 acres) would result in approximately 12 percent or less of the area compacted (USDI 1995). Designating skid trails would minimize the area that would be disturbed during tractor logging operations.

In an Oregon State University study on partial cutting (using designated skid trails), designated skid trails occupied only 4 percent of the area, compared to 22 percent for conventional logging (Bradshaw 1979). In a study of thinning and partial-cutting utilizing ground-based yarding systems, skidding logs caused soil disturbance on approximately 21 percent of the site, resulting in 13 percent displacement and 8 percent compaction (Landsberg et al. 2003). Observations of the units proposed for harvest reveal very few old skid trails still apparent across the landscape. Tree and brush vegetation has re-established in most of the skid trails that were previously compacted from past harvesting. In Alternative 2, any operations off designated skid trails are limited by moisture restrictions and minimizing the number of passes. This is expected to result in a slight soil disturbance, but detrimental compaction (over 2 inches depth) is not expected to occur.

Whole-tree yarding using a mechanical harvester would not cause any detrimental compaction as a result of using such equipment during dry soil conditions or on 18 inches or greater of snowpack, and snow conditions are such that negligible ground surface exposure occurs during operations (USDI 1995, p.166).

Soil particles are not expected to be displaced beyond the units from timber harvesting activities. The decrease in soil pore space as a result of the compacted skid trails causes a slower infiltration rate that may increase overland flow. Although erosion rates would increase initially in the harvested units, soil particles would not reach local waterways under normal rainfall conditions because of the gentle topography and Riparian Reserve buffers. Erosion rates would be expected to return to near-normal rates within 5 years as vegetative cover is re-established. In most operations, a major portion of the harvest area would remain

essentially undisturbed. Even logging systems that cause the most disturbances seldom bare more than 30 percent of the soil surface. Because surface erosion depends primarily on extent and continuity of bare areas, soil loss is usually slight (Rice et al. 1972).

The natural erosion rate in the Cascade Mountains is expected to be 0.19 yd^3/ac/yr. Harvested areas are estimated to be 0.70 yd^3/ac/yr (Aramanthus et al. 1985). However, this project differs in that unstable areas[5] would be avoided, which would result in different (lower) estimates. Consequently, the actual erosion rate is expected to be less than the estimated amount due to slope restrictions, seasonal restrictions, and the prescription. The rate of surface erosion is closely correlated with vegetative cover, especially litter on the soil surface. Litter protects the soil surface from raindrop impact and promotes infiltration. Litter and the stems of vegetation also impede the downslope movement of surface soils, which might be started by gravity, flowing water, or animals (Rice et al. 1972, p. 322).

Short-term erosion rate potential would increase moderately (15-50 percent over undisturbed rates) in the tractor units where slopes exceed 20 percent and where the skid trails are not on the contour. Most of the eroded particles would not reach waterways as a result of Riparian Reserve buffers, waterbars and the dispersal of yarding skid trails. The decrease in soil pore space, as a result of the compacted skid trails, causes a slower infiltration rate and larger amounts of sediment laden surface runoff. On slopes less than 20 percent and/or where skid trails follow the contour, runoff velocity tends to be reduced and soil particles are transported only a short distance. In this situation, soil particles would remain on site and not reach local waterways.

Geppert et al. (1984) concluded that cumulative surface erosion should result from the construction and existence of road networks, but that forest harvest and site preparation should not result in cumulative erosion, except when poorly applied on poor or harsh sites (Beschta 1978). There are no harsh or poor sites proposed for treatment in Alternative 2, as such sites were screened through the Timber Productivity Capability Classification (TPCC) process (USDI 1994, p. 3-85; USDI 1988) and removed from the timber harvest base.

Logging Systems

In the Project Area, units would be harvested utilizing a variety of logging systems including ground-based which includes tractor and mechanical harvesters, bull-line, skyline (cable) and helicopter. There are soils identified as fragile for mass movement potential (FP) within proposed units. Sites where these soils occurred were reviewed on aerial imagery, hillshade imagery, soils information, slope information, and geologic information, as well as field verified for suitability for proposed actions. Indicators of slope instability such as, hummocky slopes, headwalls, sag ponds, etc. were all taken into account during review.

Tractor Yarding

The requirements for tractor yarding are that they remain on designated skid trails spaced on average 150 feet apart and manually cut trees and pull them to the skid trails. Where possible, existing skid trails are utilized to avoid the overall increase in unit area compaction. It is assumed that 12 percent of the unit area would be compacted.

Mechanized Harvesters

Mechanized harvesting equipment (feller bunchers and cut-to-length equipment (harvesters and forwards)) would be allowed in the South Fork Little Butte Forest Management Project. For these types of harvesting equipment to be effective, operations off of designated skid trails are needed. Mechanical equipment is

[5] Unstable areas are different from fragile soils in this context. Unstable areas are considered to be areas with current slope stability issues which are avoided in the Project Area. Fragile soils that are located in the Project Area have some characteristics of unstable soils but due to site indicators are not expected to result in slope instability after the proposed actions.

driven to the trees for harvest; however, there is a requirement for equipment to have the capability to reach 20 feet. PDFs were developed to minimize impacts of using mechanical harvesters off of designated skid trails.

Adherence to the following PDFs would greatly reduce the potential for detrimental compaction within the unit. PDFs include requirements to operate in dry soil conditions, a limited number of allowable passes (1 to 2), and limiting the number of mechanical trails to an average of 50 feet spacing off the designated skid trails. Activity allowing other equipment or multiple passes would be restricted to designated skid trails. Monitoring of past operations where this has occurred in the Analysis Area has resulted in no detrimental compaction over 12 percent of the unit area. In dry soil conditions (under the plastic limit), deformation is not expected to occur, due to the lack of moisture. "Soil compaction is not likely to cause much damage if traffic is limited to dry soil conditions (i.e., drier than the plastic limit) (Penn State College of Agricultural Sciences 2014 http://extension.psu.edu/agronomy-guide/cm/sec1/sec11f)." On these 1-to-2 pass trails, it is possible that the beginning portion of the trail closest to the intersection of the designated skid trail may be passed by the equipment more often due to herringbone-type movement. Although this would be avoided where possible by planning and cutting multiple trees in a single pass, when it does occur in the dry soil conditions, it is not expected to result in detrimental compaction.

In ground-based regeneration harvest units, compaction would be alleviated from skid trails. This is a requirement in the Medford RMP on final harvests.

Approximately 167 acres of the proposed ground-based treatment units are in Fragile (FP) soils. These sites have been reviewed and are expected to be stable. Areas that may be unstable were removed or avoided in the planning phase of the project. It is assumed that 12 percent of the unit area would be compacted.

Bull-Line Yarding

Bull-line yarding is proposed in this project. This yarding method allows for yarding material on slopes generally greater than or equal to 35 percent to landings or roadsides. This method drags trees short distances (generally less than or equal to 150 feet) with no suspension from the ground. This yarding system does not require guy line anchors, tail hold trees, or cable corridors. The anticipated effects would be less ground disturbing than ground-based equipment on 35 percent or greater slopes. Gouging may occur in this yarding system and the degree of this depends on the size of log, yarding distance, degree of slope, and other factors as the log drags up the hillside. Bull-line yarding has the potential to disturb the soil in the corridor more than skyline yarding; however, this would generally occur over a smaller area and shorter distances than skyline yarding corridors. Otherwise, the effects would be similar to skyline yarding.

Skyline Yarding (Cable)

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 percent ground disturbance and Klock (1975) found 2.8 percent 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.

Helicopter Yarding

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 within harvest units 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 percent soil disturbance where McIver and

Starr (2001) found 3.4 percent soil disturbance after helicopter yarding. These differences are probably due to topographical and climatic differences at the time of yarding.

There are Fragile (FP) soils in skyline and helicopter units. These kinds of fragile soils are most sensitive to ground disturbing activities. Therefore, skyline and helicopter yarding on FP soils are not considered an issue.

Fuels Reduction and Non-Commercial Treatments

Prescribed burning of activity fuels planned under Alternative 2 would be in the form of handpile burning. The increase in erosion rates over present levels would be less than 15 percent as a result of burning hand piles because the piles would be spaced throughout the units and would occupy approximately 3-5 percent of the total area. The increased potential of soil particle movement would be low due to the gentle slope, spacing of piles and vegetation between the piles. High soil temperatures generated by burning piles would severely and negatively affect soil properties in 3-5 percent of the unit by physically changing soil structure and reducing nutrient content. In most pile burning operations, the duff and woody debris associated with the piles is completely consumed.

Duff and woody debris represent a storehouse of minerals and protection for the soil surface. Since nitrogen losses are roughly proportional to the amount of duff consumed, burn prescriptions that allow greater retention of woody debris benefit long-term site productivity. Burning volatizes organic nitrogen, or changes it into a readily available form (for plant use). Large proportions of the total nitrogen budget can be lost through volatilization in the sites where pile burning occurs. Total foliar nitrogen content is also reduced (14 percent in moderate burns, 33 percent in intense burns), and the effects last at least four years (Atzet et al. 1987). Overall, soil productivity would experience a slight (less than 15 percent) decrease through short-term effects, but potential long-term positive effects would be realized from the proposed actions as the risk of catastrophic fire would be reduced.

Understory Reduction treatments proposed in this project are expected to have minimal effects to soils. There would be no material yarded in these units. Therefore, ground disturbing yarding would not occur. Where pile burning would occur, the effects to soils would be similar to what was described above for fuels reduction pile burning.

Summary

There would be a net increase in compacted area in the tractor harvest units, averaging about 12 percent, which would slightly decrease long-term soil productivity. Based on research and past monitoring of operational activities, it is assumed there would be a 5 percent loss of productivity on all lands that would be tractor harvested using designated skid trails. The loss is accounted for in the Medford District non-declining timber harvest calculations (USDI 1994). Soil productivity would experience a slight (less than15 percent), short-term negative decrease, but potential long-term positive effects would be realized by thinning and prescribed fire. There would be a slight to moderate (15-50 percent) increase in erosion rates as a result of the combination of harvesting timber and fuel reduction activities (i.e. slashing, prescribed burning), which would last approximately three to five years. A slight cumulative long-term increase in erosion rates would occur as a result of road building.

With regard to soil productivity, there is currently little direct evidence to indicate that harvest removal alone leads to soil depletion over several succeeding rotations (Beschta n.d.). A crucial aspect that affects soil productivity is cutting intensity, or the proportion of standing trees harvested (i.e. clear-cutting vs. shelter wood vs. selection cutting). As cutting intensity decreases, so, too, do the effects on the soil.

Another critical aspect of a silvicultural regime is the rotation, or cycle length. Rotation length determines the intervals at which the site is entered and disturbed, and the rate at which nutrients are removed, redistributed or lost. Rotation length is especially important from the point of view of cumulative effects because it determines the time periods allowed for recovery between harvests. Soil productivity decline should be least likely when low silvicultural intensity is combined with high inherent productivity and

favorable conditions. Soil erosion may prove cumulative over time if periodic disturbances that result in soil leaving the site occur, at intervals too short for the site to stabilize and result in recovery. In the South Fork Little Butte Forest Management Project, soil disturbance would not result in a significant amount of soil leaving the site, and erosion rates would return to near-normal within approximately five years.

The proposed temporary roads would temporarily increase road density in the Analysis Area during project implementation. The effect of the temporary roads would last longer than the project implementation due to soil compaction and organic material displacement. The decompaction, seeding and mulching is expected to aid the process of soil restoration in these areas; however, compaction is not expected to be fully alleviated in the short-term. Soil density associated with a skid trail takes approximately 50-80 years to recover to near-natural levels (Lucklow and Guldin 2004). This may be similar to natural surfaced road recovery time although recovery time may be shorter due to scarification and the effects of freezing and thawing that occurs in parts of the Project Area.

Additionally, some existing roads would be fully decommissioned. Decommissioning the roads would increase the amount of land producing vegetation in the Analysis Area by about 16 acres in the long-term. The soils where roads proposed for decommissioning are located would be in various conditions, although erosion potential would decrease rapidly due to decommissioning, the roads would not be fully recovered in the short-term. The time needed for vegetative recovery to occur would most likely be the fastest where the surface of the soil is loosened; however, vegetative recovery is still expected to be in the long-term (10+ years). This would, of course reset the vegetative recovery of the soil.

Minimal effects from road construction, ground -based and skyline yarding, and tree removal on slope stability are expected. Unstable areas were avoided for all ground disturbing actions. This does not mean that small slope failures would not occur after this project due to the natural soil instability of this soil type within this landscape. A high rainfall event may saturate soil in areas that have been either disturbed or undisturbed and the soil may lose strength resulting in a soil creep. Therefore, the actions proposed are not expected to exacerbate the slope stability issue as unstable slope features would be avoided.

Cumulative Effects

Refer to the beginning of Chapter 3 for descriptions of past, present and reasonably foreseeable future actions.

Soil erosion may prove cumulative through time if periodic disturbances occur (that result in soil leaving the site) at intervals too short for the site to stabilize to bring about recovery. This should not be the case as a result of the SFLB Project as soil disturbance would not result in a significant amount of soil leaving the site and erosion rates would return to near normal within about five years. Most past harvest that had a substantial effect on soil erosion rates was over twenty years ago and most sites have recovered from those events. Therefore, cumulative effects to the soil resource as a result of timber harvest would be minimal if the soil resource is allowed enough time to recover from the disturbance of this project.

Timber harvest is expected to occur in the near future on adjacent private lands within the Planning Area. Private forestland is managed following the Oregon Forest Practices Act. The Oregon Forest Practices Act identifies soil disturbance greater than 20 percent of an area to be soil damage and anything above that needs to be remediated. Additionally, operators are required to avoid excavating skid trails on slumps or slides. There are additional requirements specific to high landslide hazard areas as well. Listed below are the most relevant requirements found in the Harvesting Forest Practice Rule Guidance (http://www.oregon.gov/odf/privateforests/docs/guidance/oardiv630.pdf, pp. 46-48):

- Operators and the State Forester shall share responsibility to identify high landslide hazard locations and to determine if there is public safety exposure from shallow, rapidly moving landslides;
- Operators shall not construct skid roads on high landslide hazard locations; and

- Operators shall prevent deep or extensive ground disturbance on high landslide hazard locations during log felling and yarding operations.

Assuming the Oregon Forest Practices Act is implemented properly, timber harvest on private lands is not expected to adversely impact slope stability. Although, disturbed sites are generally at an elevated risk of slope failure under high rainfall situations versus undisturbed areas. Assuming slope instability issues are addressed and avoided on private lands, the potential for cumulative effects to slope instability are not expected.

Possible future actions on private land would impact approximately 3,739 acres, or 11 percent of the Planning Area. The potential for cumulative effects of these actions on soil compaction could increase the peak flow potential; this topic is addressed in the Water Resources section.

There are grazing allotments that overlap with Project units. This could increase the amount of acres of compacted soil in areas where cattle congregate. The primary effects that livestock grazing has on the soil resource is disturbance leading to increased erosion and an increase in bulk density when cattle grazing occurs during wet soil conditions. The most basic concept is that the application of weight (cattle) to soil which is wet, will compress more soil into smaller volumes, thereby increasing bulk density of soil (weight per unit volume). The effect of compaction is to diminish the volume of soil in the plant rooting zone that can store oxygen and water (pore space), thereby limiting rooting volume of the plants. As treading is greatest at the soil surface, this can lead to decreased soil permeability of both air and water. Lowered rates of water infiltration may lead to higher rates of surface runoff during heavy rains and to greater soil erosion, a problem often related to overgrazing (Wells and Dougherty 1997). If vegetative cover, root systems and current soil bulk density are kept intact during grazing, soil degradation is not expected to occur from grazing.

The season of use allocated for allotments in the area would reduce the amount of exposure that cows could have to wet soil; however, exposure may still occur in areas that hold more water. The density of cattle within the allotment areas is minimal (about one cow per 11.5 acres). Densities are likely to be higher in some places because cattle tend to congregate. However, due to the low overall density and season of use, the anticipated effects of cattle grazing in the Project Area is minimal and is not expected to be large enough to noticeably add to the effects of proposed actions. Also, the anticipated effects are minor in comparison to the other actions occurring in the Project Area.

c. Alternative 3

There is no road construction (temporary or permanent) proposed in this Alternative. Therefore, the effects described in Alternative 2 with regards to road construction would not occur.

Road Decommissioning/ Long-Term Closures

The same roads proposed for decommissioning and long-term closures in Alternative 2 are proposed in Alternative 3. The effects to soils would be the same.

Road Improvement

Refer to discussion in Alternative 2.

The only difference is that the following roads are not going to be improved and used as haul routes in this alternative: Spur 23-2, 37-2E-24.4 B, C and 38-3E-11.7. Spur 23-2 is currently recovering and in this alternative it would continue to recover as opposed to Alternative 2 where it would be reopened, bladed and compacted. The other two roads are currently barricaded and not being used. In Alternative 3, this is expected to continue to occur.

Landings

Refer to discussion in Alternative 2.

Eighteen helicopter landing sites are identified, of which 6 sites are existing and 12 would be new construction. The number of new landings is the same as Alternative 2 and the effects would be the same. There is a reduction of existing landings to be used. This would be a reduced impact since some of these landings have healed since last used.

Forest Management

The effects to soils from forest management would be the same in Alternative 3 as Alternative 2 except for the reduction in treatment acres would result in less overall disturbance.

Logging Systems

There is an overall reduction in treatment acres in Alternative 3 compared to Alternative 2. The effects of the different logging systems are expected to be the same as Alternative 2 just to a lesser extent (716 acres less). There are less acres of ground-based yarding (362 acres less, of which there would be 115 acres less in fragile (FP) soils), skyline yarding (154 acres less), bull-line yarding (13 acres less), and helicopter yarding (187 acres less). Overall, the direct effects from logging systems would be the same as Alternative 2, just to a lesser extent as the treatment acres are reduced.

Fuels Reduction and Non-Commercial Treatments

The direct effects of activity fuels reduction treatments would be the same in Alternative 3 as Alternative 2 except for a the amount of area treated would be reduced. Activity fuels treatments would occur on 960 acres, which is 716 acres less than Alternative 2. In addition, 619 acres of Understory Reduction treatments would occur outside commercial units, which is 193 acres less than Alternative 2.

Summary

The effects of implementing Alternative 3 are similar to Alternative 2. The main difference is new and temporary road construction. Without the 0.80 miles of proposed new road construction and the 3.04 miles of temporary road construction there is a difference in the amount of acres of soil impacted. A total 15.96 acres of soil within the 35,383-acre Planning Area would not be impacted.

Cumulative Effects

Refer to the discussion in Alterative 2. The cumulative effects are expected to be the same.

E. WATER RESOURCES

1. Issues

Water-related issues associated with the South Fork Little Butte Project have been identified through public scoping or interdisciplinary team specialists and will be addressed in this document. These relevant issues are:

- Even with planned road decommissioning contributing to long-term improvement in watershed conditions, there are short-term increases in road densities and impacts on watershed conditions with new road construction. While there are immediate positive effects related to decreased channelization of water runoff and sediment routing, it takes time for vegetation to reclaim decommissioned roads and decades for full recovery (depending on the method of decommissioning and the condition of the road at the time it is decommissioned).

- There is potential for short-term effects to water quality from increased sediment produced from disturbance associated with the combination of new road construction, road decommissioning (mainly mechanical method), road renovation, and log hauling activities.
- Conde Creek, Dead Indian Creek, Soda Creek, Lost Creek, Deer Creek, and South Fork Little Butte Creek are within the Project Area and are listed as 303(d) streams for varying reasons. Non-point source pollution (sedimentation) from management activities has the potential to degrade the aquatic ecosystem (e.g., reduced water quality for salmon, steelhead, and trout).
- Concerns were raised that forest thinning and regeneration harvest (and associated canopy reduction), logging (particularly tractor yarding) and road construction could adversely affect hydrologic flow, peak flow and low flow, leading to increased erosion, stream channel downcutting, and an increase the adverse effects of flooding.
- There is a potential for adverse cumulative effects on water quality and hydrologic function within the Little Butte Creek Watershed from road building, timber harvest activities, grazing, OHV use, and fire suppression on BLM, Forest Service, and private lands.

2. Analysis Area Description

The 35,383-acre or 55.3 square mile South Fork Little Butte Planning Area is located within the Little Butte Creek Watershed (Map 3-6). The Little Butte Creek Watershed is one of seven 5th field watersheds within the Upper Rogue Subbasin. The land within the Planning Area drains into the portion of the South Fork Little Butte Creek from Dead Indian Creek to the confluence with the North Fork Little Butte Creek.

The Planning Area is smaller than the Analysis Area and for purposes of assessing the affected environment and the proposed project; the Analysis Area for water resources will consider portions of Lower South Fork Little Butte Creek and Middle South Fork Little Butte Creek. These are called sub-watersheds and represent 6th field hydrologic unit codes or HUCs. These sub-watersheds are further subdivided into 7th field HUCs called drainages which range in size from 603 to 5,025 acres (Table 3-11 and Map 3-7). The major creeks within the Analysis Area that may or may not represent 7th field HUCs are Conde Creek, Dead Indian Creek, Deer Creek, Soda Creek and Lost Creek. The total size of the Analysis Area is 48,789 acres or 76.2 square miles and consists of drainages where treatments are proposed. There are a couple areas where proposed actions cross over into an adjacent drainage not included in the Analysis Area (described above). The first location is just outside the 0636 and 0639 drainages where approximately 0.74 miles (or 1.8 acres) of new road construction (about 0.13 miles of proposed road 37-2E-5.00 (permanent) and about 0.34 miles of proposed temporary road Spur 17-1) is proposed within the Lake Creek (0706) drainage. These proposed roads are located near ridgetops and/or flat topography. Changes in road densities and canopy cover within the Lake Creek drainage would be minor and would not negatively affect criteria used to assess potential changes in peak flows or cumulative effects; therefore, the drainage was not included in the Analysis Area. The second location is just outside the 0509 drainage where approximately 12 acres of commercial timber harvest using ground based equipment (tractor) and about 0.30 miles (or 0.7 acres) of temporary road construction is proposed in the 0115 drainage of the Jenny Creek Watershed. Changes in road densities and canopy cover within this drainage would also be minor and would not negatively affect criteria used to assess potential changes in peak flows or cumulative effects; therefore, the 0115 drainage was not included in the Analysis Area. The actions proposed in these drainages are still included in the summary of effects for each action alternative.

Analysis at the drainage-level scale is large enough to assess the cumulative effect of actions that, taken individually (site scale) may not be significant, but when combined with effects from other activities occurring within the drainages, may have a potential impact ("cumulative effect"). The drainage areas are small enough to avoid "drowning out" evidence of adverse effects. As the size of the Analysis Area increases, there is an increasing possibility of the analysis indicating that there is "no problem" when in fact individual drainages may have issues of concern.

Table 3-11. Analysis Areas with Acres and Ownership

Sub-Watershed (6th field)	HUC 7 (drainage)	Acres	BLM (percent)	Private/Other (percent)
Middle South Fork LB	0509	5,025	58	42
	0512	1,032	24	76
	0515	2,616	46	54
	0518	1,463	41	59
	0521	4,050	13	87
	0524	1,549	2	98
Lower South Fork LB	0603	1,138	16	84
	0606	1,715	86	14
	0609	3,761	47	53
	0612	1,751	67	33
	0615	1,576	91	9
	0618	891	49	51
	0621	3,061	53	47
	0624	3,521	26	74
	0627	4,282	48	52
	0630	2,516	49	51
	0633	1,771	48	52
	0636	2,878	45	55
	0639	3,590	14	86
	0642	603	0	100
Total		**48,789**	**41**	**59**

The BLM manages approximately 41 percent of the Analysis Area. The U.S. Forest Service (USFS) manages land along the eastern edge of the Analysis Area for a total of 11 percent. The Bureau of Reclamation manages five acres in the Upper Dead Indian Creek (0509) Analysis Area. Private lands encompass 48 percent of the Analysis Area. A large cattle ranch (Cascade Ranch) owns land along the lower reaches of South Fork Little Butte Creek. Much of the large blocks of private lands in the upland areas are owned by industrial forest companies. Ownership of the remaining privately-held land is typically held in relatively small parcels.

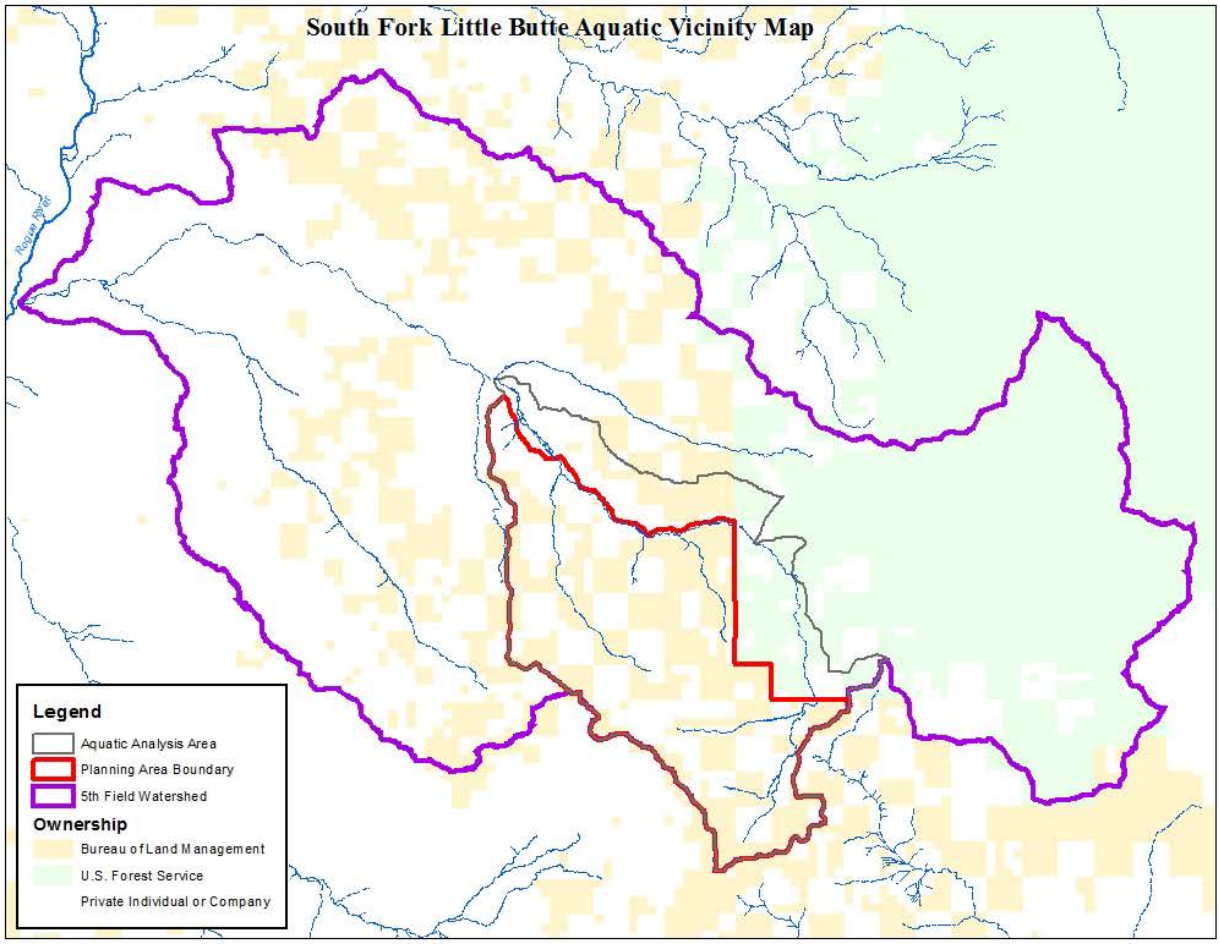
The Analysis Area is entirely within the North and South Forks Little Butte Creek Tier 1 Key Watershed as designated in the *Northwest Forest Plan* (USDA and USDI 1994). Surface water in the proposed South Fork Little Butte Creek Analysis Area includes streams, ditches, springs, wetlands, and reservoirs. Streams in the Analysis Area are classified as perennial, intermittent with seasonal flow (long duration intermittent), intermittent with ephemeral flow (short duration intermittent), and dry draws with ephemeral flow. Stream types on BLM-managed lands were identified through site visits and stream surveys; stream types on USFS and non-federal lands were estimated using aerial photo interpretation and extrapolation from information on adjacent BLM-managed lands. Streams categorized as perennial or intermittent on federal lands are required to have Riparian Reserves (see Chapter 2) as defined in the *Northwest Forest Plan* (USDA and USDI 1994). Dry draws do not meet requirements for streams needing Riparian Reserves because they lack the combination of a defined channel and annual scour and deposition. 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).

There are approximately six miles of privately-owned irrigation ditches on BLM-administered lands in the Planning Area. Nearly five miles of the irrigation ditches are within Lower Lost Creek and the other mile is located on BLM-administered lands in Upper Dead Indian Creek and Conde Creek areas.

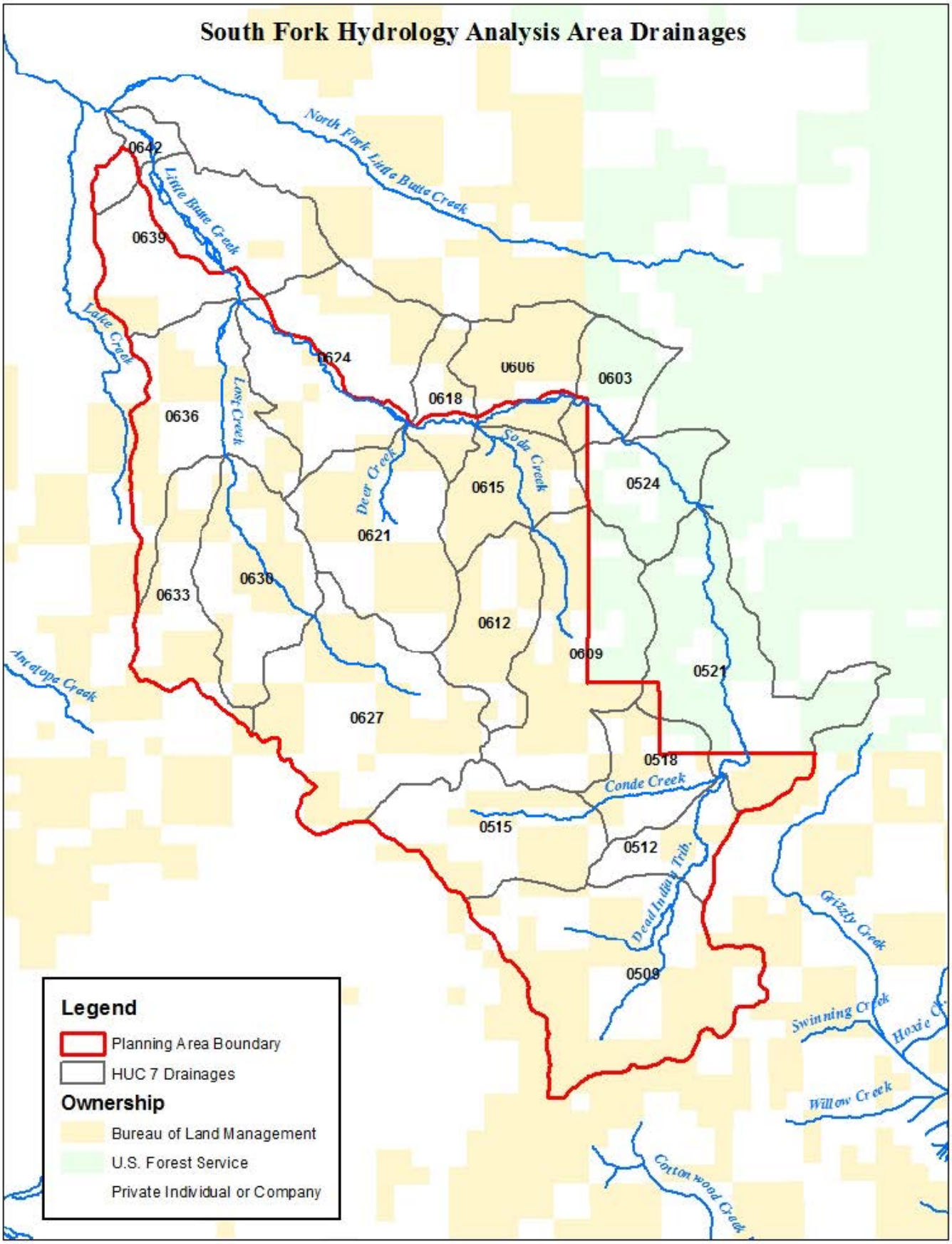
Groundwater supplies in the Planning Area are limited due to the low permeability of the volcanic rocks found in the majority of the area (USDI and USDA 1997:36). The South Fork Little Butte Creek Planning

Area has not been identified as a critical groundwater area by the Oregon Water Resources Department (OWRD 1989).

Map 3-6. Vicinity Map of the Hydrology Analysis Area in Relation to the Little Butte Creek Watershed and the Planning Area



Map 3-7. Analysis Area Drainages



3. Affected Environment

Average annual precipitation in the South Fork Little Butte Creek Analysis Area ranges from about 27 inches below the confluence of Lost Creek and South Fork Little Butte Creek (elevation 1,800 feet) to 52 inches at the headwaters of Dead Indian Creek (elevation 5,844 feet). Precipitation falls predominately from November through March and summer months are typically very dry. The rain patterns in the winter months are wide-based with relatively low intensity and long duration in contrast to localized, short duration, and high intensity summer storms that occasionally occur.

A U.S. Geological Survey (USGS) gaging station located on the South Fork Little Butte Creek near Lake Creek (above the Medford Irrigation District Canal diversion) collected streamflow data from 1922 to 1957 and 1961 to 1982 (USDI and USDA 1997, p.38). Mean monthly streamflows ranged from a low of 18.2 cubic feet per second (cfs) in August and September to a maximum of 236 cfs in April. Low flows normally coincide with the period of low precipitation from July through October. The highest streamflows usually occur from December through May. Streamflow's during the months of April and May and part of June are augmented by melting snowpack in the high elevations. Significant flows can also be produced by local, high intensity summer storms, although these events are relatively rare and their effect is limited to the local area.

Water quantity in the Analysis 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. Past human activities that have altered water quantity in the Analysis Areas include: land clearing (for agricultural and residential use), timber harvest, road operations, water withdrawals, and fire suppression. These past actions and their effects on hydrologic processes and water quantity are described in this section.

Streamflows are naturally low during the summer due to low precipitation, reduced soil drainage, and sustained high evapotranspiration. Water withdrawals exacerbate the low flow condition. Total surface water diversions in the South Fork Little Butte Creek watershed are approximately 480 cfs (USDI and USDA 1997:90) with irrigation being the primary use. Fire suppression has resulted in overly dense forest stands with high transpiration rates that likely contribute to decreasing the amount of water available for summer streamflows. Past harvest which occurred on private lands in the Analysis Area often included riparian vegetation.

Within the Analysis 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 (USDI and USDA 1997:9) and this area is referred to as either the rain-on-snow zone or transient snow zone (TSZ). The snow level in this zone fluctuates throughout the winter in response to alternating warm and cold fronts. Historically, geomorphic processes that shape landscape and channel geometry are triggered by large, infrequent storm events. In recent times, these events can be characterized by warm moist storms that result in high intensity, long duration rainfall. The results can be intensified when rainfall occurs on shallow snow packs in this elevation range, and then are quickly melted by rain and warm winds (rain-on-snow event).

The percent of a watershed in the transient snow zone can indicate elevated risk of adverse impacts. These impacts can be accelerated by modifications to forest canopy cover and roads and other disturbance features. Drainages where TSZ compromises greater than 25 percent of the area are of hydrologic concern, particularly where large openings such as clearcuts exist. The TSZ occupies 69 percent of the Middle South Fork Little Butte Sub-watershed and 38 percent of the Lower South Fork Little Butte Sub-watershed. In total, the TSZ occupies 54 percent of the Analysis Area (Table 3-12). Large areas of vegetation removal in the TSZ are of particular concern due to alterations of the streamflow regime and the potential for resultant increased peak flow magnitudes (Christner and Harr 1982).

The degrees to which hydrologic processes are affected by vegetation canopy reduction (e.g. land clearing or timber harvest) are summarized based on the extent and location. Extent refers to the amount of a drainage area that is below critical thresholds, and therefore at risk. Location refers to whether or not canopy reduction occurs within the transient snow zone. Openings in the transient snow zone and potential risk for peak flow increases are analyzed using the Oregon Watershed Assessment Manual (OWAM) (WPN 1999: IV-9-11) risk assessment method. This method indicates that drainages with more than 25 percent of the area in the transient snow zone may be at risk for possible peak flow increases. The transient snow zone occupies more than 25 percent in all but six drainages associated with the proposed project (Table 2). In addition, the peak flow risk assessment method uses the percent of rain-on-snow area that currently has less than 30 percent crown closure. We used the most recent aerial photos to estimate the area with less than 30 percent crown closure in the rain-on-snow zone (Table 2).

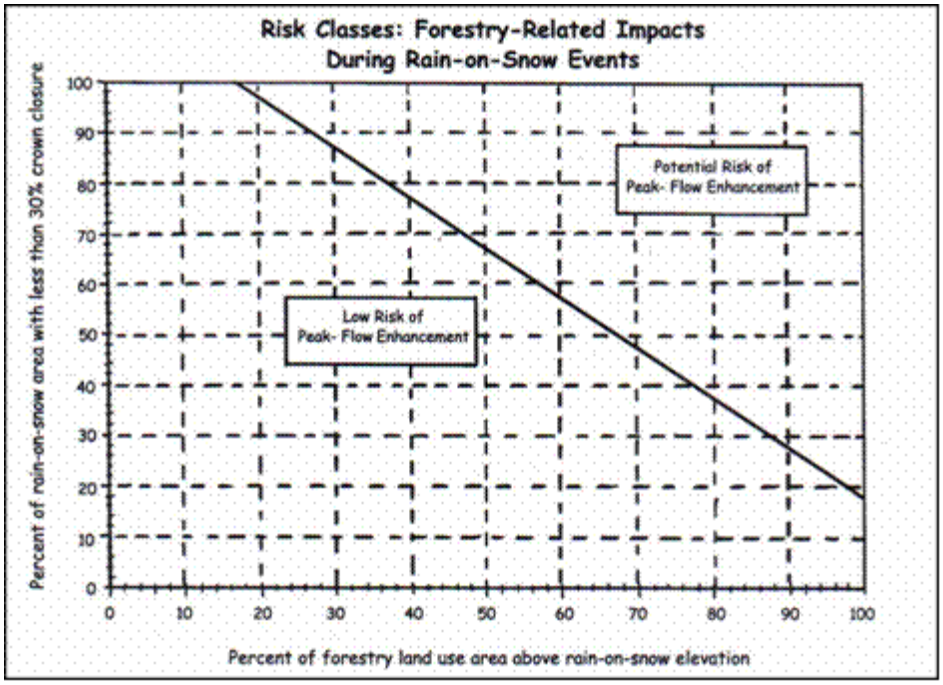
Different levels of harvest in watersheds have demonstrated variable effects on peak flows (Wemple, Jones and Grant 1996; Harr 1979). When less than 25 percent of a watershed is harvested, no detectible change in peak flows have been observed (Stednick 1996). It should be noted the majority of literature available regarding the relationship between harvest and flow have focused on clearcut harvesting, many in areas that removed close to 100 percent of the overstory canopy. For this analysis, any area where 30 percent or greater of the forested acres is less than 30 percent canopy cover is assumed to be hydrologically altered and responds similar to a clearcut. This is particularly true if a large percentage of the drainage is located within the TSZ.

Table 3-12. Percent of Transient Snow Zone (TSZ) with Less than 30 Percent Canopy Cover.

Subwatershed	HUC 7 (drainage)	Percent Forested Area Less Than 30% CC[1]	Percent of Analysis Area within TSZ	Percent Forested Area Less Than 30% CC within TSZ [1]
Middle South Fork LB	0509	38	**50**	**42**
	0512	22	**94**	24
	0515	39	**49**	20
	0518	39	**100**	**39**
	0521	21	**88**	22
	0524	12	**33**	0
Total		***29***	***69***	***25***
Lower South Fork LB	0603	4	**46**	7
	0606	20	**43**	17
	0609	29	**88**	29
	0612	18	**75**	23
	0615	28	15	**54**
	0618	15	13	0
	0621	24	**43**	18
	0624	26	9	11
	0627	23	**92**	21
	0630	17	**46**	18
	0633	6	**58**	8
	0636	61	3	**30**
	0639	50	0	**50**
	0642	82	0	0
Total		***28***	***38***	***20***
Total - All		***29***	***54***	***23***

The risk of peak-flow enhancement is estimated from the Oregon Watershed Assessment Manual (WPN 1999) risk assessment graph (Figure 3-4) which uses the percent of the Analysis Area that is within the rain-on-snow zone and the percent of the rain-on-snow zone with less than 30 percent canopy cover (Table 3-12).

Figure 3-4. Graph for estimation of the risk of peak-flow enhancement from forestry-related impacts during rain-on-snow events (WPN 1999: IV-11).



Values that fall below the diagonal line represent a low risk of peak-flow enhancement, while values above the diagonal line indicate a potential risk of peak-flow enhancement. The diagonal line roughly represents peak-flow increases of 8 to 10 percent, which represents the lower boundary of detectability. Table 3-12 and Figure 3-4 was used to determine the percent of rain-on-snow zone with less than 30 percent crown closure that represents the boundary between the two risk classes for each Analysis Area that has more than 25 percent in the rain-on-snow zone (Table 3-12). Although five of the drainages in Table 3-12 have higher percentages of reduced canopy cover, when combined with values exceeding 25 percent within the TSZ (bold highlight) only two (0509, 0518) reflect values that may indicate altered timing and increased potential for peak flows.

It should be noted that recent research indicates that effects from peak flows, although of concern, should be confined to a relatively discrete portion of the network where channel gradients are less than approximately 2.0 percent and streambeds are composed of gravel and finer material. Furthermore, data supports the interpretation that if peak flow increases do occur, they can only be detected in flows of moderate frequency and magnitude. Beyond that, they are likely not detectable (Grant, et al. 2008). What this suggests is that if increases in peak flows occur, they are unlikely to result in adverse effects to the higher gradient channels located within the Analysis Area. Also, peak flows are only detectable in smaller storm events with return periods of 6 years or less, where channel forming processes are minor in effect.

Most of the increase in sedimentation associated with forestry activities is attributed to forest roads (Sullivan 1985). Research (Reid and Dunne, 1984: Luce and Black, 1999) supported by local and regional field evaluations have consistently found roads to be the primary source of accelerated erosion in wildland watersheds. Roads impact aquatic systems through both chronic and episodic erosion. Chronic erosion is where material is detached and transported to streams via the road surface and drainage structures such as cross drains and inboard ditches. This occurs in response to precipitation events throughout the year. Episodic erosion usually occurs as a result of intense rainfall and rain-on-snow events within the TSZ. Large failures often occur as a result of culvert plugging, stream diversion and fillslope landslides. In addition, where road densities are high, concentration and routing of stormwater may result in increased peak flows. Both road density and road density with Riparian Reserves are gross indicators of the level of road impacts in watersheds. Although road density is a useful indicator, it should be noted that not all roads impart similar

effects. For instance, the magnitude of impacts from roads on steep slopes is different than those from roads located on flat terrain. Roads located near streams and road stream crossings are responsible for the majority of sediment delivered to channels.

Within the Analysis Area, some roads are unsurfaced and located within Riparian Reserves. Natural or unsurfaced roads are generally more likely than surfaced roads (rocked or paved) to contribute sediment to streams. In addition, some native surface roads are open during the rainy season. This type of use can render drainage features ineffective and result in concentrated flow and increased erosion.

Although considerable road work has been accomplished within the SFLB watershed, including decommissioning/obliteration, many crossings are susceptible to failure through culvert plugging and stream diversion. Other road segments are unsurfaced, steep, lack adequate drainage, or are located within close proximity to streams. Lack of road maintenance or improper road maintenance by all jurisdictions within the Analysis Area has increased sediment production or the potential for sediment production. In localized areas there is also an expanding network of OHV trails. These features often utilize old road beds or are established through repeated off-road travel, or unauthorized construction by proponents. They exist on the landscape irrespective of sensitive soils, adequate drainage, or proximity to watercourses and are also responsible for increased sediment production.

Although grazing that degrades aquatic habitat and increases erosion on both public and private land is widespread within the Analysis Area, chronic erosion from road surfaces, cut banks, and inboard ditches where they connect to streams likely represents the dominant source of sediment input to streams. In addition, portions of the Analysis Area are considered geomorphically unstable. Steeper slopes, primarily within Deer and Lost Creeks, and to a lesser extent Soda Creek exhibit historic and recent evidence of earthflows, debris torrents, and landslides. Failure mechanisms appear to be both natural and road related, with large storm events the predominant catalyst. Noteworthy and somewhat recent storms which impacted stream channels occurred in 2005, and again in 2011when rain-on-snow events resulted in debris torrents that scoured several channels in the Deer Creek drainage down to bedrock and deposited large volumes of sediment in lower gradient channels where critical habitat for anadromous fish is present. Many culverts also failed during both these events, resulting in road failures and the release of significant quantities of fine sediment (road fill) into aquatic habitats.

As part of this planning effort, a Transportation Management Inventory and Assessment (TMIA) process was conducted for the Little Butte Creek 5th field watershed located within the Ashland Resource Area. All BLM-managed roads were evaluated for public and/or administrative access needs versus resource impacts and recommendations were made regarding changes in maintenance levels, decommissioning/obliteration, or other actions necessary to remediate resource concerns. Recommendations were also made on reciprocal roads located both on private and BLM-managed lands. If appropriate, these recommendations were presented to affected landowners for consideration. Information was also collected on user-created or non-system routes, including trails on BLM-managed lands that confirmed location, extent, and resource concerns.

Road densities in the Analysis Areas range from 0.9 to 6.5 mi./mi.^{2} with an overall road density of 4.5 mi./mi.^{2} (Table 3-13). High road densities, greater than 4.0 mi./mi.^{2} (King and Tennyson, 1984), are found in 15 of the 20 Analysis Areas (bold highlight). Roads built in riparian areas can adversely affect stream temperature, magnitude and timing of flows, and sediment. Riparian road densities range from 1.6 to 8.4 mi./mi.^{2} with an overall road density of 4.6 mi. /mi.^{2}. Higher riparian road densities, particularly on private lands are likely the result of steep dissected terrain and many roads being located within valley bottoms. As indicated in Table 3-13, on average, road densities are considerably higher on private lands, which is typical of mixed ownership drainages within the Analysis Area and elsewhere.

Table 3-13. Road Miles and Road Densities for all Drainages in the Analysis Area

Analysis Area HUC 7	Road Miles			Road Density[2]			Road Miles – Riparian Reserves			Road Density[2] – Riparian Reserves		
	BLM	Non-BLM[1]	Total	BLM	Non-BLM[1]	Total	BLM	Non-BLM[1]	Total	BLM	Non-BLM[1]	Total
0509	27.4	12.5	39.9	3.5	1.6	5.3	4.9	3.3	8.2	2.5	1.7	4.1
0512	3.0	4.0	7.0	1.9	2.5	4.4	0.9	1.4	2.3	1.3	2.0	3.3
0515	10.9	8.9	19.8	2.7	2.2	4.8	2.9	3.0	5.9	4.1	4.3	8.4
0518	6.4	4.6	11.0	2.8	2.0	4.7	2.0	1.0	3.0	2.5	1.3	3.8
0521	3.6	21.8	25.4	0.6	3.5	4.0	0.4	2.8	3.2	0.4	3.1	3.6
0524	0.4	8.1	8.5	0.2	3.4	3.5	0	2.2	2.2	0	5.5	5.5
0603	0.1	1.5	1.6	0.1	0.8	0.9	0	1.0	1.0	0	2.0	2.0
0606	2.8	1.9	4.7	1.0	0.7	1.7	0.6	0.8	1.4	0.7	0.9	1.6
0609	11.7	13.7	25.4	2.0	2.3	4.3	2.1	1.1	3.2	1.9	1.0	2.9
0612	12.5	6.2	18.7	4.6	2.3	6.9	2.4	0.9	3.3	4.8	1.8	6.6
0615	9.9	1.0	10.9	4.0	0.4	4.4	1.6	0.3	1.9	2.3	0.4	2.7
0618	1.7	4.7	6.4	1.2	3.4	4.6	0.1	2.1	2.2	0.2	4.2	4.4
0621	14.2	11.6	25.8	3.0	2.4	5.4	4.3	3.9	8.2	2.9	2.6	5.5
0624	3.1	24.3	27.4	0.6	4.4	5.0	1.1	10.2	11.3	0.6	5.5	5.9
0627	17.1	17.3	34.4	2.6	2.6	5.1	3.0	6.1	9.1	1.7	3.4	5.1
0630	3.3	11.4	14.7	0.8	2.9	3.8	0.5	2.4	2.9	0.4	2.0	2.4
0633	8.9	9.2	18.1	3.2	3.3	6.5	2.0	3.8	5.8	2.5	4.8	7.3
0636	4.8	11.0	15.8	1.1	2.4	3.5	1.7	3.8	5.5	1.2	2.7	3.9
0639	1.1	22.4	23.5	0.2	4.0	4.2	0.5	9.8	10.3	0.3	4.9	5.2
0642	0	4.4	4.4	0	4.9	4.9	0	2.4	2.4	0	6.0	6.0
Totals	142.9	200.5	343.4	1.9	2.6	4.5	31.0	62.3	93.3	1.5	3.0	4.6

Until such time when the DEQ identifies surrogate measures associated with roads, the BLM will continue to utilize compliance with the Aquatic Conservation Strategy (ACS) in the Analysis Area (USDI 2006a:31) as a surrogate for assessing progress toward achieving goals for water quality on streams within the Analysis Area. The ACS for Key Watersheds states that existing system and non-system road mileage outside roadless areas should be reduced through road decommissioning (USDA and USDI 1994: B-19). If funding is insufficient to implement reductions, there will be no net increase in the amount of roads in Key Watersheds. Watershed restoration is a critical component of the ACS. Recommendations for watershed restoration activities that would reduce erosion from BLM-managed lands are found in the *Little Butte Creek Watershed Analysis* (USDI and USDA 1997) and the *Water Quality Restoration Plan for North and South Forks Little Butte Creek Key Watershed* (WQRP) (USDI 2006a). Decommissioning or upgrading roads is a priority, with the highest priority given to roads that are contributing large amounts of sediment to streams as well as roads in Riparian Reserves, unstable areas, and midslopes. The WQRP's sedimentation recovery goal for roads is to decrease sediment production and delivery from roads (USDI 2006a: 38). Active restoration techniques identified in the WQRP include: maintaining adequate drainage facilities on all BLM-maintained roads open for administrative access during the wet season; improve or install new drainage systems and surfacing on non-system roads near Riparian Reserves or unstable terrain; decommission or obliterate roads not critical for future management activities; allow for 100-year runoff events, including associated bedload and debris, when installing new stream crossing structures and for existing stream crossing structures that pose substantial risk to Riparian Reserves; and apply appropriate road BMPs identified in the RMP to minimize soil erosion and water quality degradation (USDI 2006a: 38). Within the past five years BLM restoration efforts have included instream log placements, riparian fencing and planting, and road treatments including 1.8 miles of decommissioning/obliteration.

Stream condition within the Analysis Area is highly variable. This is largely the result of different channel morphology and streamside characteristics associated with changes in stream gradient (transport vs.

depositional), position on the landscape, and adjoining ownership. Proper functioning condition (PFC) assessments, although of limited value, indicate that a majority (52 percent) of the assessed streams are functional, but are at risk. Properly functioning streams are a close second (41 percent) and nonfunctional streams are a distant third (7 percent). Other parameters such as fine sediment and stream temperature indicate improvement is warranted.

The Oregon Environmental Quality Commission has adopted numeric and narrative 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 South Fork Little Butte Creek and its tributaries. The Oregon Department of Environmental Quality (DEQ) is required by the federal Clean Water Act (CWA) 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 because of the section of the CWA that makes the requirement.

The BLM is recognized by Oregon DEQ as a Designated Management Agency for implementing the Clean Water Act on BLM-administered lands in Oregon. The BLM and DEQ have a Memorandum of Agreement (MOA) that defines the process by which the BLM will cooperatively meet State and federal water quality rules and regulations. In accordance with the MOA, the BLM in cooperation with the Forest Service, DEQ, and the Environmental Protection Agency is implementing the *Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters* (USDA and USDI 1999). Under the Protocol, the BLM will protect and maintain water quality where standards are met or surpassed, and restore water quality limited waterbodies within their jurisdiction to conditions that meet or surpass standards for designated beneficial uses. The BLM would also adhere to the State Anti-degradation Policy (OAR 2005; 340-041-0004) under any proposed actions.

In 2008, the DEQ completed the Rogue Basin Total Maximum Daily Load (TMDL) which was approved by the U.S. Environmental Protection Agency (EPA). Approved BLM actions include land management addressed in the Resource Management Plan (1995) providing that Best Management Practices (BMPs) and project design features (PDFs) are followed to prevent exceedance of the TMDL.

The North and South Forks Little Butte Creek Key Watershed WQRP (USDI 2006a) assumes that measures implemented to meet the temperature TMDL will also meet the likely riparian vegetation surrogate measure targets for the sedimentation TMDL. The Northwest Forest Plan Riparian Reserves would likely be more than that required to meet the percent effective shade targets and will also provide additional protection from sediment. Other approved BLM actions include management actions in the Resource Management Plan (USDI 1995) providing that Best Management Practices and Project Design Features are followed to prevent adverse effects to achieving compliance with the TMDL.

4. Environmental Consequences

As no new management is proposed under Alternative 1, the effects described reflect current conditions and trends that are shaped by ongoing management, natural processes, and other land uses and events. Discussion for Alternatives 2 and 3 reflect the direct and indirect impacts of the proposed actions. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to past, present, and reasonably foreseeable actions. Short-term effects are defined as those lasting ten years or less and long-term effects last greater than ten years (USDI 1994:4-4).

As part of the assessment of cumulative effects, a discussion of reasonably foreseeable future activities combined with those of the action alternatives is included at the end of the each alternative's effects section. Below is a summary of those actions that may occur with reasonable certainty. The Affected Environment section summarizes present conditions in the Analysis Area, which are shaped by past actions.

Future harvest on commercial private timber lands would likely occur within the Analysis Area and it is assumed that it will continue at a similar rate as has occurred in the past. Private lands are governed under state forestry regulations, and as such receive a different level of protection than federal lands. Analysis of

effects from private timber harvest generally considers the worst case scenario (i.e. all suitable forested lands would be logged at about 60 year tree-growing rotations) with regeneration harvest and road building as the predominate effects. As derived from air photo interpretation, currently approximately 4,029 acres of private timberland within the Analysis Area is predominantly 60 years old or older and may be available for harvest. The drainages with the highest percentage of those acres are 0515, 0521, 0630 and 0633 which contain 488 acres (19 percent of drainage), 639 acres (16 percent of drainage), 390 acres (16 percent of drainage) and 785 acres (44 percent of drainage) respectively.

A small amount of commercial timber harvest and non-commercial thinning on federal land (BLM) is anticipated to occur. The MC Thin timber sale within the Conde Creek drainage entails commercial thinning and post-harvest fuels reduction activities on 178 acres. Other thinning activities (Pine Plantation Thinning Project and Young Stand Management) are planned for up to 505 acres in various locations across the Analysis Area. No new road construction is proposed and canopy cover would not be reduced below levels of concern with any of these activities, therefore no appreciable synergistic effects are anticipated. There are no reasonably foreseeable future actions proposed for Forest Service or Bureau of Reclamation managed lands within the Analysis Area.

The Pacific Connector Gas Pipeline is approximately 234 miles, and is designed to transport natural gas from the Jordan Cove Energy Project (JCEP) terminal to a proposed Liquefied Natural Gas terminal in Coos Bay. The proposed centerline for the gas pipeline would cut across the northern ridgetop of the Analysis Area. If this occurs, short-term effects from road use and ground disturbance along with longer term canopy cover reductions would result. The BLM is processing the right of way request over BLM-administered lands; the Federal Energy Regulatory Commission (FERC) is the lead agency for preparing the Environmental Impact Statement (EIS) for the project. A new Draft EIS was published in November, 2014 and the new Final EIS is scheduled to be published in September 2015.

a. Alternative 1 - No Action

No actions are proposed under Alternative 1 (No Action); therefore direct and indirect effects of choosing this alternative would be that the current conditions in the Analysis Area, which are the result of past actions not related to the South Fork Little Butte Project, would persist. Alternative 1 describes the anticipated effects of not implementing an action at this time.

Under Alternative 1, there would be no changes in percent of BLM-administered forest lands with canopy cover less than the historic level, areas of compacted soil, and road densities. Therefore, there would be no change to the potential of increasing the magnitude and frequency of peak flows on BLM-administered lands.

Past events in the Analysis Area that currently have the potential to influence peak streamflows and increase erosion rates include grazing, timber harvesting, wildfire, road construction, OHV use, and land development. These activities potentially influence peak streamflows and water yield through canopy removal, soil compaction, or drainage network alteration, while roads, ground disturbance and wildfire can elevate sediment yields. Risk assessments for potential increased peak flows and sediment consider the effects of these past actions in their methodology. For example, areas previously harvested are included in the analyses of canopy cover (Table 3-12). There have been no major wildfires within the Analysis Area in the last 30 years.

Although many factors are involved, with no stand management on BLM-administered lands a high intensity wildfire over part or all of the area may be more likely to occur and possibly attain a larger size. Should this happen, it could drastically alter the surface water and groundwater regime. Immediately after a severe fire, the loss of vegetation would make more groundwater available for streamflow and low summer flows would likely increase. However, the absence of vegetation may also result in an increased risk of higher peak flows. In a relatively short time vegetation would reestablish and less water would be available for summer flow. It would take a longer period of time for vegetation to recover sufficiently for peak flows to return to

their normal range. A high severity fire could also reduce or eliminate riparian vegetation and expose large areas of bare soil to the erosive forces of rainfall, likely increasing soil erosion and sedimentation.

Although it's difficult to project, the lack of vegetation management on BLM-administered lands may increase the likelihood of a wildfire escaping initial containment, and under the right conditions, lead to a high intensity fire over part or all of the area. A high intensity fire would be a concern for potential increases in the magnitude and frequency of peak streamflows and increased sediment delivery should one occur.

Under Alternative 1, there would be no immediate change in existing water quality on BLM-administered lands. Roads in the area would be sporadically maintained but not upgraded and would continue to influence runoff and to a lesser extent, groundwater flow. In the long-term, roads with improper drainage and/or that are poorly located are more likely to chronically deliver sediment to channels, modify flow, and experience road failures during extreme precipitation events. Surface erosion from roads would be expected to remain a concern, and the risk of sediment inputs to streams would be expected to remain relatively constant. Since there would be no road closures or decommissioning there would be no action to decrease road densities or interactions with streams and resource impacts attributed to road and OHV use, particularly within Riparian Reserves, would continue.

Reasonably foreseeable future actions planned on BLM-administered lands in the Analysis Area include a small amount of commercial timber harvest and non-commercial thinning. As previously mentioned, no new road construction is proposed and canopy cover would not be reduced below levels of concern with any of these activities, therefore no appreciable additional effects are anticipated.

Other foreseeable future actions planned on BLM-administered lands in the Analysis Area include routine road maintenance activities and continued livestock grazing. Reasonably foreseeable future livestock grazing would likely continue to negatively affect water quality by increasing turbidity/sedimentation through streambank disturbance and riparian vegetation removal; although gradual improvements are anticipated as a result of potential measures incorporated into upcoming lease renewals for expired allotments (see Rangeland Resources/Grazing section).

Under reasonably foreseeable future actions, it is assumed that private forest lands would continue to be intensively managed for timber production, although unlikely, would be harvested within the next 10 years. The actual timing of any timber harvest on private land is dependent on many factors, including valuations based on supply/demand, ownership, etc. It was assumed that canopy cover would be zero percent after the reasonably foreseeable future timber harvest on private lands.

In the longer term, climate change projections indicate that the West and Pacific Northwest are likely to experience continued warming and increased precipitation along with more extreme wet and dry years (Furniss, et al. 2010). As a result, hydrologic changes, particularly the changes in snowpack and runoff patterns are among the most prominent and important consequences. Declines in snow water equivalent occurring in low and mid-elevation sites may result in earlier spring flows and lower late season flows. Changes in average annual streamflows are also expected to decrease. Flood severity is expected to increase because increased interannual precipitation variability will cause increased runoff in wet years and increased rain-on-snow probability in low elevation snowpacks.

Given these impacts, effective climate change adaptation strategies will need to focus on maintaining watershed resiliency.

b. Alternative 2 – Proposed Action

Direct and Indirect Effects

This alternative proposes treating forest stands utilizing a variety of silvicultural prescriptions. A total of 1,676 acres are proposed for commercial harvest. An additional 1,553 acres are proposed for non-commercial treatments, of which 741 acres are within commercial harvest units and 812 acres are strictly non-

commercial stands. Harvest methods include ground-based, cable, helicopter, and bull-line, with the majority (1,005 acres) proposed for ground-based logging systems.

Within stands where canopy cover is currently 30 percent or greater, proposed treatments would not reduce canopy cover below that level. This would not result in appreciable reductions in canopy cover at the drainage scale (7th field). Since no harvest within Riparian Reserves would occur, stream temperatures would not be affected by the proposal and the project would be in compliance with both the Rogue Basin TMDL (ODEQ 2003b) and North and South Forks Little Butte Creek Key Watershed WQRP (USDI 2006a). Tractor yarding would be limited to designated skid trails, and generally slopes less than 35 percent. Eleven skid trails are proposed outside of treatment units. This is to allow access for harvest without constructing temporary roads. Designating skid trails and reusing old skid trails would reduce the area that would be compacted during logging operations. The use of a mechanical harvester would not cause any detrimental compaction because such equipment would only be used during dry soil conditions or on an eighteen-inch snow pack. Twelve new helicopter landings up to one acre in size could be constructed, including one on private land that is adjacent to a seasonal wetland. Following use, these landings would be treated by decompacting the surface, seeding, scattering slash and other debris, and closing or barricading the entrance. In addition, perimeter control as outlined in a special PDF (Roads and Landings, Objective 2 (5), p. 2-34) to avoid impacts would be required on the landing located near the wetland.

Where fuel treatments occur tree thinning and pile burning would retain a mix of hardwoods and conifers, organic duff layer, leaf litter, and coarse wood debris. Collectively these forest components provide nutrients, bacteria and fungi decomposers, and mycorrhizae to maintain long-term site productivity. Additionally, fuel treatments would likely occur over a period of years, distributing activity over time. These activities would not appreciably decrease canopy cover as only small diameter vegetation would be cut and piled.

Proposed transportation activities include temporary and permanent road construction, road maintenance, renovation, long-term closures, full decommissioning, and the installation of two temporary stream crossings and two temporary bridge installations.

A total of 0.80 miles of new permanent road construction and 3.04 miles of temporary road construction would occur. Of these 3.84 miles, 0.13 miles of permanent road and 0.64 miles of temporary road would be constructed in drainages outside the Analysis Area (see Analysis Area Description section). Temporary roads would be fully decommissioned by decompacting the surface, scattering slash and other debris, and blocking vehicle access after use. Hydrologic recovery would occur over time provided the closure is effective and vegetation becomes established. No road construction would occur within Riparian Reserves, which would reduce the likelihood of construction generated sediment reaching surface water.

As a result of the TMIA process, numerous road segments were identified and recommended for decommissioning, of which 4.05 miles of roads are proposed for full decommissioning and another 7.27 miles are proposed for long-term closure under this alternative. Full decommissioning would entail mechanically treating the road, or if there is currently an effective closure in place and the drainage is stabilized, the road would not be physically treated but fully decommissioned by removing it from the transportation system (i.e. natural decommissioning, p. 2-16). Long-term closure may entail stabilizing drainage, including removing culverts as necessary and installing features to restrict vehicle use. Of the miles proposed for full decommissioning, 1.66 miles of road has funding identified, while the remaining 2.39 miles of road would be decommissioned as funding becomes available.

Actions included in this alternative that have a high probability of affecting water quality through sediment delivery include landing construction and use; road use and maintenance; cable and tractor yarding; decommissioning; and road construction/renovation. Log hauling and associated road maintenance, which would entail ditch cleaning; road blading; and maintenance of drainage features, is of particular concern. The total miles of roads proposed for haul and potentially maintenance, including those outside the Analysis Area, is 122.28 miles. Log truck traffic, especially on unsurfaced roads, loosens the road surface and makes that material available for transport to channels. Also, wet season road use may be considered. When road

use and maintenance is performed improperly or best management practices (BMPs) are not implemented the potential for sediment delivery to streams increases dramatically, particularly during the wet season. Examples of maintenance practices that may increase sediment production include sidecasting material, undercutting cutslopes, improper disposal of material, and unnecessary disturbance within Riparian Reserves, particularly ditch blading. Luce and Black (1999) found no significant increase in erosion when only the road surface was treated; however, statistically significant erosion occurred when road ditches were bladed. Luce and Black (2001) observed an 87 percent decrease in erosion and sediment transport from roads in years one and two following road maintenance activities. With this proposal hauling, road maintenance, and stream crossing activities are expected to result in short-term increases in sediment and turbidity. However, if BMPs are implemented and maintenance activities are properly conducted, particularly during the wet season, these increases are expected to me minor.

Road construction and decommissioning has the potential to increase sediment production as well, especially on steep unstable terrain that is characteristic throughout much of the Analysis Area and where stream crossings are present. However, all new proposed roads, both permanent and temporary, are located on or near ridgetops or in areas where indicators of instability were not observed. This minimizes the potential for both road failures and delivery of sediment through new ground disturbance. Decommissioning activities posing a higher risk to water quality include culvert removal and channel reconstruction. Although proper implementation of PDFs and BMPs greatly reduces the magnitude of these effects, minor short-term increases in sediment and turbidity are possible. However, it is expected that long-term benefits exceeding any short-term impacts would occur. The amount of permanent new road construction (0.67 miles within the Analysis Area) proposed when compared to the existing road system, is minor in extent and would not measurably increase road density and the compacted area attributed to roads within the affected drainages, and more importantly within Riparian Reserves.

An indirect effect that is difficult to quantify is OHV use following harvest. In areas not already effectively closed by gates or other measures, OHV use of skid trails and other features such as previously closed roads has been observed. There is potential for an increase of unmanaged OHV trails which can lead to elevated sediment rates and adverse impacts to soils and other resources. These effects may persist over time. Within the Analysis Area, generally light use is occurring; however, acute and persistent effects are noticeable within some meadows in areas of mixed ownership and gentler topography. The probability that OHV use will increase as a result of this alternative is low, primarily because PDFs designed to discourage this type of use are included in this proposal. They include blocking and camouflaging main skid trails at landings and intersections with roads and effectively decommissioning all temporary roads.

Project Design Features and BMPs are designed to protect water quality and are integral in ensuring compliance with applicable State and federal statutes, such as the Clean Water Act (CWA). BMPs required for this project are contained in the Medford District Resource Management Plans (USDI 1995), and include newly revised road BMPs that were incorporated as part of an RMP update (USDI 2011a). With the proper implementation of PDFs and BMPs, there would be minor increases of sediment routed to stream channels, largely the result of road use and haul. Not considering temporary road construction, which would be fully decommissioned following use, this alternative provides for up to a net reduction of 3.25 miles of road within the Analysis Area, depending on the availability of funding. At a minimum, a net reduction of 1.66 miles of road would occur. The elimination of these sources of both chronic and episodic sediment would result in a likely minor but long-term reduction of sediment delivery to channels within the Analysis Area. Also, since no appreciable reduction in canopy cover less than 30 percent will occur, there is little probability the proposal would modify the magnitude or timing of peak or base flows.

In the long-term, climate change projections indicate that the West and Pacific Northwest are likely to experience continued warming and increased precipitation along with more extreme wet and dry years (Furniss, et. al. 2010). As a result, hydrologic changes, particularly the changes in snowpacks and runoff patterns are among the most prominent and important consequences. Declines in snow water equivalent occurring in low and mid-elevation sites may result in earlier spring flows and lower late season flows. Changes in average annual streamflows are also expected to decrease. Flood severity is expected to increase

because increased interannual precipitation variability will cause increased runoff in wet years and increased rain-on-snow probability in low elevation snowpacks.

Given these impacts, effective climate change adaptation strategies will need to focus on maintaining watershed resiliency. Under this alternative, although some of the BLM-administered lands have been treated to reduce fuel amounts and continuity, additional vegetation and fuels treatments under limited circumstances may decrease the likelihood a high intensity wildfire occurring over part or all of the area. This would maintain or slightly improve watershed resiliency as would a reduction in road densities. However, given the uncertainty in climate models and predicted effects on a site specific scale, it is difficult to make accurate statements pertaining to this alternative's effect on climate change and resultant impacts.

Increased road density, particularly with Riparian Reserves, can increase the potential for sediment delivery to stream channels. Road densities are considered moderate to high in all drainages, particularly within Riparian Reserves. Alternative 2 would reduce road densities within the Analysis Area. This is consistent with recommendations specified in the Little Butte Creek Watershed Analysis (USDI and USDA 1997) regarding decommissioning roads to meet ACS and Riparian Reserve objectives. This alternative includes decommissioning portions of roads located within Riparian Reserves. Under this alternative, all new road construction occurs high up in the drainages outside of Riparian Reserves and avoids unstable areas. New roads would be outsloped to eliminate concentrating runoff. There would be no direct connection to stream channels. It is expected that sediment production from new road construction would be short-term and would not likely reach surface water. Alternative 2 includes fully decommissioning 4.05 miles of road in the Analysis Area and would result in a net reduction of at least 1.66 miles, and possibly up to 3.25 miles within the Analysis Area. More importantly, at least 0.03 miles and up to1.97 miles of these are located within Riparian Reserves.

As described previously, there are a couple areas where minor amounts of the proposed actions occur in drainages (7th field HUCs) immediately adjacent to the Analysis Area. Approximately 0.74 miles (or 1.8 acres) of new road construction (about 0.13 miles of proposed Road 37-2E-5 (permanent) and about 0.34 miles of proposed temporary road Spur 17-1) is located within the Lake Creek (0706) drainage just outside the 0636 and 0639 drainages. These proposed roads are located near ridgetops and/or on relatively flat topography. Changes in road densities and canopy cover within the Lake Creek drainage would be minor and would not negatively affect peak flows or sediment production. Approximately 12 acres of commercial timber harvest using ground-based equipment (tractor) and about 0.30 miles (or 0.7 acres) of temporary road construction is proposed in the 0115 drainage of the Jenny Creek Watershed just outside the 0509 drainage in the Analysis Area. Changes in road densities and canopy cover within this drainage would also be minor and would not negatively affect criteria used to assess potential changes in peak flows or sediment production.

Overall, Alternative 2 does not reduce canopy cover below critical thresholds or result in appreciable increases in road density. These would be the primary catalysts that may trigger synergistic responses. The proposal does not appreciably decrease canopy cover within the TSZ and will not result in peak flow increases. Sediment production resulting from road use and construction may increase in the short-term. In many cases riparian vegetation vigor would improve over time, thus potentially decreasing stream temperatures.

Cumulative Effects

As described in the affected environment section, impacts from roads, recreation, and past logging has altered watershed processes in the upper drainages of the Analysis Area. In the lower stream reaches of the drainages in the Analysis Area grazing, roads, residential development, channel alteration, and water diversions are responsible for degraded aquatic processes and conditions. This mix of impacts is typical of many of the drainages that are tributary to South Fork Little Butte Creek.

It is expected that reasonably foreseeable future actions including rotational harvest on private industrial timberlands that maintain forest conditions in an early- to mid-seral condition (USDI 1995) and land disturbance attributed to development of private lands will continue. An estimated 4,029 acres of timber is

potentially available for harvest on private lands within the Analysis Area (Table 3-14). Under the reasonably foreseeable future timber harvest on private forest lands, there would be increases in seven drainages where values currently below the threshold of 30 percent would be exceeded[3].

Table 3-14. Reasonably Foreseeable Future Timber Harvest on Private Forest Lands.

Analysis Area	Reasonably Foreseeable Future Harvest on Private Forest Lands		
	Acres	Current Percent Canopy Cover Less Than 30%[1]	Percent Canopy Cover Following Private Harvest[2]
0509	159	38	41
0515	488	39	58
0521	639	21	37
0603	83	4	11
0606	72	20	24
0609	87	29	31
0612	0	18	18
0615	84	28	33
0618	93	15	25
0621	131	24	28
0624	486	26	40
0627	396	23	32
0630	390	17	33
0633	785	6	50
0636	118	61	65
0639	18	50	51

1/ Includes all ownerships.
2/ Assuming all private forestland greater than 60 years is harvested close to the same time.
3/ Bold indicates drainages that may be at elevated risk after private harvest excluding drainages already exceeding 30 percent prior to harvest.

Activities on BLM-administered lands will likely continue to focus on commercial thinning for forest health and fuels reduction projects. Some recovery is expected to occur as previously harvested areas within Riparian Reserves improve shade and large wood recruitment. Grazing impacts on private lands will likely continue to occur at near present levels.

Drainages that may be at an elevated risk of experiencing adverse cumulative effects typically have both high road densities and large percentages of canopy cover less than 30 percent. Drainages with large percentages of private land with forested stands greater than 60 years old were also included in this analysis. Although unlikely, if all those acres were reduced below 30 percent canopy cover within ten years, some drainages would be at levels where potential cumulative impacts may be magnified. This alternative does not elevate the potential for cumulative effects beyond those that may be currently occurring.

Although there are both natural and human induced risk factors for cumulative effects, this alternative is not expected to increase these within the Analysis Area drainages, or the larger sub-watersheds.

c. Alternative 3

Direct and Indirect Effects

The primary difference affecting water resources between Alternative 3 and Alternative 2 is that no new permanent or temporary road construction is proposed. In addition, there are less harvest acres (716 acres less) and fewer road mileages (13 miles) proposed for timber haul.

Alternative 3 proposes treating forest stands utilizing a variety of silvicultural prescriptions. A total of 960 acres are proposed for commercial harvest. An additional 1,133 acres are proposed for non-commercial

treatments, of which 514 acres are within commercial harvest units and 619 acres are non-commercial stands. Harvest methods include ground-based, cable, helicopter, and bull line, with the majority (643acres) proposed for ground-based logging systems. Tractor yarding would be limited to designated skid trails, and generally slopes less than 35 percent. Seven skid trails are proposed outside of treatment units. This is to allow access for harvest without constructing temporary roads.

Anticipated effects of implementing Alternative 3 are the same as described for Alternative 2, with the exception of effects described for road construction, and the amount of short-term increases in sediment and turbidity resulting from hauling and road maintenance would be less. In addition, Alternative 3 would reduce road mileage in the Analysis Area slightly more than Alternative 2 (net reduction of 4.05 miles versus 3.25 miles).

Cumulative Effects

Cumulative effects discussion for Alternative 2 is also applicable for Alternative 3. Although there are both natural and human induced risk factors for cumulative effects, Alternative 3 is not expected to increase these within the Analysis Area drainages, or the larger sub-watersheds.

F. AQUATIC HABITAT & FISH

1. Introduction

The proposed South Fork Little Butte Forest Management Project would be located in the south central portion of the Little Butte Creek 5th field Watershed, in the Rogue River Basin. For the fisheries analysis, areas will be discussed by major catchment, defined by areas that drain to distinct fish bearing streams. This area will henceforth be referred to as the Analysis Area for aquatic resources. In the South Fork Little Butte Project, the Analysis Area catchments from west to east are Lost Creek, which includes the named channels of Charlie and Harrison Creeks, Deer Creek, Soda Creek, Dead Indian Creek, which includes the named channel of Conde Creek, and the South Fork of Little Butte Creek itself between its mouth near the town of Lake Creek and the confluence of Dead Indian Creek (Map 3-6). The South Fork of Little Butte Creek is the primary tributary to Little Butte Creek. All project elements proposed in the South Fork Little Butte Project would occur within these analysis catchments except for 12 acres of one tractor unit, and approximately 0.3 mi of new temporary road construction to access the unit, would cross over a drainage divide and into the adjacent Jenny Creek Watershed. These activities would occur near the ridge top, would not include any stream channels and would be hydrologically disconnected from aquatic habitats, and would have no causal mechanism to impart any impacts to aquatic habitat; therefore, they will not be discussed further in this analysis. Additionally, a limited amount of road construction, road maintenance, and log haul would occur in the Lake Creek catchment (adjacent and to the west of Lost Creek). This area will be analyzed for road work and haul only.

Little Butte Creek is not included within the Analysis Area, but the Little Butte Creek Watershed as a whole will be discussed in this analysis, as the Northwest Forest Plan requires that Aquatic Conservation Strategy Objectives (USDA and USDI 1994, Appendix B) be analyzed at the site, drainage, and 5th field watershed scales. However, the primary focus of this analysis will be on the previously mentioned Analysis Area catchments (the site and drainage scales), as it is in these particular streams that potential effects to fisheries resources from this project would be discernable.

2. Issues

Aquatic habitat- and fish-related issues associated with the South Fork Little Butte Project have been identified through public scoping or interdisciplinary team specialists and will be addressed in this document. These relevant issues are:

- Riparian areas and instream aquatic habitats in the watershed and Analysis Area catchments are currently degraded from a host of past and ongoing activities, particularly, but not limited to the following:

- Rural residential and agricultural development, especially along the main channel of the South Fork Little Butte Creek, which has resulted in reduced riparian corridors, reduced floodplain connectivity, and reduction in both water quantity and quality.
- Demands for water use have led to: construction of dams which may obstruct fish passage; some streams in the watershed being over allocated; and altered stream flow regimes.
- Extensive road construction has created high road densities and led to increased sediment inputs to aquatic habitat.
- Historic and ongoing grazing has resulted in increased erosion and sediment transport to many stream reaches.
- South Fork Little Butte Creek, Soda Creek, Indian Creek, and Lost Creek are considered critical habitat for coho salmon, listed as threatened under the Endangered Species Act (ESA) of 1973. The South Fork Little Butte Creek Watershed is also designated as a Tier 1 Key Watershed for the recovery of at risk stocks of fish. The Planning Area is located entirely within the South Fork Little Butte Creek Key Watershed. There is concern that increased sedimentation from the implementation of the project proposal could potentially impact fish habitat and the recovery of fish populations in the South Fork of Little Butte Creek.
- There is potential for short-term effects to water quality from increased sediment produced from disturbance associated with the combination of timber harvest activities, new road construction, road decommissioning (mainly mechanical method), road renovation, and log hauling activities.
- Areas of unstable geology exist, particularly in Deer Creek, which has suffered several recent debris torrents. Increased forestry operations have the potential to trigger or exacerbate future mass wasting events. Debris torrents, landslides, and increases in channel erosion resulting from increased peak flows are examples of mass wasting events capable of delivering many tons of sediment into aquatic habitat rapidly, to the detriment of aquatic organisms and their habitat.
- Past timber harvest has reduced riparian canopy cover and the potential for large wood recruitment, and led to large canopy openings throughout the Planning Area including openings within the transient snow zone (TSZ) where rain-on-snow events may have resulted in enhancements to peak flows within some of the Analysis Area catchments. New openings created by timber harvest or new road and landing construction may alter the magnitude and timing of future peak flow events.
- Logging (particularly tractor yarding) and road and landing construction could increase soil compaction, and alter hydrologic flow, including peak flow and low flow.
- Sediment and turbidity levels in each of the Analysis Area streams are elevated, and all streams have been listed by the Oregon Dept. of Environmental Quality (ODEQ) for failing to meet water quality standards set for sediment. This situation is compromising the function and health of both the stream system and populations of aquatic organisms. Furthermore, every Analysis Area fish bearing stream, except for Deer Creek, is listed for exceeding water temperature standards.
- The effects of timber harvest and road construction, when combined with other past, ongoing, and reasonably foreseeable future actions on public and private lands, could potentially contribute to adverse cumulative effects to aquatic habitats and associated organisms.
- Any increased sedimentation to streams from the implementation of the project proposal could potentially impact aquatic habitat and fish.

3. Endangered Species Act and Coho Critical and Essential Fish Habitat

In 1997, the Southern Oregon/Northern California Coasts (SONCC) Evolutionary Significant Unit (ESU) of coho salmon (*Onchorynchus kisutch)* was listed as “threatened” with the possibility of extinction under the Endangered Species Act (ESA) by the National Marine Fisheries Service (NMFS). SONCC coho are known to occur in the South Fork Little Butte Creek and several of its larger tributaries, including lower portions of Lost Creek, Soda Creek, and Dead Indian Creek.

On May 5, 1999, NMFS designated Coho Critical Habitat (CCH) for SONCC coho salmon. Critical habitat includes "all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers." It further includes "those physical or biological features essential to the conservation of the species and which may require special management considerations or protection...", including all historically accessible waters (F.R. vol. 64, no. 86, 24049). CCH is broken into occupied CCH, habitat known to support Coho based on observation or historical records, and unoccupied CCH, which is habitat that is assumed to be capable of supporting populations of coho should the species be recovered. The upper distribution of unoccupied CCH is often determined by fisheries biologists, using available information and professional judgment to make an educated estimate of where Coho could have historically been present. Determinations are usually based on stream conditions (such as stream size, gradient, presence and nature of natural barriers such as waterfalls, etc.). Lacking information regarding historical distribution of coho salmon, and in the absence of natural fish migration barriers, fisheries managers often consider unoccupied CCH to include stream reaches known to be accessible to other migratory fish, particularly to steelhead. This document will consider CCH to include all waters known to be accessible to steelhead trout, which includes the South Fork Little Butte, Lost Creek, Deer Creek, and short reaches on Soda Creek and Dead Indian Creek, which have large natural barrier falls located a little upstream of their mouths.

Essential Fish Habitat (EFH) has been defined by NMFS as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This definition includes all waters historically used by anadromous salmonids of commercial value (in this instance, coho salmon). EFH within the Analysis Area is identical to CCH. More information regarding EFH may be found at:
http://www.habitat.noaa.gov/protection/efh/howweprotect.html

4. Riparian Reserves

Under the Northwest Forest Plan, Riparian Reserves (RRs) were established on all stream channels displaying annual scour and deposition located on federal lands. Areas of unstable/potentially unstable ground are also managed as RRs. Riparian Reserve widths have been identified as 300 feet or twice the length of a site-potential tree (whichever is greater) for fish bearing streams, 150 feet or the length of one site potential tree for non-fish bearing perennial streams, and 100 feet or the length of one site potential tree for intermittent streams. Widths are measured as slope distance from the edge of the stream, and are applied to both sides of the channel. Site potential tree heights are 165 feet on BLM-managed lands in the Analysis Area catchments. These Riparian Reserve widths are in accordance with the Medford District Resource Management Plan (RMP) (USDI 1995). The primary function of Riparian Reserves is to provide shade and a source of large wood inputs to stream channels. Additionally, they are a source of nutrient inputs to the aquatic ecosystem, they provide bank stability, maintain undercut banks that offer prime salmonid habitat, and provide habitat for a diverse range of other aquatic and terrestrial organisms (Meehan 1991).

5. Aquatic Conservation Strategy

The Aquatic Conservation Strategy (ACS) was developed to restore and maintain ecological health of watersheds and aquatic ecosystems on public lands. It includes nine objectives, which guide BLM's management of Riparian Reserves. These objectives are examined at the site (e.g. a single pool or stream reach), HUC 7 (drainage) and HUC 5 (large watershed) scale. The nine objectives and effects from implementation of the Proposed Action (Alternative 2) are presented in Appendix B of this document.

6. Foreseeable Future Actions

This section presents other activities proposed in the foreseeable future, within the Aquatic Analysis Area, that may add cumulative impacts to fisheries resources on top of anticipated impacts resulting from the South Fork Little Butte Project. Anticipated direct and indirect affects to fisheries resources will be described from each action. For any foreseeable future action determined to have any anticipated effects to aquatic habitat, the cumulative effect of the action coupled with effects from the South Fork Little Butte Project will be discussed at the end of this analysis.

Federal Timber Harvest

Timber sales awarded under the Heppsie (EA #DOI-BLM-OR-M060-2012-0017-2REA) and Rio Climax (EA #DOI-BLM-OR-M060-2011-0010-REA) Forest Management Projects are currently ongoing. These sales are occurring in catchments adjacent to the proposed South Fork Little Butte Aquatic Analysis Area, within the greater Little Butte Creek Watershed. Effects anticipated to result from these projects included small periodic inputs of sediment into headwater channels draining Heppsie Mountain (North Fork Little Butte catchment) which would result in undetectable or biologically meaningless inputs at the their confluences with the North Fork Little Butte Creek. Analysis for the Rio Climax Project determined that log haul and new road construction would have a high likelihood of contributing sediment to Antelope Creek and Lake Creek, but that direct inputs of fine sediment resulting from haul would be of insufficient magnitude to meaningfully affect fish or fish habitat. Inputs from new road construction would occur in areas or during times (turbidity pulse during flood event) that are not anticipated to measurably impact fish habitat, and hence would result in either undetectable or biologically meaningless inputs at their outlets with Little Butte Creek. Because neither of these projects would result in sediment effects detectable at the sub-watershed scale, they would not contribute cumulative sediment effects to the Little Butte Creek Watershed.

The MC Thin timber sale, analyzed under the Conde Forest Management Project (EA # DOI-BLM-OR-M060-2012-0002-REA**),** is an ongoing timber sale within the South Fork Little Butte Aquatic Analysis Area, specifically in the Conde Creek portion of the Dead Indian analysis catchment. No project elements proposed in the MC Thin timber sale are expected to contribute any negative effects to aquatic habitat due to lack of overall hydrologic connectivity between project elements and the aquatic system, location of the project and flat and stable ground, small scale of the project, and design features which restrict project activities to either dry or frozen conditions. The MC Thin timber sale would not have the potential to contribute cumulative sediment effects to aquatic habitat.

Canopy cover would remain within the range of natural variability within harvested units for all three of these federal timber projects, and therefore they would not affect peak flows. All three projects incorporated full width Riparian Reserves, and therefore water temperatures would not be affected.

Private Timber Harvest

Future timber harvest on private lands would likely occur within the Analysis Area. The Water Resources section above addresses future timber harvest on private lands, and assumes that it will continue to occur at a similar rate as has occurred in the past, with similar affects to aquatic habitats. Private lands are governed under state forestry regulations, and as such receive a different level of protection than federal lands. Analysis of effects from private timber harvest generally considers the worst case scenario (i.e. all suitable forested lands would be logged at approximately 60 year tree-growing rotations). At the time of this writing, it was apparent that a large unit on private industrial timber is being laid out presumably for upcoming active logging in the Deer Creek catchment. This unit has been incorporated into the cumulative effects analysis for timber harvest conducted for the peak flow analysis, and is reflected in the total acreage of non-hydrologically recovered ground. The cumulative effects analysis will assume that all suitable (60 years of age or older) timber stands on private lands will be harvested. The analysis also assumes that, in general, harvest rates on private lands will continue as in the past, and that the amount of disturbance to aquatic systems as a result of this harvest will continue similar to present rates, helping to maintain degraded aquatic habitats.

Pacific Connector Gas Pipeline

A large liquefied natural gas pipeline is proposed by a private corporation that would traverse the area. Within the South Fork Analysis Area, the proposed pipeline location would be on the spine of the drainage divide between the North and South Forks of Little Butte Creek, near Heppsie Mountain. The proposed Rright-of-way of the pipeline would not cross any stream channels, dry draws, or Riparian Reserves within the Aquatic Analysis Area, would have no hydrological connectivity with any aquatic habitats in the Analysis Area, and therefore would not contribute cumulative impacts to fish or aquatic habitat within the Analysis Area.

Grazing

Cattle grazing is widespread throughout both the Analysis Area catchments and in the larger watershed, both on private and BLM-managed lands. Several allotments on BLM-managed lands are up for renewal. The lease renewal process utilizes standards and guidelines which consider effects to aquatic habitat, therefore, at a minimum, it is anticipated that no additional degradation to aquatic habitat would result from renewal of the allotments which overlap with the South Fork Little Butte Analysis Area catchments. A more likely result of the renewal process would be a reduction of impacts, which could be accomplished by such measures as reducing the number or duration of livestock grazing, riparian exclusion, providing off-site water, etc. At present, specific management plans for area allotments have not been fully developed at this time, so this analysis will assume that cattle grazing will continue across all ownerships as at present. Cattle grazing in sensitive riparian areas will continue to impact water quality, with chronic episodic inputs of sediment and turbidity occurring to stream reaches adjacent to destabilized and trampled banks. Small springs and seeps are particularly vulnerable to degradation, as these areas often contain suitable browse along with a reliable water source, which both attracts and concentrates cattle to these areas. In areas lacking a large overstory component, cattle grazing of riparian vegetation can also add to stream temperature warming.

7. Affected Environment—Fish and Designated Habitat

This section presents baseline conditions in the Little Butte Creek Watershed and within the Analysis Area specifically.

Little Butte Creek Watershed

SONCC coho salmon, fall Chinook salmon (*O. tshawytscha)*, summer and winter steelhead (*O. mykiss*), and Pacific lamprey (*Entosphenus tridentata)* are native migratory fish species present in the watershed. Chinook distribution includes the mainstem of Little Butte Creek from its mouth to the confluence of the South and North Forks of Little Butte Creek, at which point they begin to diminish, in part due to passage barriers downstream which hinder their upstream migration. Coho and steelhead occur far up both forks, and are also present in many of the larger tributary streams in the watershed, including Dead Indian Creek, Soda Creek, Lost Creek, Lake Creek, and Antelope Creek. In the Analysis Area catchments, coho have been described as currently present up to river mile 2.4 in Lost Creek, mile 0.9 in Soda Creek, mile 0.6 in Dead Indian Creek, and are present in the South Fork of Little Butte Creek in its entirety through the Analysis Area. Steelhead presence extends further upstream in all of these streams, and they are present in Deer Creek as well (see Table 3-15 below).

Cutthroat trout (*O. clarkii*), sculpin (*Cottus spp.*), Klamath small-scale sucker (*Catostomus rimiculus*), and rainbow trout (*O. mykiss*) are native fish species present in the watershed that do not migrate to the ocean. Distribution of most of these species extends well upstream in both forks of Little Butte Creek. Cutthroat and rainbow trout are typically found the farthest upstream.

A host of introduced fish species are also present in the watershed, including brook trout (*Salvelinus fontinalis*), and warm water species, such as redside shiners (*Richardsonius balteus*), largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), yellow perch (*Perca flavescens*), and common carp (*Cyprinus carpio)*. The warm water species are primarily found in watershed impoundments located downstream of the Analysis Area, and in the slower and warmer water areas in lower reaches of mainstem Little Butte Creek. The brook trout reside in the headwater stream reaches at higher elevations, including the South Fork Little Butte Creek upstream of the Analysis Area, and in Lost Lake and adjacent reaches of Lost Creek.

Little Butte Creek is used as a migratory corridor for adult and juvenile Coho and steelhead to access their primary spawning and rearing habitats located in the larger tributaries. Fall Chinook salmon are mainstem spawners and utilize suitable spawning locations in Little Butte Creek. Some steelhead and coho likely also spawn in the mainstem, especially during periods of low flow when access into spawning tributaries is difficult. Both forks of Little Butte Creek and the larger tributaries (Antelope, Lake, Lost, Deer, Soda, and

Dead Indian Creeks) are utilized as spawning and rearing habitat for coho, steelhead and resident trout species. Little Butte Creek is considered occupied CCH to well up both forks (http://www.streamnet.org/). Table 3-15 and Map 3-8 display fish and fish habitat distribution within the South Fork Little Butte Analysis Area.

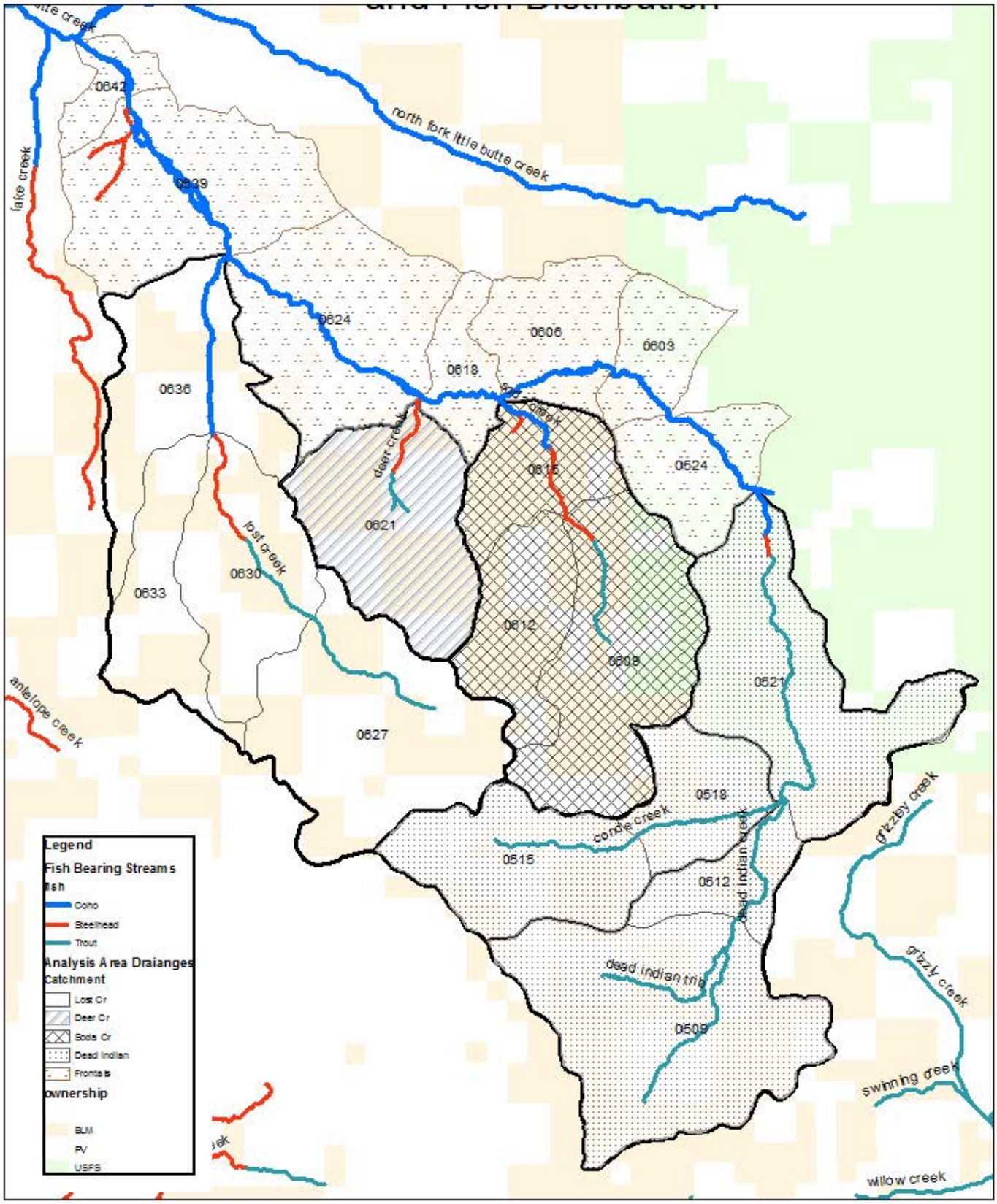
Table 3-15: Known and assumed historic salmonid and habitat distribution, by river mile, in the streams draining the South Fork Little Butte Analysis Area. Miles have been round to nearest tenth.

Catchment	Coho[1]	Steelhead CCH/EFH[2]	Trout
Lost Creek	2.3	3.5	7.4
Deer Creek	0	0.9	1.6
Soda Creek	0.9	2.6	4.1
Dead Indian Creek	0.4	0.7	15.9
South Fork & Frontals	16.5	18.6	18.6
Total Fish/habitat Miles	**20.1**	**26.3**	**47.6**

1 Current observed/recorded distributions.

2 Assumed historic distribution, based on best available information.

Map 3- 8: Fisheries Analyis Area catchments and fish distribution for the South Fork Little Butte Project



8. Environmental Consequences - Fish and Designated Habitat

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 South Fork Little Butte Project. Discussion for Alternatives 2 and 3 reflects the direct and indirect impacts of the proposed actions for each alternative. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable.

a. Alternative 1 - No Action

The No Action Alternative will have "*No Effect*" to fish populations or distribution, SONCC coho salmon, CCH, or EFH, as no ground disturbing activities would occur under this alternative. Affects already occurring to fish habitat as a result of past and ongoing activities are presented in the Aquatic Habitat and Riparian Reserve sections following.

b. Alternatives 2 and 3

The BLM has chosen to consult on Alternative 2, as this alternative would equate to the greatest level of disturbance, and hence have the highest likelihood of affecting listed fish and their habitat. BLMs Fisheries Biologist determined that Alternative 2 would be a "*May affect/Not Likely to Adversely Affect*" SONCC Coho salmon, CCH, and EFH in the South Fork Little Butte Creek Analysis Area catchments. This determination was made upon anticipated affects to aquatic habitat that can indirectly affect fish, and are described in this EA and the Biological Assessment (BA) prepared for NMFS for the South Fork Little Butte Creek Project. Informal consultation on this project was completed in March of 2015. Effects to aquatic habitat were determined to be of insufficient magnitude and of a nature to not meaningfully impact aquatic habitats in fish bearing channels. Though not consulted on, Alternative 3 would also be a "*May affect/Not Likely to Adversely Affect*" as effects to fish and aquatic habitat would be very similar, though of slightly lesser magnitude than is anticipated for Alternative 2.

9. Affected Environment - Aquatic Habitat

Little Butte Creek Watershed

Instream habitats in the Little Butte Creek Watershed as a whole can be described as degraded when compared to pre-European settlement conditions. Generally speaking, lower portions of the watershed have been impacted more so than upper portions, as lowland areas have been settled and developed extensively. Houses, businesses, and roads occur adjacent to much of the mainstem of Little Butte Creek and its major tributaries, resulting in narrowed and constrained riparian corridors. Confinement of the streams by roads and structures has resulted in a loss of habitat features as little natural stream channel meander remains; this has resulted in higher riffle to pool ratios, and a corresponding reduction in the amount of quality rearing habitat. Water quality is relatively poor in the mainstem of Little Butte Creek, which is plagued by elevated water temperatures, and subject to moderate to high levels of sediment and turbidity, as well as a suite of other water quality issues (see Water Resources section above). Water is withdrawn for agricultural purposes from many of the streams in the lower watershed, exacerbating water quality/quantity issues during the summer months. The forks of Little Butte Creek and tributaries farther up in the watershed, though far from pristine, have been subject to less channel adjacent development, and as such contain greater habitat complexity which provides higher quality habitat for aquatic organisms. In general, water quality is better in these stretches, though water temperature and sediment/turbidity problems are pervasive through many of these stream reaches as well.

Many miles of road have been constructed in the watershed, and road densities in many of the sub-watersheds and drainages, including the Analysis Area catchments, are considered high (see Water Resources section above). Roads have contributed to sedimentation of instream habitat. The effects of fine sediment on aquatic organisms have been well documented; fine sediment (such as decomposed granitic sand and silt) in excessive amounts degrades stream and aquatic organism health. This sediment can fill in pools,

cover spawning gravels, and smother eggs (Meehan et al. 1991). Reduced substrate availability and complexity may decrease the diversity and quantity of aquatic organisms, upsetting the ecological balance of the stream system. Increased turbidity, which occurs when fine sediment becomes entrained in the water column, can disrupt feeding and territorial behavior of juvenile salmonids. This can lead to decreased growth rates and increased mortality. These effects may be far-reaching, and stream reaches many miles downstream of point-sources of sediment input (including downstream areas designated as CCH and EFH) have the potential to be negatively impacted (Meehan et al. 1991). The Little Butte Creek Watershed Analysis identified roads as the largest human impact to the watershed in terms of sediment delivery and negative effects to fish habitat (USDI and USDA 1997).

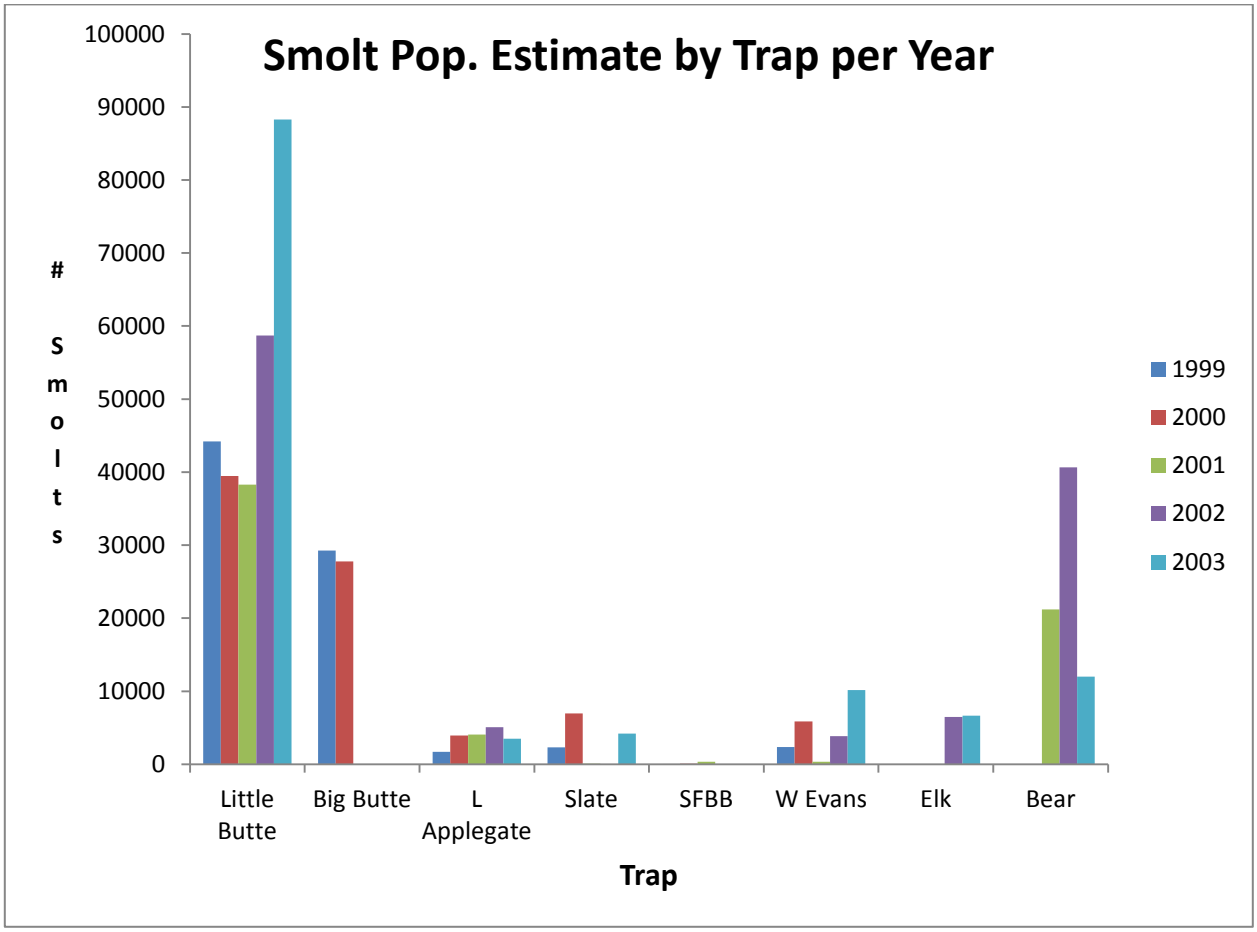
Upland areas of the watershed have been affected primarily by commercial logging and roads associated with harvest activities and cattle grazing. These activities have in the past and continue at present day to contribute to elevated levels of sediment delivery to aquatic habitats. Clearcutting large swaths of forested land is still practiced on private lands in the watershed. Some of the cuts have occurred in areas prone to large scale erosional processes; this coupled with an extensive road network which has a high degree of hydrological connectivity has increased the risk of events with potential to impact aquatic habitat. Recent examples of such events occurred in 2005 and again in 2011 when large debris torrents which appeared to initiate from recently clear-cut hillsides on private lands impacted several miles of aquatic habitat in the Deer Creek catchment.

Cattle grazing is widespread throughout the entire watershed, particularly in upper portions, both on private and federal lands. The primary effects to aquatic habitat from cattle grazing occur when cattle are concentrated for extended periods in sensitive riparian areas (i.e. those not armored by rocky banks or surrounded by dense vegetation), and are manifested as reduced riparian vegetation and bank stability and corresponding increases in water temperature and sediment inputs. Where cattle use is concentrated in streamside areas, they may contribute excessive nutrient and/or bacterial (such as fecal coliform, including E. coli) amounts to the aquatic system as well.

Off-highway vehicle (OHV) use has been documented as contributing to fine sediment deposition in portions of the watershed as well. OHV trails with connectivity to aquatic environments impact aquatic habitat in a similar fashion as roads. However, as OHV trails are typically user created natural surfaced trails with no thought given to their drainage capabilities, they can be particularly prone to rutting and subsequent transport of eroded particulates down the trail and towards aquatic habitat.

In spite of the myriad of issues affecting both water quality and aquatic habitat, Little Butte Creek remains a very productive stream, producing some of the highest numbers of salmon and steelhead smolts observed in the upper Rogue River basin (Figure 3-5). Recognizing this, extensive restoration efforts have occurred in the watershed over the last decade or so, and include the removal of barriers, the placement of large wood in many miles of stream, planting of riparian vegetation, obliteration of roads and OHV trails with hydrological connectivity, and exclusion of cattle from sensitive riparian areas.

Figure 3-5. Estimated Number of Coho and Chinnook Salmon, Steelhead Trout, and Lamprey Out-Migrants from Six Rogue Basin tributaries. Data from Smolt Trapping Project Conducted by ODFW and BLM in 1999-2003



South Fork Little Butte Creek

The mainstem channel of the South Fork of Little Butte Creek from its confluence with the North Fork of Little Butte Creek up to and including Dead Indian Creek drains all of the Analysis Area catchments. Through the Analysis Area it flows almost entirely through private rural residential and agricultural (primarily cattle grazing) lands, with the exception of less than a mile which flows through isolated BLM parcels. The South Fork upstream of Dead Indian Creek (above the Aquatic Analysis Area) drains forested lands managed almost exclusively by the U.S. Forest Service. Riparian corridors are absent or very narrow along most of the stream through the Analysis Area, and are generally intact upstream of the Analysis Area, with long reaches dominated by old-growth forest.

Water quality and quantity are the two biggest issues to aquatic organisms in the South Fork of Little Butte Creek. Numerous diversions reduce summer flows and significantly reduce the amount of habitat available for young fish, particularly in lower reaches of the creek (i.e. from the Soda Creek confluence downstream). For example, stream gage readings recorded on June 8, 2014 showed 28 cubic feet per second (cfs) of flow in the South Fork near the Soda Creek confluence, but less than 2 cfs at its mouth near the town of Lake Creek on that same date, a reduction of over 90 percent of stream flow in less than 8 stream miles.

This lack of water also exacerbates water quality issues, in particular summer stream temperatures, which are problematic due to the lack of mature riparian vegetation in the South Fork of Little Butte below the Soda Creek confluence. The stream is listed as exceeding summer water temperature standards by the ODEQ. Excessive sediment is also a major concern in the system, and the stream is listed throughout its length for sediment as well. Sediment inputs are pervasive throughout the whole system, resulting from a myriad of

sources, including natural erosion processes (the stream system is a high energy system, which possess high erosive potential), high road densities, and other management activities including cattle grazing in upland and valley bottom locations, and timber harvest operations in upland areas.

In spite of these problems, the South Fork of Little Butte Creek is among the highest producers of salmon and steelhead smolts in the Rogue Basin, and water quality and quantity issues notwithstanding, the system possesses attributes conducive to spawning and rearing by salmonids, and it is thought by ODFW that the bulk of coho production in the Little Butte Creek Watershed occurs in the South Fork. ODFW inventories (1994) for the South Fork documented that the reaches which flow through the Analysis Area are located in a wide low gradient valley characterized by a pool riffle stream system with a good ratio of pools (20-40 percent, depending on reach). Fine sediment levels throughout the surveyed reach (which extends well past the Aquatic Analysis Area) were in the undesirable range at 23 percent. In spite of this deficiency, surveyors commented that of all streams surveyed in the Little Butte Creek Watershed in 1994 the South Fork system was in the best condition. Repeat surveys conducted after 1994 surveyed reaches which were broken up considerably differently, but one reach surveyed in 2002 resurveyed a portion of one of the 1994 reaches and documented sediment levels of 12 percent. While this comparison is not an exact before/after, it may indicate that sediment levels improved somewhat between 1994 and 2002 within at least a portion of this particular reach.

Lost Creek

At 11,444 acres in size and composed of four 7th field drainages, Lost Creek is one of the largest tributaries to the South Fork of Little Butte Creek. BLM-managed lands include 47 percent of the catchment area and 54 percent (4 miles) of the fish bearing channels. There are a couple of rural residences in Lost Creek, and a few small parcels managed as active pasture by private, but the vast majority of the catchment is forested. As such, riparian corridors in Lost Creek are relatively intact. Lost Creek flows through a steep canyon, from approximate river mile 3.5 to mile 6.5, which includes Lost Lake and Lost Creek Falls. Above the falls the topography flattens out considerably on the Dead Indian Plateau. The main issues in the catchment are lack of water due to withdrawals for irrigation (private) and excessive fine sediment from a myriad of sources, most notably cattle grazing, which is prevalent throughout the catchment, but focused in the gentle topography found on the Dead Indian Plateau in the upper portions of the catchment. There is also evidence of past diversion ditch failures which would have resulted in large scale erosion and subsequent sediment input into the aquatic system. The stream is listed as water quality limited for exceeding both sediment and summer stream temperature standards.

ODFW conducted an extensive aquatic inventory of Lost Creek when surveyors assessed the instream aquatic habitat conditions of the lower 11 kilometers of the mainstem channel, including the natural slide formed Lost Lake (ODFW 1994). Of note surveyors documented that Lost Creek generally has a moderate gradient channel, a high pool-to-riffle habitat ratio throughout, and boulder, cobble and gravel dominated substrate. They also noted numerous log and debris jams. These are all characteristics that are indicative of good spawning and rearing habitat. However, surveyors also noted a high percentage of actively eroding banks, numerous landslides, and high levels of fine sediment (34 percent) throughout the length of the survey. Lost Creek has not been resurveyed since 1994, and current sediment levels are unknown but assumed to still be elevated. The high percentage of fines is likely a limiting factor to productivity of Lost Creek.

Numerous canals, some of them quite large, divert water out of channel, most of which winds up being used to irrigate pastures owned by a large private cattle ranch. A large portion of the water is diverted out of the Lost Creek catchment and into the adjacent Lake Creek catchment, where numerous reservoirs are filled annually to support ranch operations. Thus low summer stream flows, and resulting higher summer water temperatures, are also likely a limiting factor to productivity in Lost Creek.

Lost Creek includes a unique feature in the slide-formed Lost Lake at approximate river mile 5.3, which has been stocked with non-native brook trout in the past to provide sport angling opportunities. The lake likely captures and stores a fair amount of sediment produced in upper areas of the catchment. Generally speaking and water withdrawals notwithstanding, Lost Creek has been the least impacted of any of the Analysis Area

catchments, largely due to its rugged nature and relative inaccessibility. BLM implemented an instream large wood project in lower Lost Creek in 2011, placing roughly 50 pieces of large wood and root wads into the creek to increase/improve habitat complexity. Additionally, 0.5 miles of riparian roads, including one large stream crossing were obliterated in 2012 on BLM-managed lands.

Deer Creek

The Deer Creek catchment is 3,061 acres in size and includes only a single 7th field drainage. Fifty-five percent of the catchment is on BLM-managed lands, though only 33 percent of the fish bearing stream miles are on BLM. The entire catchment is in forested lands managed primarily for timber production, and in general, riparian corridors are intact. High sediment, mass wasting, and peak flow alterations are the primary aquatic habitat issues in Deer Creek.

ODFW aquatic inventories (1994) documented relatively high-gradient channels, low pool frequencies, and high (33 percent) amounts of fines sediment in Deer Creek. Surveyors noted high percentages of actively eroding banks, from 40-60 percent depending on the reach. There are areas of unstable geology in the catchment, and this, coupled with recent large scale clear cutting on private lands and extensive road building across steep slopes, has led Deer Creek to be the most impacted of any of the Analysis Area catchments. It has recently experienced two large debris flow events in its tributary channels, the first in 2005, and again in 2011, which scoured channels, caused the failure of numerous culverts, and resulted in considerable inputs of fine sediment from eroded road fill, but which also deposited many pieces of large wood. The torrents appeared to have originated from clearcuts and roads on private lands. Deer Creek is listed as water quality limited on the ODEQ 303(d) list for exceeding sediment standards.

Given Deer Creek's small size, steep gradient, and lack of pools, it is the least productive and has the least potential of the Analysis Area catchments for salmonids, a condition that would hold true regardless of the past and ongoing issues. Of note, it is the only Analysis Area catchment not listed for water temperature, perhaps a result of its relatively intact riparian corridor, or perhaps indicative of ground water influences. BLM obliterated 0.8 miles of riparian road, including four stream crossings in 2012 in the catchment.

Soda Creek

At 7,079 acres the Soda Creek catchment includes three 7th field drainages. The majority of the catchment is in federal ownership (62 percent BLM and 13 percent USFS), and 98 percent of the fish bearing stream miles are on BLM-managed lands. The stream flows through a relatively steep forested canyon for much of its length, where streamside vegetation is dominated by large conifers, and the stream is confined to a steep rocky channel. The upper third of the catchment is located on the flat Dead Indian Plateau where the nature of the stream and its upper tributaries change considerably to low gradient streams, including areas which flow through open meadows. Cattle grazing and timber management are the dominant land uses in the catchment, with the grazing concentrated in the upper portion on the Dead Indian Plateau. High fine sediment/turbidity levels and summer stream temperatures are the primary aquatic habitat issues in Soda Creek.

ODFW aquatic inventories (1994) which included 5.5 miles of the mainstem channel, characterized the stream as moderately steep gradient channel with low pool densities, and with substrate relatively evenly distributed between all size classes from fine sediment to bedrock, but that fine sediment levels averaged throughout were high at 34 percent. Subsequent surveys conducted on a reach of lower Soda Creek documented mush less sediment; 14, 19, and 10 percent in 1998, 2001, and 2007 respectively, suggesting that the high sediment problem may be improving. Casual observations conducted by BLM staff performing sporadic spawning surveys on 0.7 miles of lower Soda Creek suggest that though suspended fine sediment is habitually a problem in the stream, deposited fine sediment comprises only a small fraction of the substrate, which is dominated by bedrock and large boulders and cobbles. The stream gradient is high enough, and water velocities rapid enough, that it appears as if much of Soda Creek is a transport reach, not conducive to capturing and storing high amounts of fine sediment. Conversely, casual observations by BLM staff performing riparian grazing monitoring surveys suggest that Soda Creek and its tributaries in the upper third of the watershed (the Dead Indian Plateau) have very high levels of deposited fine sediment. Sources of

sediment include natural (clay soils, coupled with annual snow melt which results in transport of bared soils to upper reaches, and bank erosion due to the high stream energies in lower reaches), and those related to land management, most notably grazing of sensitive riparian areas, and roads.

Instream large wood tallies were in the low to moderate range in the first ODFW survey, but numbers have likely increased substantially since 1994, due to instream wood restoration projects (BLM put approximately 20 large pieces with root wads in the channel in 2008) and blow down events, several of which have occurred in the catchment since 1994. Other recent restoration in the catchment includes riparian plantings and cattle exclusion of some meadow areas in the upper catchment, and the obliteration of 0.3 miles of riparian roads, including one stream crossing.

Due to the relative inaccessibility, high percentage of fish habitat in federal ownership, good perennial stream flow, and the intact riparian corridor along its fish bearing reach, Soda Creek remains in relatively good shape aquatic habitat wise, and ranks high in priority among all the fish bearing streams on the Ashland Resource Area.

Dead Indian Creek

The Dead Indian Creek catchment is a large tributary system, comprised of five 7th field drainages, and encompassing 10,120 acres, of which only 36 percent are managed by the BLM. Only 25 percent (1 mile) of fish bearing streams are on BLM-managed lands in the catchment, and these are found exclusively on the Dead Indian Plateau. Forest Service lands include a good portion of the lower catchment. Dead Indian Creek is similar in nature to Soda Creek in that it flows through a steep canyon in its lower reaches and flattens out on the plateau, though much more of its catchment area-wise is located on the plateau than Soda Creek. Primary issues in Dead Indian Creek are water withdrawals, excessive sedimentation, and high stream temperatures.

ODFW did not perform large-scale aquatic inventories in Dead Indian Creek, and consequently there is little information available regarding conditions in lower portions of the catchment. Aquatic habitat in upper (surveyed) portions is typified by low gradient stream reaches which meander through wet, seasonally wet, and dry meadows, with sporadic stands of willow, aspen, and riparian brushy species present as the dominant shade providing vegetation adjacent to the channels interspersed with sporadic stands of timber. The quality of aquatic habitat within both Conde and Dead Indian Creeks has been reduced by several factors. Both systems suffer from excessive sediment input, primarily the result of widespread cattle grazing which occurs in many sensitive riparian areas in the Analysis Area. Stream surveys (USDI 1995 and 1998) found actively eroding streambanks along 55 percent of surveyed reaches in Conde Creek, and 46 percent in Dead Indian Creek. Streambank alteration (Cowley and Burton 2006) measurements of 33-49 percent were observed at two sites along Conde Creek. Repeated field observations show active erosion occurring along many of the perennial stream banks as a result of grazing (USDI 2003-2008). Focused cattle use along perennial seeps, springs, and channels in the late summer and early fall result in bank disturbance and streamside vegetation consumption leaving stream channels and banks vulnerable to seasonal high flow events and subsequent sediment increases and channel widening. While this sediment would be mobilized at a time when turbidities are naturally elevated, exposed and disturbed banks are susceptible to continued degradation throughout the winter months with no time for recovery post-grazing season.

The common observation of siltation in seeps, springs, streams and ponds in the area indicates bank destabilization and sediment transport along watercourses. This has been observed repeatedly along most perennial water courses in the area over the last 10 years by BLM hydrology and fisheries staff. Grazing has also led to reductions in streamside shade in some areas, as riparian vegetation has been removed through browse. Reduction in shade allows for increased penetration of sunlight, which facilitates warming of surface waters. Exacerbating this situation, the majority of the instream flows in Conde Creek, and much of those in Dead Indian Creek, are diverted out of channel for irrigation purposes in the summer months. This considerably reduces the quantity and quality of aquatic habitat in the creeks downstream of the diversions, as not only is there less streamflow and hence less aquatic habitat for organisms, the smaller volume of water is able to be heated at an accelerated rate. Grazing and water withdrawals have contributed to both Dead Indian and Conde Creeks being listed as water quality limited for exceeding summer temperature criteria.

Beaver complexes exist in the catchment, and are particularly noticeable in Conde Creek where recent beaver activity has created many large dam pools. These pools have both positive and negative implications to aquatic habitat. Detrimental to water quality, the creation of the pools was accomplished by the felling of many hardwoods and brushy species (primarily aspen and willow) adjacent to the stream. These species were the primary source of shade to Conde Creek in this reach, as the stream meanders through a natural meadow lacking a conifer overstory. This loss of shade further increases the rate at which the stream can be warmed by sunlight. Furthermore, the pools allow for additional heating of the water ponded behind the dams. On the positive side, the large and complex pools provide habitat for many aquatic organisms, and have captured large amounts of fine sediment, keeping it from impacting downstream habitats.

Recent restoration efforts have been undertaken in the area to alleviate the degradation to Conde Creek resulting from grazing. Several large streams and adjacent meadows have been fenced off. Willows have also been planted to encourage new growth of bank stabilizing and shade producing vegetation. Though the recent beaver activity has resulted in the removal of large swaths of aspen and willow, the disturbance is natural and should benefit aquatic habitat in the long-term, as it has created many large pools, allowed for the capture and retention of sediment, and raised the local water table and allowed several reaches of the stream to be reconnected with its flood plain. Aspen and willow are both notable vigorous re-sprouters, and should re-establish and spread relatively quickly.

High road densities found in the Analysis Area catchments (greater than 4 mi./mi.^{2} in the Analysis Area; see Water Resources section above) also contribute to elevated sediment levels. Roads with direct connectivity with stream channels pose the greatest risk for sediment transport off the roads and into aquatic habitat. Within the Analysis Area catchments, upper Conde Creek (HUC #515) has very high riparian road densities (over 7 mi./mi.^{2} of riparian areas), placing this drainage at an elevated risk for increased sediment input from roads. Largely as a result of grazing and high road densities, sediment levels exceed benchmark standards in both Conde and Dead Indian Creeks.

10. Environmental Consequences - Aquatic Habitat

a. Alternative 1 - No Action

The No Action Alternative would have no direct or indirect effects, and hence would not add a cumulative effect to aquatic habitats, as no ground disturbing activities would occur. Aquatic habitats within the watershed would continue to exist in their current degraded state. As no new road construction or renovation of old roads would occur, road densities would remain at the current level within the Analysis Area. Fish habitat would continue to be impacted as a result of past and ongoing activities, as described in the current condition section.

Urban and agricultural lands would likely remain in their current state, impacting fish habitat in the drainages and in the Little Butte Creek Watershed as described previously. It is unknown at this time what additional development may occur on private lands, but increased development of the area would place greater stresses on aquatic habitats.

b. Alternative 2 – Proposed Action

This alternative proposes various prescriptions for commercial timber harvest, follow up fuels and non-commercial thinning treatments, new permanent and temporary road construction, road maintenance, new landing construction, temporary skid trails outside of unit boundaries, road decommissioning, and log haul, as described in Chapter 2 of this document. These project elements and their potential to affect fish and aquatic habitat are discussed below. Disturbances proposed in the South Fork Little Butte Project with proximity and/or connectivity to aquatic habitats include road maintenance, road decommissioning, and log haul, which would involve numerous stream crossings.

Ground disturbing activities in or near stream channels and roads have the greatest potential to impact fish habitat; it is these activities that could increase erosion and sediment transport to, and storage in, stream channels. Log haul is the project element proposed under this alternative which has been identified as having

the greatest potential to contribute sediment to streams. Some of the roads identified for full decommissioning that do not have funding identified at the time of this analysis include stream crossings. Removal of culverts on these roads would lead to direct short-term inputs of sediment into aquatic habitat.

Commercial Timber Harvest, Designated Skid Trails, and New Landings

There are three primary mechanisms by which timber harvest and landing construction may influence aquatic habitat: 1) removal of streamside vegetation reduces shade, which can increase water temperature, and reduce recruitment potential of large wood, a key habitat feature of aquatic systems; 2) reduction of canopy (particularly in the transient snow and snow zones) if applied to large areas of watersheds has been shown to alter hydrological processes, such as increasing peak and base flows, or altering the timing of these flows, which in turn may impact channel and habitat features; and 3) ground disturbance and compaction from yarding corridors or skid trails can bare soils, reduce infiltration, channel overland flow, and route eroded particulates (fine sediment) to downslope stream channels.

In the South Fork Little Butte Project, all harvest would occur outside of Riparian Reserves at a minimum distance of one site potential tree height from the edge of the stream channel. Because existing large wood densities and shade would be maintained within the Riparian Reserves, harvest and yarding operations would have no impact to stream temperatures, or future large wood recruitment potential. The Water Resources analysis of the South Fork Little Butte Project documented that harvest operations would not reduce canopy cover within any of the Analysis Area catchments enough to measurably affect or alter the timing of peak or base flows (see Water Resources section). As harvest and yarding operations would not take place in Riparian Reserves, no hydrological connectivity would exist between harvest units and stream channels. Fine sediment mobilized from units or skid trails would be filtered by remaining vegetation within the Riparian Reserves, and deposited on the forest floor before reaching aquatic habitat. In sum, no connectivity, and hence no causal mechanism, would exist for commercial timber harvest to input sediment through the RR buffers and into stream channels.

As harvest and yarding operations would not decrease stream shade, reduce future wood inputs, increase peak flows, negatively modify summer base flows or input sediment into aquatic habitats, they would not directly or indirectly affect the aquatic environment, and hence would not impact fisheries resources, and would not have the potential to add a cumulative effect.

Eleven designated skids trails are proposed outside of units that would connect road and landing locations with commercial tractor-yarded harvest units. These designated skid trails range from approximately 70 feet to 550 feet in length and are proposed near ridge top or sub-ridge top locations. None would cross any Riparian Reserves or drainage channels. The skid trails would be constructed, used, and rehabilitated in the same dry season. Because these designated skid trails would not be hydrologically connected to the aquatic system, and PDFs would require them to be rehabilitated before the wet season, there is no potential that they would contribute sediment to aquatic channels, and therefore, they would not affect aquatic habitat nor have the potential to add a cumulative effect.

Twelve new helicopter landings are proposed, which could be up to an acre in size each. None of these new landings are proposed in RRs on BLM-managed lands. They are all located on ridges or sub-ridges, would be hydrologically disconnected from the stream system, and decompacted and rehabilitated after use (see PDFs in Chapter 2). For these reasons, construction and use of new helicopter landings would not impact fish or aquatic habitat, and would not have the potential to add a cumulative effect.

One tractor landing outside of Unit 5-2a would be constructed to deck logs adjacent to and upslope of the paved Conde Creek Road. This landing would include the outer portion of a RR on upper Soda Creek, well upstream of fish habitat. There would be approximately 150 feet of intact RR between the landing location and the edge of the wetted channel, so shade to the stream would not be reduced by this landing. The landing, which is located on flat ground, would be treated following harvest to stabilize disturbed soils. Because the surface would be slashed and mulched, and because it is flat, offsite sediment movement is not anticipated to occur, and therefore, this landing would not impact fish or aquatic habitat. There would be no potential for cumulative impacts.

Non-Commercial Thinning and Fuels Treatments

Non-commercial vegetation (material less than eight (8) inches DBH) would be removed through contracts that hire out cutting, and piling of material. Tops and limbs of trees cut would be treated to reduce fire risk by piling and burning the material in a controlled manner. BLM would burn the piles during wet weather conditions. Some material could be made available for firewood, pulp or woody biomass depending on market conditions and demand. These treatment activities would involve only hand crews with saws thinning small diameter vegetation and piling and burning the slash. Very little ground disturbance would occur. Any check lines would be rehabbed following ignition operations, reducing the risk of the fire-lines contributing sediment downslope. Ground cover, such as forbs and grasses, trees greater than 8 inches diameter and all riparian plant species would remain after fuels activities. These activities would not impact aquatic habitat. The treatments would leave no-treatment buffers, as outlined in the PDFs, around stream channels, and hence would not reduce shade afforded to stream channels. The vegetative buffers remaining adjacent to channels would trap any off-site sediment or ash movement (very unlikely) mobilized as a result of fuels treatment activities. There is no probability that aquatic habitat would be affected, as no avenue would exist for sediment or ash to enter the channels from fuels treatments. In sum, non-commercial vegetative treatments as proposed in the South Fork Little Butte Project would have no causal mechanism to affect any aquatic habitats, and hence would not contribute to cumulative effects.

Roads

New Road Construction

The primary mechanism by which new road construction may impact water quality is the potential to intercept, concentrate, and route flow down the road prism, which disrupts natural flow paths, while at the same time increasing erosion of the road surface and subsequent transport of sediment towards downslope aquatic habitat. Where a road crosses a stream, these eroded particulates may be input into aquatic habitats. Under Alternative 2, four new permanent roads are proposed, totaling 0.80 miles in length. Proposed new road 37-2E-24.04 would be 0.10 miles in length and located on the drainage divide between Deer Creek and Soda Creek, but on the Deer Creek side of the ridge. The 37-2E-15.00A road, 0.14 miles in length, would be located near the drainage divide between the Lost Creek and a small South Fork Little Butte Frontal catchment. Proposed road 37-2E-14.00C, 0.10 miles long, would be located on a sub-ridge over ½ mile upslope from Lost Creek. Proposed road 37-2E-5.00 would be 0.46 miles long and located on the drainage divide between the Lake Creek catchment and a small South Fork Little Butte Frontal catchment, with 0.13 miles of the road on the Lake Creek side of the divide, and 0.33 miles in the frontal drainage.

None of the proposed new roads would cross any stream channels, dry draws, or Riparian Reserves. They would all be hydrological disconnected from the aquatic environment, as they would be located on or near ridge tops far from channels. Therefore, there is no probability they would contribute sediment to Analysis Area streams.

Temporary Roads

Sixteen temporary spur roads totaling 3.04 miles are proposed. Temporary roads would be constructed during the beginning of the dry season, utilized during the spring, summer, and fall to access units, and decommissioned, or if needed for other purposes would be effectively blocked, before the onset of fall rains. Surfaces would be de-compacted, slashed, seeded and mulched, and rendered inaccessible to vehicular traffic. Proposed temporary road 38-3E Spur 23-1, 0.46 miles long, would be located in the headwaters of the Dead Indian Catchment, along the drainage divide with the Jenny Creek Watershed. 0.14 miles of this road would be on the Dead Indian side of the divide, while 0.32 miles would be in the Jenny Creek Watershed. This road would not cross any streams or draws. One short proposed temporary road (38-3E Spur 20-2), would be 0.14 miles in length and would be located on a sub-ridge near the drainage divide of Dead Indian Creek. Segment 37-3E Spur 20-1, 0.05 miles in length, would be located on a sub-ridge on the upper third of the slope in the Soda Creek catchment. Proposed temporary roads 37-3E Spur 30-2 (0.07 miles), and Spur 30-1, (0.12 miles) are proposed on the ridge spine on the drainage divide between Soda Creek and Deer Creek. Proposed temporary road 37-2E Spur 18-1, (0.05 miles) would be located on the

drainage divide between Soda Creek and a small frontal catchment. Temporary road 37-2E Spur 13-1 (0.05 miles) is proposed on the divide between Deer Creek and a small frontal catchment. Temporary spur segments 37-2E Spur 25-1, 25-2, and 25-3, (total 0.14 miles) are proposed on a sub-ridge in Deer Creek. Proposed temporary roads 37-2E Spur 15-4 (0.3 miles) and Spur 15-1 (0.27 miles) would located on the drainage divide between Lost Creek and small frontal catchment. Temporary road 37-2E Spur 20-3 (0.23 miles) is proposed on a small sub-ridge in Lost Creek. Temporary roads 37-2E Spur 17-1 (0.86 miles) and Spur 17-2 (0.24 miles) are proposed on the drainage divide between the Lost Creek and Lake Creek catchments. Tempoary spur road 38-2E Spur 1-1 (0.06 miles) is proposed on a flat area in the Lost Creek catchment, lower third of the slope. Temporary road 38-3E Spur 20-2 (0.14 mi) is proposed on a flat bench near the drainage divide of upper Dead Indian Creek. None of the proposed temporary roads would cross any Riparian Reserves, stream channels or dry draws.

None of the temporary roads would have any hydrological connectivity with the aquatic environment. After harvest operations are completed, the roads would be fully decommissioned, which would entail: the road surface (travelway) would be decompacted so that the former compacted surface would be rendered loose and friable to a depth of 12 to18 inches. Slash, boulders, and other debris would be placed along the roads "entire length" as determined by availability of materials to provide ground cover and discourage mechanized use. Blockage at the entrance would consist of placing logs, slash, boulders, berms, and other material so the entrance is camouflaged for a minimum distance of 100 feet and vehicle access is precluded.

Because these proposed temporary road locations would have no hydrological connectivity, the construction and decommissioning activities would have no causal mechanism to contribute sediment to aquatic habitat.

Road Improvements and Renovation

Road improvements along haul routes are proposed as needed to meet BLM standards and are described in Chapter 2 in detail. Improvements may include spot rocking, grading, general maintenance (fixing pot holes as they form, adding rock as needed to maintain the road in its current condition during hauling activities), opening and closing of several short road segments, and repairing drainage on road surfaces. Addition of river rock and rocking the approaches to a ford directly over fish habitat is proposed as part of this project. Another ford on an intermittent tributary to Lake Creek is also proposed to have river rock added to it, and this activity would include repairing a past road/stream capture via re-establishing a berm to discourage future captures by utilizing natural rock substrate available on site. Ground-disturbing road improvement activities would be restricted to the dry season and all activities would be suspended during precipitation events (i.e. rare thunderstorms).

There is no probability that opening and closing roads would contribute sediment to streams as the roads are located on ridge tops and are hydrologically disconnected from the stream system. There is no probability that spot rocking road surfaces will contribute sediment to streams. Addition of rock to roads should reduce the potential for erosion stemming from haul, thereby resulting in less sediment production. There is no probability that addition of river rock to two fords will contribute fine sediment to streams; the rock will be washed and free of fines, and the adjacent banks are not proposed to be disturbed. At the location of the washed out ford, on site rock would be used to re-establish grade control to reduce the potential for future wash outs. This activity may generate small amounts of fine sediment, but it would be restricted to the road prism and not in-channel. This activity should reduce sediment input into the channel by reducing future road/stream captures. The channel eventually empties into a large reservoir where water is diverted out of the system and used to irrigate pastures on a large private ranch, so even in the event that the grade control failed in the future, contributed sediment would be captured and stored in the reservoir. There is no probability adding additional rock and repairing pot holes for general maintenance to upkeep roads used for haul will contribute sediment to streams, as these activities would not generate additional sediment. There is little probability that repairing drainage of existing roads would contribute sediment to streams. Though reshaping of the road surfaces (installation of water bars, creating outslopes) would involve significant disturbance to the road surface, the intent of this activity is to disconnect the road from the stream system, yielding a reduction in sediment transport to streams. Grading has potential to increase sediment production, because grading can break up armor layers on the road surface, temporarily increasing road surface erosion.

However, Luce and Black (1999) noted that blading of only the travelway yielded no increase in sediment production whereas blading of ditches, which often occurs during grading operations, substantially increased sediment yield. BLM is not proposing to blade ditchlines during road grading activities for the South Fork Little Butte Project. Because BLM is proposing only grading of travelways and not blading in ditches, it is not anticipated that grading would contribute detectable quantities of sediment to Analysis Area streams.

Road Decommissioning and Long-Term Closures

Approximately 4.05 miles of roads are proposed for full decommissioning; of which up to 1.66 miles of road would be available for treatment (funding is secured or not needed at the time of this analysis). The additional 2.39 miles of road proposed for full decommissioning could occur in the future as funds become available. An additional 7.27 miles of road is proposed for long-term closure (see Chapter 2 for more details). Long-term road closures would have no direct or indirect negative effects to aquatic habitat as proposed activities include only storm proofing as necessary and barricading the entrance of the roads to preclude access to vehicles. Precluding vehicle access would help to reduce erosion rates of the road surfaces. These roads proposed for long-term closure include 4 stream channel crossings, and these points would still maintain hydrological connectivity between portions of the roads and the aquatic system. Storm proofing the roads may include formation of rolling dips or waterbars where needed, and these structures could reduce the portion of the roads which are hydrologically connected. However, as the roads would still exist on the landscape, road densities would not be reduced by this activity

Of the 1.66 miles of funded proposed decommission roads, about 0.54 miles of road (5 segments) would receive some level of mechanical decommissioning and necessitate ground disturbance. All but one of these road segments are located in upland areas far from Riparian Reserves and stream channels. One short road (38-2E-1.01) proposed for mechanical decommissioning does include roughly 50 feet of the outer edge of a Riparian Reserve, but does not include any channels or dry draws. None of these five proposed mechanical decommissioning road segments have hydrological connectivity with the aquatic system, and therefore this action would have no causal mechanism to contribute sediment to channels. About 1.12 miles of decommissioning would be “natural”, of which roughly 0.5 miles would be within Riparian Reserves. Natural decommissioning would require no ground disturbance other than creation of barricades where needed, and hence this activity would also have no causal mechanism to contribute sediment to the aquatic system. These segments contain no culverts, are stable, and are in some state of hydrological and vegetative recovery. By allowing them to continue to decommission naturally they would in effect simply be removed from BLMs transportation database with the intent that they would never be used again, and would remain inaccessible to vehicular traffic in perpetuity.

The additional 2.39 miles of existing roads that have been identified for varying levels of future mechanical decommissioning have numerous channel crossings and include 1.50 miles of roads within Riparian Reserves. Of the 2.39 miles of road identified, about 1.45 miles (seven segments) are in the Dead Indian catchment. These segments include seven stream crossings, four of which would be over perennial streams, including one crossing over Conde Creek, a large fish bearing tributary to Dead Indian Creek. An additional 0.43 miles of road is in the Deer Creek catchment and includes two crossings over intermittent streams. In Soda Creek, one short (0.10 miles) road segment has been identified for potential future decommissioning. This road is within a Riparian Reserve, but does not include any stream crossings. The remaining 0.41 miles of potential future road decommissioning would occur in a small unnamed South Fork frontal catchment, and would include three stream crossings, one of which would be over a perennial stream.

Removing culverts and re-shaping banks at the12 stream crossings (five perennial and seven intermittent) which could be treated in the future would lead to small site level inputs of fine sediment into aquatic habitat. Previous road obliteration projects undertaken by the BLM suggest that less than one cubic yard of sediment would be input at each crossing site. These inputs would occur during the instream summer work period. As funding has not been identified for this work, it is unknown if and when any particular segment would be treated. In the unlikely event that funding was procured to accomplish all the work in one season, this action would result in a one-time input of up to 12 cubic yards of sediment into aquatic habitat in the South Fork Analysis Area in a single season. Inputs would be spatially spread across a large area, except for in Conde

Creek due to the high number of crossings within a relatively short distance from each other. As one crossing is directly over fish habitat, sediment would directly impact cutthroat trout at the site scale (single pool or short reach) in Conde Creek. Because the work would occur in the summer, when stream flows are very low, the most likely impact would be after a brief pulse of elevated turbidity that would occur when the culvert was pulled, that the displaced sediment would then settle out just downstream of the work site, where it would remain until the first significant flow event of the fall or winter, at which time it would be flushed downstream in the nature of elevated turbidity, where it would quickly become undetectable beyond background conditions. This same scenario would likely apply to the other perennial crossings as well. The seven intermittent crossings would all be dry during decommissioning activities; any displaced sediment contributed to these small channels would remain in channel until the first large storm event of the following fall/winter, at which point this sediment would also be flushed downstream. Though these one-time contributions of sediment would impact aquatic habitat, it would not meaningfully impact fish or aquatic organisms at more than the very small site level scale, and would over time yield a benefit as a net reduction in hydrological connectivity between roads and the aquatic system, which would reduce chronic sediment inputs to aquatic habitat, while also reducing road densities in a Tier 1 Key Watershed.

Haul Routes

Repeated use of the unpaved haul roads may both directly and indirectly contribute fine sediment to streams as rocked surfaces become pulverized rock (i.e. dust, a form of fine sediment) surfaces after repeated heavy truck traffic. Natural surfaced roads are vulnerable to rutting and erosion from use, particularly if the road is used during the wet season. Direct contributions of fine sediment could occur if dust mobilized by haul should settle out in stream channels crossing or adjacent to the haul route. Indirectly, the fine sediment that remains on the road prism would be available to be transported off of the road during the first significant rain event following a season of haul. Properly engineered roads are capable of shedding the majority of mobilized sediment off of the road (or road ditch) downslope and into vegetation. However, the road/ditch distance from the last cross drain located on either side of a channel crossing would directly contribute captured water and mobilized sediment into the stream channel. Therefore, use of the roads for haul would increase the risk of road derived sediment transport to stream channels, particularly in the vicinity of road/stream crossings.

An estimated volume of 2,400 log truck loads would be required to haul felled logs off site. Log hauling would occur on an estimated 91.5 miles of private, county, and BLM-managed non-paved roads within the Project Area. Of this, roughly 66.0 miles would use gravel or rocked roads, and 26.0 miles would be natural surfaced roads. Note that estimates of road mileage are rounded up, and due to rounding error not all reported mileages will exactly match. Mainline routes include the rocked Lake Creek, Lost Creek, and Deer Creek Roads. The mainline route in Soda Creek is paved, and would be used to haul out timber from the Soda Creek, Deer Creek, and Dead Indian Creek catchments. In the Analysis Area, haul routes include 163 crossings over perennial (55 crossings) and intermittent (108) streams. Nine crossings would be directly over fish bearing stream reaches, including five crossings over CCH (three in Lake Creek and two in Lost Creek). Two of the Lake Creek crossings are bridged, but one is an existing ford. Both crossings over Lost Creek are existing bridges; however, one bridge is not rated for heavy equipment. This crossing has an existing adjacent ford over the mainstem of Lost Creek, which is used by the private landowner. BLM proposes to utilize a temporary portable bridge at this particular ford location. The existing ford over Lake Creek would be improved by rocking the approaches for a minimum of 100 feet on either side of the crossing, and adding river rock to the channel through the crossing point. Lake Creek is seasonally dry at the crossing point, and access and use of the road and crossing would be restricted to the dry season. The remaining four crossings over fish habitat (resident trout) include two over upper Lost Creek, including a failed crossing with a washed out culvert that BLM also proposes to cross via a temporary portable bridge, one crossing over Deer Creek (culvert), and one crossing over Conde Creek (culvert), a Dead Indian Creek tributary.

In Lake Creek, 8.4 miles of haul routes (6.5 miles rocked, 1.9 miles natural surfaced) would include 21 crossings, five of which would be perennial, including three crossings over CCH (two bridges, one ford). The majority of the haul route mileage is the mainline Lake Creek Road, a well-travelled, well rocked, and

well drained road. Routes in Lake Creek are proposed to be open to winter haul, with the exception of the road which includes the ford crossing over Lake Creek; this route would be dry season only, and would only access one unit (estimated haul volume would be approximately 40 truck-loads).

Within Lost Creek, 28.2 miles of haul routes could be utilized of which 10.9 miles is native-surfaced. Sixty-four streams, including 20 perennial streams, would be crossed by routes in the Lost Creek catchment. One crossing would be over CCH, for which BLM proposes to utilize a temporary portable bridge to cross. A portable bridge is also proposed for use over a portion of Upper Lost Creek (rainbow trout habitat) to access a unit on the far side of a failed crossing (private lands). The mainline haul route which parallels Lost Creek would be restricted to dry season use. Rocked routes in upland portions of the watershed (high elevation on the Dead Indian Plateau) would be open for winter haul, except for the route which includes the temporary bridge over upper Lost Creek, which would be dry season only.

Routes in Deer Creek include 14.2 miles (2.5 miles of natural surfaced) and 30 crossings, of which nine would be over perennial streams. No routes in Deer Creek would cross CCH. The BLM road system in Deer Creek has recently been upgraded as most of the routes have been outsloped to provide for optimal drainage. However, recent heavy haul traffic by private industrial timber in the drainage has reduced the base layer of rock below optimal, and so the BLM is proposing that the majority of haul routes in Deer Creek would be restricted to dry season use only.

In Soda Creek, 20.7 miles of routes may be used, of which only 2.0 miles would be natural surfaced. Routes in the catchment would include 14 crossings (13 perennial); no crossings would be over fish bearing streams. Most of Soda Creek proper is well separated from roads topographically, as the canyon it flows through is too steep for roads. Only the headwater reaches of the catchment on the Dead Indian Plateau are accessible by roads. Rocked routes in Soda Creek are proposed to be open to winter haul.

Haul routes in the Dead Indian catchment are limited to ridge top or headwater areas on the Dead Indian Plateau, and include 11.1 miles, 3.9 miles of which would be natural surfaced, would include 12 stream crossings (five over perennial streams), none of which would be over CCH. Rocked routes in Dead Indian Creek are proposed to remain open to winter haul.

All hauling on native surfaced roads would be seasonally restricted to the dry season, generally May 15th to October 15th. Winter haul would be allowed on 47 miles of rocked roads. Hauling operations would be stopped if it could result in damage to the road beds. Dust abatement measures (water or lignen applied to dry road surfaces) may be used to reduce dust during the dry season on rocked and natural surfaced roads.

Weathering of road surfaces can lead to chronic sediment and turbidity contributions to aquatic habitats, and maintenance and use of roads (such as for haul) can accelerate rates of erosion, particularly during the wet season (Luce and Black 1999; Reid and Dunne 1984). Many variables interact to determine the potential for any given stretch of road to influence aquatic habitat, with the most important being the degree to which the road is hydrologically connected with the aquatic system (Furniss et al. 2000; Jones et al. 1999; MacDonald and Coe 2008). Hydrological connectivity is present at any point where roads and streams interface. Connectivity also changes in response to climactic conditions, with the greatest road-stream hydrological connectivity occurring during the wettest period of the year, when soil moisture contents are high, groundwater tables elevated, and runoff more likely (Furniss et al. 2000). For this reason, wet season use of a given road system has a much higher potential to contribute impacts to aquatic habitat then dry season use. Due to the high number of stream crossings, and because wet season haul is proposed on certain routes, it is likely to result in inputs of sediment to streams in the Analysis Area based on truck traffic alone.

Placement and dismantling of the temporary bridges at the two ford locations in Lost Creek would result in small scale disturbances to the outer stream banks, and though confined to outside the wetted channel at the time of disturbance, it is likely a small amount of sediment would be generated by this activity as well that would have a high likelihood of working its way into the stream.

Addition of river rock and armoring the ford approaches in Lake Creek should suffice to protect the stream beds in the intermittent channel and Lake Creek proper, and this activity is not likely to result in additional fine sediment input.

In other locations, the presence of riparian vegetation between all roads and stream channels coupled with dust abatement measures would reduce the probability of dust generated from dry season haul from migrating off the road directly to streams, but it is possible that very small amounts of airborne dust generated by haul would settle out into both Lake Creek and Lost Creek at crossing locations because portions of the haul routes are within 40 feet of the streams. Other areas where dry season haul is proposed are well removed from fish habitat, and there is no probability of dry season haul directly contributing detectable quantities of dust to fish streams from these upland areas.

Hauling also has the potential to break down aggregate on the road surfaces. This eroded material would then be available for transport off the road during significant rain events, and either shed off the road surface by drainage structures and turned downslope into roadside vegetation, or transported to an inboard ditch. Only at locations where the road/ditch interfaces with streams at road/stream crossings would broken-down aggregate have the likelihood of reaching the aquatic system. In the Analysis Area, and including Lake Creek, there are a total of 163 streams (55 perennial) which are crossed by potential haul routes (includes winter and dry season routes). As such, there is a high degree of hydrological connectivity, and therefore, a high likelihood that hauling would contribute fine sediment to the aquatic system. Sediment delivery would occur during precipitation events. For roads limited to dry season use, this would occur as a single larger pulse during the first large rain event following the haul season. For roads open for winter haul, smaller inputs could occur throughout the rainy season.

Although hauling would have a high likelihood of contributing some sediment into streams in the Analysis Area, the magnitude of the inputs would be minimized due to dry season haul restrictions on sensitive road surfaces, the majority of the haul route miles are disconnected via functioning road drainage devices (i.e. outsloped surfaces, rolling dips, inboard ditches relieved by cross drain culverts), and haul routes would be spread over a large spatial and temporal scale, minimizing the use any one surface would receive in a given season of hauling.

It is not anticipated that fine sediment will be generated from use of the two fords in Lake Creek, as the channels are very rocky and well armored, and placement of river rock through the fords should protect the natural stream bottoms from truck traffic. Rehabilitating the crossing over the intermittent channel would reduce the future likelihood of the road capturing high flows, reducing chronic erosion and sediment transport to downstream habitats. The intermittent channel in question feeds a large impoundment, where stored water is diverted out of Lake Creek, so this would have no appreciable benefit to fish habitat. Both streams will be dry during the season of use.

It is anticipated that some sediment generated from the temporary crossings would be contributed to Lost Creek in the vicinity of the lower and upper stream crossings. Inputs would primarily stem from the two disturbances associated with placement and removal of the bridges, as opposed to chronically occurring every time a log truck passed over the ford in the absence of the crossings. The volume of fine sediment released to aquatic habitat from placement and dismantling of the crossings would be minimal, and limited to fine particulates already presently stored in the natural stream substrate within the bankfull channel. The nature of the input stemming from placing and removing the bridges would be a brief plume of elevated turbidity, as stored fine sediment in the channel at the crossing locations would be mobilized and released to the stream during the first elevated flow event following use of the bridge. As the stream system would be flushing a summers worth of accumulated fines through during such an event, any elevated turbidity resulting from construction/dismantling of the crossings would not be discernable beyond background levels of turbidity a short distance downstream from the ford locations. Once assimilated into background conditions, it would be undetectable.

Vegetation is present between the creeks and the road to capture the majority of airborne dust generated by dry season haul along the main routes, including those that parallel Lost Creek and Lake Creek. However,

where the roads closely parallel and cross the streams, it is anticipated that a small amount would settle into aquatic habitat in both Lost Creek and Lake Creek. Given an anticipated traffic volume of only 3 to 4 truckloads per day coupled with dust abatement measures, the amount of dust (sediment) generated by dry season haul to reach and settle out in any one pool would be biologically meaningless to fish.

Aggregate broken down on the road surfaces from haul would also result in inputs of sediment to the aquatic system. Given dry season haul restrictions on sensitive road surfaces, adequate surfacing of all routes proposed for winter haul, intact and functioning drainage features of the road systems which would disconnect the majority of the road lengths from the aquatic system, and contract stipulations that would halt hauling activities during weather events that could increase the risk of damaging the roads and increasing the likelihood of sediment transport, the amount of sediment that would be input to any one channel resulting from haul is expected to very light. Sediment would only be input into streams at road/stream crossings, and most of these crossings are located well upstream of fish habitat. Sediment resulting from haul that was transported to streams would either be stored in the channels, or slowly released over time to fish habitat as undetectable pulses during high flow events.

It is difficult to accurately quantify how much sediment may be generated on any given road surface from haul, as there are many variables that influence erosion rates, transport potential, and subsequent deposition into aquatic habitat. Luce and Black (2001) found that a volume of haul equivalent to 12 daily truck loads per work day for one month (240 total truck loads) on rocked roads during the wet season in the coast range of Oregon increased sediment production from the road surface by about 380 kg/km of road. Note that the study did not attempt to quantify how much of this increased sediment production was likely to find its way to aquatic habitat, and that it was conducted in the coast range, which receives about three times the average annual precipitation as the Analysis Area, and that haul was allowed to continue during precipitation events. Also, note that the authors did not offer a quantitative comparison of wet season versus dry season haul erosion rates, but they did note that proscription of wet weather haul is an effective Best Management Practice (BMP) for reducing sediment production stemming from haul.

A very rough estimate of the potential magnitude of sediment produced by wet season haul may be obtained by incorporating the erosion rates reported by Luce and Black (2001) and calculating the number of truck loads anticipated to result from this sale. The following analysis assumes that: 1) the purchaser would opt to winter haul every unit available for winter haul (i.e., would not harvest and haul during the dry season); 2) that all winter haul would occur when temperatures were above freezing and no snow pack is present; 3) an average unit volume of 6,000 board feet of timber per acre; 4) that an average log truck load is 4,500 board feet of timber; 5) that only the 50 meters of road on the uphill side of each crossing is hydrologically connected with the aquatic system; and 6) that all sediment generated in this connected area is immediately conveyed to the stream.

Within the Analysis Area catchments, 47.0 miles of rocked roads would be open to winter haul, which would include a total of 61 stream crossings (28 perennial and 33 intermittent). This would equate to 3,050 meters (1.9 miles) of hydrologically connected routes spread across the entire Analysis Area. Utilizing erosion rates described by Luce and Black 2001) and assuming a constant rate of aggregate break down, one truck load would equate to approximately 1.6 kg of sediment production per kilometer of road, or 0.18 lbs of sediment per log truck crossing. Each crossing in GIS was assigned an estimated haul volume value (number of truck crossings) based on the unit acres accessed by each particular crossing. The result of the analysis estimates 355 pounds of sediment contributed to channels in Analysis Area streams from winter haul (Table 3-16).

To put this in perspective, this would equate to less than 0.168 cubic yards (or 355 lbs.) spread amongst the 61 crossings, or an average of about 2.96 cups of fine sediment per crossing per year (assuming a 3-year timber contract and constant rate of haul, and that 2,106 lbs of wet soil = 1 cubic yard).

Table 3-16: Winter Haul Miles, Crossings, Number of Log Truck Crossings, and Estimated Sediment Contribution to the Aquatic System by Analysis Area Catchment

Catchment	Winter Haul miles	# Stream Crossings	Total # Truck Crossings	Estimated Sediment (lbs)
Lake Creek	6.5	17	912	164
Lost Creek	17.5	28	612	110
Deer Creek	1.1	0	0	0
Soda Creek	17.2	13	419	75
Dead Indian Creek	3.7	2	33	6
Frontals	1	1	0	0
Total	**47**	**61**	**1,976**	**355**

Sediment input directly into fish habitat would be limited to the portions of the roads near Lost Creek and Lake Creek and the two unpaved crossings over Coho habitat in Lake Creek. Other inputs resulting from winter haul would occur primarily in headwater areas well upstream of fish habitat and would only occur during high precipitation events. Sediment contributions to fish habitat from winter haul would be undetectable beyond contributions from other sources given the small quantity of sediment estimated to be generated from haul, that it would be contributed over large spatial and temporal scales, and that contributions would primarily occur in headwater stream reaches.

c. Alternative 3

Alternative 3 is similar to Alternative 2 except for two major differences; 1) considerably less harvest is proposed, and 2) no new road construction is proposed. The same amounts of roads are proposed for fully decommissioning and long-term closure as in Alternative 2. Therefore, a larger net reduction in road densities would occur. Other than these differences, effects to aquatic habitat under Alternative 3 would largely be the same as described under Alternative 2.

Though the main line haul routes in general would not be appreciably different under Alternative 3 as compared with Alternative 2, secondary routes would be reduced by an estimated 15.0 miles, and haul volume would be reduced considerably (approximately 1,300 estimated truckloads as compared with 2,400 truckloads in Alternative 2). Routes proposed to be available for winter haul would remain the same between the two alternatives so the volume estimates would also be similar, except in Lake Creek, where an estimated 104 truckloads less would occur under Alternative 3. Utilizing the same sediment production from winter haul estimation as described for Alternative 2, the reduction in estimated haul volume would equate to approximately 20 pounds less sediment contributed to aquatic habitat in Lake Creek as compared to Alternative 2. Under Alternative 3, the road with the two washed out fords in the Lake Creek catchment would not be used, as Unit 5-4 is not proposed for harvest. As a result, the road/stream diversion point would not be rehabilitated as described under Alternative 2, and this spot would remain at high risk for future failures and routing of the captured stream down the road, perpetuating chronic sediment inputs into aquatic habitats in Lake Creek.

d. Summary of Effects - Aquatic Habitat

In the short-term (one to three years) there would likely be small inputs of sediment to channel crossings and reaches adjacent to some rocked and natural surfaced roads used for haul, especially in those areas open to winter haul. Any sediment increases would be minor relative to existing sediment levels. Under Alternative 3, less timber harvest would occur, and hence less haul, and so sediment inputs from haul would be less than under Alternative 2. Under both Alternatives 2 and 3, upland work, including timber harvest and non-commercial treatments would have no effect on fine sediment levels, due to the filtering action of Riparian Reserve buffers and incorporation of extensive PDFs designed to prevent overland sediment movement.

Stream temperatures would not be negatively affected, as no shade producing riparian vegetation adjacent to perennial streams would be removed (see Riparian Reserves section below).

Future private timber harvest is assumed to continue at present levels, and cumulative effects to water resources have been assessed (see Water Resources). Future private harvest, coupled with ongoing erosion issues, is expected to continue the trends in streambank stability, sedimentation potential, and health of riparian areas currently present in the Analysis Area. The South Fork Little Butte Project would contribute small amounts of sediment to aquatic habitats in the Analysis Area catchments. The bulk of these inputs would occur in headwater channels far from essential or critical habitat, and would occur at times when they would be undetectable and/or biologically meaningless to aquatic habitat or aquatic organisms, and would represent only a very small fraction of amounts contributed annually from all other sources. Direct inputs of fine sediment resulting from haul would be of insufficient magnitude to meaningfully affect fish or aquatic habitat. Decommissioning of the funded roads would have no causal mechanism to contribute sediment to any channels as none of the segments are hydrologically connected with aquatic habitat. Potential future road decommissioning of the hydrologically connected road segments would in the short-term input up to 12 cubic yards of sediment into aquatic habitats, but would in time result in a net reduction of sediment inputs as hydrological connectivity would be reduced by 12 crossings. Reduction of road densities was identified in the Little Butte Creek Watershed Analysis as one of the most important watershed restoration actions to pursue.

The unfunded roads identified for full decommissioning (2.39 miles) would yield benefits to aquatic habitat as they would reduce road mileage in Riparian Reserves and would restore stream crossings. However, as funding is not secured, it is unknown if and when any of these segments might be decommissioned. The roads identified for full decommissioning where funding is secured (1.66 miles) are not hydrologically connected with aquatic habitat so even though they would represent a reduction in road densities, there would be no appreciable benefit directly to aquatic habitat from this action. Roads proposed for long-term closure would be storm proofed and barricaded, ensuring that both erosion potential and hydrological connectivity are reduced, but the roads would remain on the landscape and continue to contribute to high road densities found throughout the Analysis Area.

11. Affected Environment - Riparian Reserves

Riparian corridors along fishbearing stream reaches in the Little Butte Creek Watershed have been reduced from historic levels as agriculture and urban development of valley lands, road construction, and historic timber harvest practices have cleared vegetation adjacent to stream channels. This has increased penetration of solar radiation to stream channels, resulting in elevated summer stream temperatures. Riparian corridors are narrow around most reaches as roads, businesses, and homes now exist in the historic flood plain. Within the Aquatic Analysis Area, riparian corridors are narrow or absent along most of the South Fork of Little Butte Creek, but are generally intact up the tributary catchments, as they drain forested landscapes that have not been converted to agriculture or residential lands. ODFW considers greater than 70 percent shade desirable, and less than 60 percent shade undesirable to aquatic organisms in small (less than 12 meters wide) forested streams. All of the Analysis Area catchments are listed as water quality limited for exceeding summer stream temperature criteria by the Oregon Dept. of Environmental Quality (DEQ), except for Deer Creek. Elevated water temperatures can affect spawning and incubation time, feeding, growth, and survival of salmonids (Meehan 1991).

Within the Analysis Area catchments, there are an estimated 4,795 acres of Riparian Reserves on BLM-managed lands (calculated from GIS). About 4,153 acres of Riparian Reserves on BLM-managed lands have been assessed for vegetative condition; the remaining acres are north of the South Fork of Little Butte, where no project elements are proposed, and are excluded from the following analysis. There are many more acres of riparian areas located on private lands that do not receive the same level of protection as are provided RRs on federal lands. Overlaying the vegetation condition (GIS) layer with Riparian Reserve boundary layer is a useful way to display current vegetative states of the reserves over the large area encompassed within the Analysis Area. Note, however, that the vegetative condition layer was generated primarily to reflect upland conditions, and only estimates the conditions in riparian areas, especially those areas adjacent to stream

channels (the primary shade and large wood producing zone). A summary of existing vegetative states in RRs on BLM-managed lands within the South Fork Little Butte Analysis Area is presented by catchment in Table 3-17 below.

Table 3-17. Vegetation Condition Class of Riparian Reserves in the South Fork Little Butte Analysis Area

Catchment	Riparian Reserve Acres by Vegetation Type						
	Grass and shrubs	Hardwoods	Seedlings/Saplings (0-4.9" DBH)	Poles (5-11" DBH)	Mid (11-21" DBH)	Mature (>21" DBH)	Total Acres of R.R.
SFLB Frontals	53	51	5	0	116	42	267
Lost	42	247	86	25	538	456	1394
Deer	40	0	63	20	259	112	494
Soda	101	17	103	25	484	329	1059
Dead Indian	140	15	100	78	176	421	930
TOTAL	**376**	**330**	**357**	**148**	**1573**	**1360**	**4144**

The vegetation condition surrounding the RRs can provide insight to how well the RRs are capable of functioning, in terms of providing shade and as a source of large wood inputs. For the purpose of this analysis, it was assumed that stands in the Mid condition class (trees are 11-21 inches in diameter at breast height (DBH) on average) will function to provide sufficient shade to stream channels, and that pole size trees (5-11 inches DBH) and smaller may not provide sufficient shade to stream channels to prevent solar penetration to the stream channel. It was also assumed that only stands in the Mature condition class (trees greater than 21 inches DBH on average) are capable of providing a source of large wood of sufficient size to encourage channel modification and habitat improvements. Hardwoods were not included in this comparison as they do not conform well to DBH measurements, and do not provide large wood of the same quality that conifers do (Beechie et al 1999). Excluding hardwoods (a common component of riparian areas) and pole size trees may tend to underestimate the percent of RRs that are currently providing sufficient levels of shade to stream channels. Table 3-18 below displays the percent of all RRs that are in the Mid vegetation condition class or greater (capable of providing high levels of shade), or are in the Mature vegetation condition class (capable of providing large wood to channels).

Table 3-18. Percent of Riparian Reserves in the Mid Vegetation Condition Class or Greater and the Mature Vegetation Condition Class in the Analysis Area

Catchment	% of Reserves in Mid Condition Class or Greater (Trees ≥11" DBH)[1]	% of Reserves in Mature Condition Class (Trees >21" DBH)[1]
SFLB frontals	59	16
Lost Creek	71	33
Deer Creek	75	23
Soda Creek	77	31
Dead Indian Creek	64	45
TOTAL	**71**	**33**

[1] Does not include acres of hardwoods, which likely underestimates actual shade provided to stream channels.

Data obtained through this coarse analysis suggests that within the South Fork Little Butte Analysis Area, Riparian Reserves capable of contributing large wood inputs into the aquatic system are limited in all of the Analysis Area catchments. Reserves capable of producing high shade are abundant in the Lost Creek, Deer Creek, and Soda Creek catchments, but are below desirable levels in the Dead Indian Creek and the South Fork Frontal catchments. However, it should be noted that within these catchments there are areas that

naturally contain large hardwood (in particular oak) and meadow (grass/shrub) components. The headwater reaches of Soda Creek and Dead Indian Creek include many acres of wet meadows, which are common features adjacent to small streams on the Dead Indian Plateau. In these areas, the lack of mid and/or mature sized conifers is a natural condition, and exclusion of them in this type of analysis tends to overstate past disturbances to RRs. In any event, RRs in forested areas which have been altered by past human caused disturbances will continue to mature over time, and it is expected that both the amount of shade and the potential for large wood inputs will increase, barring a catastrophic wildfire or major flood event.

12. Environmental Consequences - Riparian Reserves

a. Alternative 1 - No Action

Alternative 1 would have no direct or indirect effects to RRs within the Little Butte Creek Watershed as no actions would be proposed in RRs. The RRs would remain as they are currently, slowly recovering as stands mature. It is anticipated that levels of shade and large wood input will slowly increase over time. Benefits will be limited in RRs impacted by roads assuming the existing road system will likely remain in use, perpetuating canopy openings adjacent to the fish bearing stream reaches. As this alternative would not have any direct or indirect effects on the RRs, there is no potential for cumulative effects.

b. Alternative 2 – Proposed Action

Construction of one landing and road decommissioning activities are the only actions proposed that could affect Riparian Reserves in the Analysis Area. All other activities would either not occur within Riparian Reserves or would not change the existing amount or condition of Riparian Reserves and therefore would have no causal mechanism to affect them.

One landing proposed upslope of the paved Conde Creek Road would include the outer 15 feet of the Riparian Reserve of upper Soda Creek and would disturb about one third of an acre of riparian vegetation, but would not remove any channel-shading trees, or reduce the potential for future large wood inputs. Road segments proposed to be fully decommissioned and have funding secured include 0.5 miles of riparian roads which would allow for the eventual recovery of these riparian areas. This would allow for the recovery of approximately 1.2 acres of riparian vegetation, which when coupled with the proposed disturbance associated with the riparian landing would net an increase of 0.9 acres of recovered Riparian Reserves. Additional roads identified for future decommissioning but currently lacking funding include 1.5 miles within Riparian Reserves. If these roads were decommissioned in the future, it would result in future recovery of an additional 3.6 acres of Riparian Reserves within the Analysis Area.

Assuming that these un-funded roads are someday decommissioned, collectively, actions proposed in Riparian Reserves would net an increase (over time) of 4.5 acres of recovered riparian vegetation.

As the recovery of RRs on federal lands continues, it is anticipated that both shade levels and inputs of large wood will eventually increase over stream channels on BLM-managed lands within the Analysis Area. However, it will take many years for the RRs to achieve their full potential, and benefits would be limited in areas already impacted by permanent roads. Because the majority of riparian areas over the fish bearing channels in the Little Butte Creek Watershed are on private lands, it is unlikely that the recovery of Riparian Reserves on federal lands would translate to lower stream temperatures to the larger and more productive fish bearing reaches, which are anticipated to remain in their current state (i.e. narrow corridors, impacted by roads, residences, and pasture land).

c. Alternative 3

There are no differences in activities proposed in Riparian Reserves under Alternative 3 as compared to Alternative 2, and hence effects to Riparian Reserves would be the same under this alternative as described above.

G. TERRESTRIAL WILDLIFE

1. Introduction

This section discusses terrestrial wildlife habitats and the potential impacts to terrestrial wildlife species from the proposed actions as described in Chapter 2 of this document. For the purpose of this analysis, this EA section will hereafter refer to two reference scales: the Project Area and the Wildlife Analysis Area. The Project Area describes where actions are proposed, such as areas where forest management or transportation management activities are proposed. The larger Wildlife Analysis Area, approximately 61,209 acres, is used for a more applicable spatial scale for species with larger home ranges and dispersal movements.

The Wildlife Analysis Area for northern spotted owls (NSO) includes all areas of suitable northern spotted owl habitat within the home range circles for the 17 known owl sites affected by or in the vicinity of the proposed treatment activities. Five of the known NSO sites were studied using radio telemetry in 2001 through 2003. The telemetry locations obtained during tracking of the owls associated with these sites were used for assessing effects to NSO.

This same Wildlife Analysis Area is used for fisher. Home range size for fisher is quite variable, but in the southern Cascade Mountain ranges from approximately 6,000 to 15,000 acres (female and male {non-breeding season} respectively). Thus the 61,209 acres Wildlife Analysis Area is a conservative approximation of 4 to10 fisher home ranges and would be expected to yield a reasonable representation of effects to the species.

2. Issues

Wildlife-related issues associated with the South Fork Little Butte Project have been identified through public scoping or ID team specialists and will be addressed in this document. These relevant issues are:

- Timber harvesting could potentially lead to reduction of forest stand structure, including canopy cover, and snag/down wood densities in the South Fork Little Butte Creek Project Area, impacting habitats for Bureau Special Status Species and other wildlife utilizing the Planning Area. Comments were received listing concerns specifically for the northern spotted owl, Pacific fisher, Bureau Sensitive bat species, Neotropical migratory birds, and Survey and Manage Species.
- Dwarf mistletoe infestations can have beneficial effects for some wildlife species (habitat, food source, etc.); timber harvesting to reduce the mistletoe infestations could adversely affect species that benefit from its presence in stands.
- Road construction and renovation may affect terrestrial and aquatic species and their habitats. Roads can cause mortality from road construction, mortality from collision with vehicles, modification of animal behavior, alteration of the physical environment, alteration of the chemical environment, and increased use of an area by humans.
- Deer and elk winter range areas exist in the Planning Area; manage according to the RMP, which emphasizes providing thermal cover and minimizing disturbances between November 15 and April 1.
- Activities associated with timber harvest may affect nesting, roosting, foraging and dispersal habitat within Critical Habitat Units OR-37 and OR-38. CHU OR-37 provides the single most important link connecting the Oregon Cascades Province to the Klamath Mountains province.
- The presence of barred owls and their interaction with northern spotted owls should be considered.
- There is a potential for adverse cumulative effects on wildlife habitat within the Little Butte Creek Watershed from road building, timber harvest activities, grazing, OHV use, and fire suppression on BLM, Forest Service, and private lands.
- Address how the project will meet the RMP retention requirement for late-successional forests (15 percent of federal lands in each 5th field watershed).

3. Assumptions

- No activities will occur within the 100-acre spotted owl activity centers or 300-meter (984 foot) nest patch radii of known nest sites.
- If no T&E (Threatened and Endangered) or Special Status Species habitat is known or suspected to be present in the Project Area, or the area is outside the range for a particular 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 or habitat, 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.
- Coarse wood already on the ground will be retained and protected from disturbance to the greatest extent possible during treatment.
- Snags which do not need to be felled for safety reasons will be retained within the harvest units to the extent possible. In salvage units, some snags may be removed as per silvicultural prescription guidelines.
- "Treat and maintain" spotted owl habitat means the action occurs within NRF (nesting, roosting, and foraging) or dispersal habitat but would not change the conditions that classify the stand as NRF or dispersal post-treatment. NRF habitat will retain at least 60 percent canopy cover, large trees, multistoried canopy, standing and down dead wood, and diverse understory adequate to support prey, and may contain some mistletoe or other decay. Dispersal habitat will retain at least 40 percent canopy. The habitat classification of the stand following treatment will be the same as the pretreatment habitat classification.
- Per direction in the Northwest Forest Plan (USDA and USDI 1994b, Chapter 2, p. 26), late-successional forest is forest habitat 80 years or older. Late-successional forest generally, but not always, provides suitable habitat for spotted owls. Suitable spotted owl habitat is generally 80 years and older, but also contains other attributes such as multiple layers, standing snags and large down logs, large limbs, and tree cavities.
- Northern spotted owl habitat is specifically rated for suitability for spotted owls, while late-successional habitat not rated as suitable northern spotted owl habitat may provide habitat for other species.

4. Affected Environment

a. Vegetation Conditions and Terrestrial Wildlife Habitats (General)

The South Fork Little Butte Forest Management Project proposal is located in the western portion of the Little Butte Creek watershed, which is a tributary to the Rogue River. The total size of the Wildlife Analysis Area is 61,209 acres (approximately 96 square miles). BLM-administered lands comprise 42 percent of this area.

The present-day composition and distribution of vegetation in the Project Area is influenced by site characteristics (soil types, aspect, and topography), natural disturbance (wildfires, insects, disease, etc.) historic mining, rural residential development, agricultural activities, timber harvest, fuels reduction projects, fire suppression, and road building. Common forest types include Douglas-fir, ponderosa pine, white fir, mixed conifer, and white oak forest series (USDI 1995).

The vegetation condition classes presented in Table 3-19 provide habitat for the terrestrial wildlife species found in the proposed South Fork Little Butte Wildlife Analysis Area. Acreage of each vegetation condition class and several wildlife species that are representative of the various habitats are also displayed. Approximately 200 vertebrate terrestrial wildlife species are known or suspected to occur in the Wildlife Analysis Area based on known range and habitat associations. This includes species that migrate through the area.

An analysis of the late successional forest habitat was last done in the Ashland Resource Area for the Little Butte Creek 5th field watershed in 1999 (USDI 1999). At that time, the analysis determined there were 8,255 acres of late-successional forest habitat in BLM reserves in the watershed. In 2008, the Butte Falls Resource Area conducted a Late-Successional Assessment for salvaging trees from a 2008 blow down event. In this document, there is a summary of the total late-successional habitat on BLM lands in Ashland and Butte Falls in both reserve and non-reserve areas. At that time, there were 31,799 acres of late-successional forest, which was 42 percent of the total forested acres in the watershed on BLM lands (75,057 acres).

Since the total late successional acres were also similar in the 1999 report (for all acres), we assumed some of the activities (natural and timber sales) were not considered in the 2008 LSR Assessment. We summarized all projects and natural events that may have removed NRF and dispersal habitat within the Little Butte Watershed since 1999. We used fire history, Biological Assessment, and timber sale GIS layers to calculate the changes. This analysis resulted in a loss of 693 acres of NRF and dispersal habitat, which could represent late-successional forest habitat.

Table 3-19. Vegetation Condition Classes on BLM-Administered Lands within the Wildlife Analysis Area

Vegetation Condition Class	Acres (BLM Lands)	Representative Species (from Brown 1985)
Grassland/Shrubland	1,954	gopher snake, California ground squirrel, western meadowlark, wrentit, dusky-footed woodrat
Hardwood/Woodland	2,241	acorn woodpecker, western gray squirrel, ringneck snake
Seedling/Sapling	2,496	northwestern garter snake, mountain quail, pocket gopher
Small Conifer	870	golden-crowned kinglet, porcupine, Southern alligator lizard
Large Conifer	10,014	ensatina, Stellar's jay, mountain lion
Mature Conifer	7,886	northern spotted owl, northern flying squirrel, pileated woodpecker

b. Special Status Wildlife Species

Special Status Species are those species that are federally-listed as Threatened or Endangered; proposed or candidates for federal listing as Threatened or Endangered; or are Bureau Sensitive species (IM No. OR-2012-018). Survey and Manage species are listed for protection under the Northwest Forest Plan and are discussed in the following section. Table 3-20 lists the Special Status and Survey and Manage species that are known, suspected or have habitat in the Wildlife Analysis Area. Species determined to have a very low likelihood of occurring in the Project Area, or whose presence would be considered accidental, were not included in this analysis. BLM Manual 6840 (USDI 2008) provides policy and guidance for the conservation of BLM Special Status Species and the ecosystems upon which they depend on BLM-administered lands. BLM Special Status Species include those species listed or proposed for listing under the Endangered Species Act (ESA), as well as those designated as Bureau Sensitive by the State Director.

The objectives of the BLM Special Status policy are:

- To conserve and/or recover ESA-listed species and the ecosystems on which they depend so that ESA protections are no longer needed for these species; and
- To initiate proactive conservation measures that reduces or eliminates threats to Bureau Sensitive Species to minimize the likelihood of and need for listing of these species under the ESA (USDI 2008, section .02).

Per BLM Manual 6840 (Section .06), Bureau Sensitive Species will be managed consistent with species and habitat management objectives in land use and implementation plans to promote their conservation and to minimize the likelihood and need for listing under the ESA. Project implementation will adhere to the requirements set forth in Section 6840.2.C. All Bureau Sensitive species were considered and evaluated for this project, and only those that could be impacted by the Proposed Actions are discussed in more detail.

Table 3-20. Wildlife Species Known, Suspected or Habitat Occurs in the Analysis Area

Scientific Name	Common Name	Status	Occurrence
Strix occidentalis caurina	northern spotted owl	FT	Known
Strix nebulosa	great gray owl	S&M	Known
Haliaeetus leucocephalus	bald eagle	SEN/EPA	Known
Aquila chrysaetos	golden eagle	EPA	Known
Falco peregrinus anatum	American peregrine falcon	SEN	Suspected
Pekania pennanti	fisher	SEN/FP	Known
Cania lupus	gray wolf	FE	Suspected
Antrozous pallidus	pallid bat	SEN	Suspected
Myotis thysanodes	fringed myotis	SEN	Suspected
Corynorhinus townsendii	Townsend's big-eared bat	SEN	Known
Actinemys marmorata	Pacific pond turtle	SEN	Known
Helminthoglypta hertleini	Oregon shoulderband	SEN/S&M	Suspected
Monadenia chaceana	Chace sideband	S&M	Suspected
Monadenia fidelis celeuthia	travelling sideband	SEN	Suspected
Vespericola sierranus	Siskiyou hesperian	SEN	Suspected
Pristiloma arcticum crateris	Crater Lake tightcoil	SEN/S&M	Suspected
Deroceras hesperium	Evening Fieldslug	S&M	Suspected
Callophrys johnsoni	Johnson's hairstreak	SEN	Suspected
Chloealtis aspasma	Siskiyou short-horned	SEN	Known
Bombus occidentalis	Western bumblebee	SEN	Suspected
Polites mardon	Mardon skipper	SEN	Known

Status:
FE – Federally Endangered
FT – Federally Threatened SEN – Bureau Sensitive Species EPA – Bald and Golden Eagle Protection Act
FP – Federal Proposed S&M – Survey and Manage Species
Occurrence:
Known – Species is known to occur in the Project Area
Suspected – Species not known to occur but reasonable potential to exist in the Project Area
Habitat – Less probable for species to occur but suitable habitat is found in the Project Area and is within the known or suspected range of the species

Federally Listed or Proposed Species

Northern Spotted Owls (NSOs)

The northern spotted owl, a federally-listed Threatened species, is associated with existing habitat within and adjacent to the South Fork Little Butte Project Area. 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).

The Bureau of Land Management (BLM), Forest Service (FS), and U.S. Fish and Wildlife Service (USFWS) have conducted a coordinated review of four reports containing information on the northern spotted owl.

The reviewed reports include the following:

- Scientific Evaluation of the Status of the Northern Spotted Owl (Sustainable Ecosystems Institute, Courtney et al. 2004);
- Status and Trends in Demography of Northern Spotted Owls, 1985-2003 (Anthony et al. 2004);
- Northern Spotted Owl Five Year Review: Summary and Evaluation (USFWS 2004); and
- Northwest Forest Plan – The First Ten Years (1994-2003): Status and trend of northern spotted owl populations and habitat, PNW Station Edit Draft (Lint 2005).

Anthony et al. (2004) published meta-analysis of owl demographic data collected in 14 demographic study areas across the range of the northern spotted owl. Four of the study areas are in western Washington, six are in western Oregon, and four are in northwestern California. Although the agencies anticipated a decline of NSO populations under land and resource management plans during the past decade, Anthony identified greater than expected NSO population declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California. However, Anthony (2010) stated that that there is now an apparent decline in spotted owl occupancy in the Southern Cascades Study Area, while the presence of barred owls is increasing.

The reports listed above did not find a direct correlation between habitat conditions and changes in NSO populations, and they were inconclusive as to the cause of the declines. Even though some risk factors had declined (such as habitat loss due to harvesting), other factors had continued, such as habitat loss due to wildfire, potential competition with the barred owl, West Nile virus, and sudden oak death (USFWS 2004; Lint 2005). The barred owl is present throughout the range of the spotted owl, so the likelihood of competitive interactions between the species raises concerns as to the future of the spotted owl (Lint 2005).

In more recent reports (Davis et al. 2010, 2011; Forsman et al. 2011), it has become more evident that the barred owl population is increasing across the range of the northern spotted owl. Forsman (2011) indicates that the spotted owl populations have declined across most of the range, with the most significant declines occurring in Washington where the barred owl has been present the longest. Although analysis within the nearest NSO demography study (Klamath Study Area, or KSA) to the Project Area indicates a stable spotted owl population during the study period, the recent data shows the beginning of a trend towards a declining population (Davis et al. 2010). Davis et al. (2010) states that

> [t]here is mounting evidence that barred owls are negatively impacting spotted owl population within the KSA. This is illustrated by several population trends beginning about 2003, which is when barred owl detections within the KSA exceed 10 percent of the sites. Spotted owl detections have been steadily decreasing since 2002 and reached the lowest point in 2010, the same year barred owl detections reached their highest level. Fecundity rates appear to be declining during the past 8 years and in only 1 of those 8 years was the rate above average. Fecundity rates for sites with known barred owl presence were lower than at other sites. If these trends continue a combination of lower occupancy and reduced fecundity, there may be cause for concern regarding the spotted owl population.

On June 30, 2011, the USFWS released the *Revised Recovery Plan for the Northern Spotted Owl* for public comment (USDI Fish and Wildlife Service 2011). This Revised Recovery Plan recommends achieving recovery of the spotted owl through 1) the retention of more occupied and high-quality habitat, 2) active management using ecological forestry techniques, both inside and outside of reserves, 3) increased conservation of spotted owls on State and private lands, and 4) the removal of barred owls in areas with spotted owls. The plan recommends retaining the Northwest Forest Plan reserve network while the Service utilizes a habitat modeling framework to develop and propose a new critical habitat network for the spotted owl. This new critical habitat for NSOs was finalized on November 21, 2012 and published in the Federal Register on December 4, 2012. The effective date for the Final Critical Habitat was on January 3, 2013 (30 days after the date of the publication in the Federal Register).

The original foundation for spotted owl recovery was the 1994 Northwest Forest Plan (NWFP). Management direction and land allocations in the standards and guidelines of the NWFP are intended to constitute the Forest Service and BLM contributions to the recovery of the northern spotted owl (USDA USDI 1994). The NWFP provides a network of late-successional reserves, 100-acre Known Spotted Owl Activity Centers (KSOACs), connecting riparian corridors, and connectivity blocks across the lands within the Plan area.

The NWFP-designated KSOACs were the best habitat on federal lands as close as possible to the spotted owl nest site, or owl activity center, for all sites known as of January 1, 1994 (USDA and USDI 1994b). These KSOACs are to be protected to preserve an intensively used portion of the breeding season home range close to a nest site or center of activity (USDI 1995). There are no KSOACs in the Project Area.

The South Fork Little Butte proposed activities are located within the provincial home ranges (1.2-mile radius from the site center) of 14 historic spotted owl sites. No known nests are located within the proposed treatment units. The Wildlife Analysis Area encompasses the entire home range of 17 historic NSO sites. The Wildlife Analysis Area was delineated based on a combination of factors including watershed boundaries, NSO home ranges, and proposed project units. The survey history for each NSO site within the Wildlife Analysis Area has varied over the years. Reproduction has been confirmed at three sites in the last 10 years. For purposes of this analysis, all sites are assumed to be occupied. While there is no requirement to survey for spotted owls prior to implementing forest management actions, the BLM conducted six survey visits to each of these sites in 2014, and the sites will be surveyed again in the 2015 field season. The 2014 surveys resulted in the location of two nest sites. Fledglings were located at both of these sites.

Northern Spotted Owl Habitat

For the purposes of this analysis, the vegetation within the South Fork Little Butte Project Area was typed into habitat categories pertinent to the northern spotted owl. These categories are distinct and not overlapping. These habitat types are used throughout this document to describe and quantify habitat conditions across the landscape (Table 3-21).

Highly suitable, or **RA 32** (Recovery Action 32) **habitat**, is a sub-set of NRF habitat. Under the NSO Recovery Plan, the US Fish and Wildlife Service recommends agencies maintain substantially all of the older and more structurally complex, multilayered conifer forests on federal lands (USDI FWS 2008c). These forests are characterized as having large diameter trees; high amounts of canopy; and decadence components such as broken-topped live trees, mistletoe, cavities, large snags and large coarse wood. Stands proposed for harvest in the South Fork Little Butte Project Area were evaluated using interagency draft methodology. Stands evaluated and meeting the definitions in the methodology are referred to as RA 32 stands. Through field evaluations, approximately 103 acres of proposed treatment units were determined to meet RA 32 stand conditions and removed from further consideration for treatment. (See also Chapter 2, Section F, Alternatives and Actions Considered but Eliminated from Detailed Analysis).

Northern Spotted Owl Prey Base

Dusky-footed woodrats, the primary prey species for spotted owls in southwest Oregon, are found in high densities in early seral or edge habitat (Sakai and Noon 1993). Down wood is an important habitat feature for these major prey species in southwest Oregon. Dusky-footed woodrats build stick nests, sometimes incorporating logs as part of the structure. Northern flying squirrels are another major source of owl prey in southwest Oregon (Forsman 2004).

Northern Spotted Owl Critical Habitat

Critical habitat is designated under the auspices of the Endangered Species Act of 1973 and was first designated for the northern spotted owl in 1992. Critical habitat includes the primary constituent elements (PCE) that support nesting, roosting, foraging, and dispersal. It also includes forest land that is currently unsuitable, but has the capability of becoming NRF habitat in the future (57 Federal Register 10:1796-1837). On February 28, 2012, the U.S. Fish and Wildlife Service (USFWS) released the proposed revised critical habitat in the form of maps and the draft form of the Federal Register publication. The proposed rule was published in the Federal Register on March 8, 2012 (77 Federal Register 46:14062-14165). On

Table 3-21. Northern Spotted Owl Habitat Types and Area in the South Fork Little Butte Project Area

Habitat Type	Description	Areas (Acres)
Suitable Habitat: Nesting, Roosting, and Foraging (NRF)	Meets all spotted owl life requirements. Stands are generally older than 80 years, have a high canopy cover (greater than 60 percent), a multilayered structure, and large overstory trees. Deformed, diseased, and broken-top trees, as well as large snags and down logs, are also present. Suitable habitat also includes areas with more uniform structure that may not have nesting structures, but provides roosting and foraging habitat with flying space for owls in the understory.	9,163
Dispersal Only Habitat	Not suitable for spotted owl nesting/roosting/foraging, but has sufficient patchy cover to be used for travel between suitable stands, a minimum 40 percent canopy cover, and an average tree diameter greater than 11 inches with flying space for owls in the understory.	4,570
Capable Habitat	Forest that is currently not spotted owl habit, but can become NRF or dispersal in the future as trees mature and canopy fills in.	4,695
Non-Suitable Habitat	Lands that do not provide habitat for spotted owl and would not develop into NRF or dispersal in the future (open prairies, meadows, shrub lands, etc.)	7,019
	TOTAL	25,447

November 21, 2012, in compliance with an order from the U.S. District Court of Columbia, the USFWS finalized the proposed rule. The rule becomes effective 30 days after the date of Federal Register publication. Federal Register publication took place on December 4, 2012, thus the rule became effective on January 3, 2013. There are 21,768 acres of critical habitat in the Wildlife Analysis Area.

The proposed project treatment units are located in the Klamath East (KLE) critical habitat unit (also referred to as Unit 10) and specifically, are within subunit KLE 5. The KLE 5 subunit consists of approximately 37,646 ac (15,325 ha) in Jackson County, Oregon, and comprises lands managed by the BLM and the State of Oregon. The 37,606 acres (15,219 ha) of BLM-administered land are managed per the NWFP (USDA and USDI 1994b) while the State of Oregon lands are managed under the Southwest Oregon State Forests Management Plan (ODF 2010b, entire). Special management considerations or protection are required in this subunit to address threats from current and past timber harvest, losses due to wildfire and the effects on vegetation from fire exclusion, and competition with barred owls. This subunit is expected to function primarily for north to south connectivity between subunits, but also for demographic support. The USFWS evaluation of sites known to be occupied at the time of listing indicates that approximately 86 percent of the area of subunit KLE 5 was covered by verified spotted owl home ranges at the time of listing (USDI FWS 2012). Within the Wildlife Analysis Area, 17,074 acres of BLM-administered land fall within KLE 5. While all proposed treatment units are within subunit KLE 5, about 4,694 acres of federally- managed land within the Wildlife Analysis Area fall within KLE 4.

Primary Constituent Elements of Critical Habitat

Based on current research on the life history, biology, and ecology of the northern spotted owl and the requirements of the habitat to sustain its essential life history functions, as described above, the Service has identified the following PCEs for the northern spotted owl which are as follows (USDI FWS 2012):

1) Forest types that may be in early, mid-, or late seral states and support the spotted owl across its geographical range.
2) Habitat that provides for nesting and roosting (NR). This habitat must provide:
   a) Sufficient foraging habitat to meet the home range needs of territorial pairs of northern spotted owls throughout the year.
   b) Stands for nesting and roosting that are generally characterized by:
      - Moderate to high canopy closure (60 to over 80 percent),
      - Multilayered, multispecies canopies with large (20- 30 in (51-76 cm) or greater DBH) overstory trees,
      - High basal area (greater than 240 sq. ft/acre (55 m^2/ha)),
      - High diversity of different diameters of trees,
      - High incidence of large live trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and other evidence of decadence)
      - Large snags and large accumulations of fallen trees and other woody debris on the ground, and
      - Sufficient open space below the canopy for northern spotted owls to fly.
3) Habitat that provides for foraging (F), which varies widely across the northern spotted owl's range, in accordance with ecological conditions and disturbance regimes that influence vegetation structure and prey species distributions (see specific description for the Klamath province below).
4) Habitat to support the transience and colonization phases of dispersal (D), which in all cases would optimally be composed of nesting, roosting, or foraging habitat (PCEs (2) or (3)), but which may also be composed of other forest types that occur between larger blocks of nesting, roosting, and foraging habitat. In cases where nesting, roosting, or foraging habitats are insufficient to provide for dispersing or nonbreeding owls, the specific dispersal habitat PCEs for the northern spotted owl may be provided by the following:
   a) Habitat supporting the transience phase of dispersal, which includes:
      - Stands with adequate tree size and canopy closure to provide protection from avian predators and minimal foraging opportunities; in general this may include, but is not limited to, trees with at least 11 in (28 cm) DBH and a minimum 40 percent canopy closure; and
      - Younger and less diverse forest stands than foraging habitat, such as even-aged, pole-sized stands, if such stands contain some roosting structures and foraging habitat to allow for temporary resting and feeding during the transience phase.
   b) Habitat supporting the colonization phase of dispersal, which is generally equivalent to nesting, roosting, and foraging habitat as described in PCEs (2) and (3), but may be smaller in area than that needed to support nesting pairs.

Gray Wolf

The gray wolf is a federally-listed as Endangered species in Oregon west of highways 395 and 78. Until 2011, gray wolves were only known to occur in Oregon east of these highways. In September 2011, one radio collared male wolf (OR-7) disappeared from the Imnaha pack in Northeastern Oregon. Since 2011 the

Oregon Department of Fish and Wildlife (ODFW) has been tracking OR-7's dispersal movements, which included some time in Northern California.

The proposed South Fork Little Butte Project is located near the known wolf activity area of OR-7 (ODFW 2015). This area covers the southeastern portion of Douglas County, the eastern edge of Jackson County, and the western edge of Klamath County. Since March 2013, ODFW has documented OR-7 spending the majority of his time in the southwest Cascades. On June 4, 2014, ODFW announced that OR-7 and a mate produced offspring. In September 2014, ODFW released results from genetic analysis that showed OR-7's mate was also from northeastern Oregon and that the pups were offspring from both adults. Then on January 13, 2015, ODFW identified additional wolf activity in the Keno area. The known wolf activity maps for the Rogue Pack and the new Keno wolf pair were updated on the ODFW website on January 27, 2015. Both of these areas of known wolf activity fall outside of the Wildlife Analysis Area for the South Fork Little Butte Project.

Wolves have large home ranges and use a variety of habitats, but use of different habitat types primarily coincides with wild ungulate ranges, including winter range, summer range and calving/fawning areas (Mech and Boitani 2010). Important wolf habitat components for reproduction are denning sites and rendezvous sites. Den sites may be in hollow logs, clefts between rocks, deep riverbank hollows, spaces under upturned trees or rock overhangs, or in abandoned dens of other animals (Mech and Boitani 2010).

They may use the same den for several years. After 1 to 2 months these natal dens are abandoned for an open area called a rendezvous site. At the rendezvous site pups are guarded by a few adult pack members, while the rest of the pack hunts (Mech and Boitani 2010).

Pacific Fisher

Fishers, a federally Proposed species under the ESA (Federal Register, Vol 79, no. 194, 10/7/14 pgs. 604190-60443), are found in forest woodland landscape mosaics that include conifer-dominated stands. Their occurrence is closely associated with low- to mid-elevation forests (generally less than 4,100 feet) with a coniferous component, large snags or decadent live trees and logs for denning and resting, and complex physical structure near the forest floor (Aubry and Lewis 2003). Forest type is probably not as important to fishers as the vegetative and structural complexity that lead to abundant prey populations and potential den sites (Lofroth et al. 2010). Fishers do not appear to occur as frequently in early-successional forests as they do in late-successional forests in the Pacific Northwest (Powell and Zielinski 1994), but 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 (Lofroth et al. 2010). In addition, Buskirk and Powell (1994) hypothesized that the physical structure of the forest and prey associated with forest structures are the critical features that explain fisher habitat use, not specific forest types. 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 (Lofroth et al. 2011; Aubry and Raley 2006).

Females usually give birth in cavities (natal dens) in large live or dead trees. These cavities are in trees with openings that access hollows created by heartwood decay (Aubry and Raley 2002). After the kits become more active, the females move them to a larger den (maternal 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 snags, mistletoe brooms, rodent nests, logs, and cull piles for rest sites (Lofroth et al. 2010).

Currently, there are two populations of fisher in Oregon which have been assumed to be genetically isolated from each other; a small population in the Southern Cascades near Prospect and Butte Falls, and a second population in southwestern Oregon in the Klamath and Siskiyou Mountains (Lofroth et al. 2010; Aubrey et al. 2004). This is considered to be the result of 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). Recent DNA analysis of hair samples collected at baited camera stations have demonstrated that individuals from both of these populations overlap in habitat use and thus there is likely a portion of their range in which interbreeding takes place.

Fishers are highly mobile and have large home ranges, and travel over large areas. In the Southern Cascades population, the average home range for females was approximately 6,200 acres (25 km^2). Male home ranges varied from approximately 36,300 acres (147 km^2) during breeding season to 15,300 acres (62 km^2) during the nonbreeding season (Aubry and Raley 2006). One male dispersed approximately 34 miles (55 km) to the Big Marsh area on the Deschutes National Forest (Aubry and Raley 2002). Other fisher research studies on the west coast have shown that fisher mean home range size vary considerably. Females' mean home ranges vary from 1.7 km^2 to 59 km^2, and males' from 7.4 km^2 to 177.5 km^2.

The northern spotted owl NRF habitat-type described above adequately describes suitable fisher denning and resting habitat because there is a direct correlation of key habitat features used to assess NSO habitat and fisher habitat (high canopy cover, multi-storied stands, large snags, and large down trees on the forest floor). Using northern spotted owl habitat as a surrogate for fisher habitat has been accepted by the courts as a reasonable practice (*KS Wild v. US BLM*, Case No. 06-3076-PA, Order and Judgment 9/10/2007).

Based on the NSO habitat analysis, approximately 9,163 acres of suitable fisher denning and resting habitat exist on BLM-administered lands within the Wildlife Analysis Area. However, all of these acres may not provide optimal fisher habitat because past harvest practices and land ownership patterns have resulted in fragmented habitat. BLM "checkerboard" ownership may be one of the primary factors limiting the ability of BLM-administered lands to provide optimal habitat for fishers (USDA and USDI 1994). This checkerboard ownership pattern was created by the Congressional acts that provided land grants, and is beyond the scope of the BLM's authority.

Fisher surveys using baited camera stations and hair snares have been conducted in portions of the Little Butte Creek watershed and proximate to the Project Area. Only one of these camera stations within the Wildlife Analysis Area has yielded photos of fishers. The extent (dispersal, foraging, or breeding) to which the South Fork Little Butte Project Area is used by fisher is not known.

U.S. Fish and Wildlife Service 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 U.S. Fish and Wildlife Service issued a proposal to list the West Coast Distinct Population Segment (DPS) of fisher (*Pekania pennanti*) as a threatened species under the Endangered Species Act in the Federal Register on October 7, 2014 (Federal Register, Vol 79, no. 194, 10/7/14 pgs. 604190-60443). The South Fork Little Butte Project falls within the range of the West Coast DPS of fisher. A final decision from USFWS is anticipated in April of 2016. Fishers remain a BLM Bureau Sensitive Species.

Bureau Sensitive Species

Bureau Special Status Species (SSS) are species listed or proposed for listing under the ESA and species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. The SSS list was most recently updated in January 2012. This list has two categories: Sensitive and Strategic. Per BLM Manual 6840 (Section .06), Bureau Sensitive Species will be managed consistent with species and habitat management objectives in land use and implementation plans to promote their conservation and to minimize the likelihood and need for listing under the ESA. Project implementation will adhere to the requirements set forth in Section 6840.2.C. All Bureau Sensitive species were considered and evaluated for this project, and only those that could be impacted by the proposed actions are discussed in more detail.

Bald Eagle

The bald eagle is a Bureau Sensitive Species and is also protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The US Fish and Wildlife (2007b) bald eagle Management Guidelines state:

> Bald eagles generally nest near coastlines, rivers, large lakes or streams that support an adequate food supply, usually fish and waterfowl. They often nest in mature or old-growth trees; snags (dead trees); cliffs; rock promontories; rarely on the ground; and with increasing frequency on human made structures such as power poles and communication towers. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds. Nest sites typically include at least one perch with a clear view of the water where the eagles usually forage. Shoreline trees or snags located in reservoirs provide the visibility and accessibility needed to locate aquatic prey. Eagle nests are constructed with large sticks, and may be lined with moss, grass, plant stalks, lichens, seaweed, or sod. Nests are usually about 4-6 feet in diameter and 3 feet deep, although larger nests exist.

There is one known bald eagle nest within the Project Area.

Bats

Pallid bats west of the Cascade Range 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). Roost habitat includes buildings, bridges, large decadent snags, and rock outcrops. Pallid bats have not been confirmed in the Wildlife Analysis Area, but they could be present.

Fringed myotis bats 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, and mines, and in crevices and cavities in large trees. No fringed myotis bats have been documented in the Wildlife Analysis Area.

Townsend's big-eared bats use a variety of habitats throughout the western U. S. They prefer caves or mine adits for roost sites, but may also use large, loose-barked snags. Townsend's big-eared bats have been documented within the Wildlife Analysis Area.

No mining adits are known to be present in the Project Area. Any mining adits located prior to harvest that can provide suitable bat habitat will be protected with a 250-foot no-cut buffer (USDI 1995). Scattered large remnant trees and snags that could provide roosting opportunities during foraging are present in and adjacent to the proposed units. Those within the units are not the subject of treatment and would be protected to the greatest extent possible, unless they present a safety hazard.

Mollusks

The proposed action is located within the suspected ranges of four terrestrial mollusk species which appear on the Bureau Sensitive species list. Two of these terrestrial mollusks also appear on the NWFP Survey and Manage list (see Table 3-25). Protocol surveys are required and mollusks are granted protection through buffering of known locations. Although very little is known regarding the ecology of these species, they are generally associated with moist areas and use rock substrate, large woody debris and logs as refugia during the dry months (Duncan et al. 2003). Protocol surveys for terrestrial mollusks were conducted in the Project Area during fall of 2014 and will be completed in the spring of 2015. Voucher specimens collected from surveys are currently being classified by species and sent to a regional malacologist for verification.

Habitat attributes for the **travelling sideband (*Monadenia fidelis celeuthia*)** include dry basal talus and rock outcrops, with oak and maple overstory components. Also, they have been found along spring run-off in rocks and moist silty alluvial benches adjacent to creeks with moist vegetation and detritus in mixed conifer-hardwood forest.

The **Siskiyou hesperian (*Vespericola sierranus)*** preferred habitat includes riparian and other perennially moist habitats with deep leaf litter, woody debris and rocks.

The **Oregon shoulderband (*Helminthoglypta hertleini*)** is generally associated with shrublands or rocky inclusions in forested habitat with substantial grass and subsurface water sources.

The **Crater Lake tightcoil** (***Pristiloma arcticum crateris***) may be found in perennially wet situations in mature conifer forests, among rushes, mosses and other surface vegetation or under rocks and woody debris within 10 m. of open water in wetlands, springs, seeps, and riparian areas, generally in areas which remain under snow for long periods in the winter.

Johnson's Hairstreak Butterfly

The Johnson's hairstreak butterfly is dependent on conifer mistletoe for egg-laying and for food in its larval stage. The host plants are dwarf mistletoes (*Arceuthobium campylopodum*) and other mistletoes (including *A. tsugense*). It spends much of its lifespan in and near the tops of conifer trees, although it descends to ground level for nectaring (including Oregon grape, Pacific dogwood, ceanothus, pussy paws, and *Rubus* species), and to visit moist muddy areas as a source of water (Pyle 2002). Surveys for the species are difficult as it spends the majority of its lifecycle high in the canopy of older conifers with mistletoe infection. Surveys have not been conducted for this species in the Wildlife Analysis Area. Habitat exists in the area and therefore the Johnson's hairstreak will be included in this analysis. The nearest known site is east of Medford, approximately 6 miles south and east of the Project Area.

Siskiyou Short-horned Grasshopper

This species is documented within the Wildlife Analysis Area. It has been found in multiple locations dominated by brush and grass. It is often associated with blue elderberry for the egg-laying phase of its life cycle. Siskiyou short-horned grasshoppers are actively feeding and reproducing from July through September.

Western Bumblebee

This species was until recently common across much of the western United States and has been documented within the Wildlife Analysis Area up to the present. The species has experienced a precipitous population decline in the last decade, likely due to introduction of non-native pathogens. This species is associated with open grassland/ shrubland where abundant flowering plants occur and serve as a food source.

Pond Turtle

The pond turtle is associated with streams and ponds throughout southwestern Oregon. Nest sites are terrestrial and located near water sources. Over-wintering sites may be aquatic or terrestrial, sometimes several hundred yards from water. Pond turtles have been documented within the Wildlife Analysis Area.

Peregrine Falcon

The peregrine falcon is a Bureau Sensitive species. This species nests on rock cliffs and outcrops and feeds on a variety of birds including pigeons and waterfowl. Peregrine falcons have not been documented nesting within the Wildlife Analysis Area but suitable rock cliff nesting habitat exists within the area. These habitats will be unaffected by proposed actions. This species will not be included in further analysis for the project.

c. Survey and Manage Species

Great Gray Owls

Great gray owls nest in a varied array of open forests associated with grassy areas suitable for their preferred prey species (e.g., voles, moles, gophers). Broken top trees, abandoned raptor nests, mistletoe clumps, and other platforms provide suitable nest structures (USDA and USDI 2004). All of the great gray owl (GGO) nests located in the western half of the Ashland Resource Area have been platform nests, whereas nests located in the higher elevation eastern portion of the Resource Area have been in broken top snags. Suitable

nesting habitat is defined in the "Survey Protocol For The Great Gray Owl " (USDI and USDA 2004) as large diameter trees with roosting cover within 200 meters (656 feet) of suitable foraging habitat. Foraging habitat is described as "relatively open, grassy habitats, to include bogs, natural meadows, open forests and selective/regeneration harvest areas" (USDI and USDA 2004). They have been observed foraging up to 2.0 miles from the nest (Bull and Henjum 1990).

There are 13 recorded historical nest locations of great gray owls within the Wildlife Analysis Area. The forested stands present within the Wildlife Analysis Area are of mixed suitability as habitat for great gray owls. Some stands are dense, steep and/or do not provide an open, grassy understory condition typical of GGO habitat. Other stands offer habitat components more typically utilized by great gray owls (e.g. broken-topped trees, grass and forb communities to support prey species). High quality nesting and foraging habitat for GGOs exists within the Wildlife Analysis Area. Surveys in the Project Area are on-going and will be completed in 2015.

Mollusks

The Proposed Action is located within the suspected ranges of four terrestrial mollusk species which appear on the NWFP Survey and Manage species list. Two of these terrestrial mollusks also appear on the Bureau Sensitive species list (see Table 3-25). Protocol surveys are required and mollusks are granted protection through buffering of known locations. Although very little is known regarding the ecology of these species, they are generally associated with moist areas and use rock substrate, large woody debris and logs as refugia during the dry months (Duncan et al. 2003). Protocol surveys for terrestrial mollusks were conducted in the Project Area during fall of 2014 and the spring of 2015. Voucher specimens collected from surveys are currently being classified by species and sent to a regional malacologist for verification.

The **Chase sideband (*Monadenia chaceana*)** is commonly found within 30 meters (98 feet) of rocky areas, talus deposits and in associated riparian areas. Areas of herbaceous vegetation in these rocky landscapes adjacent to forested habitats are preferred.

The **evening fieldslug (*Deroceras hesperium*)** is primarily a riparian associate found in perennially moist habitat, including spring seeps and deep leaf litter along stream banks and under debris and rocks.

The **Crater Lake tightcoil** (***Pristiloma arcticum crateris***) and the **Oregon shoulderband (*Helminthoglypta hertleini*)** are also listed as Bureau Sensitive species and are discussed in the BSS section above (p. 3-xx).

d. Other Wildlife Species of Concern

USFWS Birds of Conservation Concern and Game Birds Below Desired Condition

Resident (found year-round) and Neotropical bird species are addressed here due to widespread concern regarding downward population trends and habitat declines. BLM has interim guidance for meeting federal responsibilities under the Migratory Bird Treaty Act (USDI 2008b) and Executive Order (EO) 13186. Both the Act and the EO promote the conservation of migratory bird populations. The interim guidance was transmitted through Instruction Memorandum No. 2008-050. The Instruction Memorandum relies on two lists prepared by the US Fish and Wildlife Service in determining which species are to receive special attention in land management activities; the lists are *Bird Species of Conservation Concern* (BCC) found in various Bird Conservation Regions (Project Area is in BCR 5) and *Game Birds Below Desired Condition* (GBBDC). Table 3-22 displays those species that are known or likely to be present in the Wildlife Analysis Area.

Table 3-22. BCC and GBBDC Species Known or Likely to be Present in the Project Area

Scientific Name	Common Name	Status
Patagioenas fasciata	band-tailed pigeon	GBBDC
Zenaida macroura	mourning dove	GBBDC
Aix sponsa	wood duck	GBBDC
Contopus cooperi	olive-sided flycatcher	BCC
Selasphorus rufus	rufous hummingbird	BCC
Carpodacus purpureus	purple finch	BCC

GBBDC – Game Birds Below Desired Condition
BCC – Birds of Conservation Concern

Current research indicates the most appropriate scale to study impacts to migratory birds is at the eco-regional scale (California Partners in Flight 2002). Breeding bird surveys in the Southern Pacific Rainforest Physiographic Region (which includes western Oregon) indicate that songbirds are declining. The exact cause of these declines is still unclear, but issues associated with their winter grounds (Central and South America) are suspected to be an important factor.

Band-tailed pigeons are generally found in temperate and mountain coniferous and mixed forests and woodlands, especially pine-oak woodland. They will often forage in diverse habitats not used for nesting, including cultivated areas, suburban gardens and parks (Braun 1994). Mineral springs and mineral graveling sites are important for mineral intake by adults, especially during the nesting season. Pigeons show strong fidelity to mineral sites and have been documented traveling 32 miles from a nesting site to a mineral spring (Jarvis and Passmore 1992).

Mourning doves breed in variety of open habitats, including agricultural areas, open woods, deserts, forest edges, cities and suburbs. A dove may have up to five or six clutches in a single year. Human alteration of original vegetation in North America is generally beneficial for this species, with creation of openings in extensive forests and plowing of grasslands for cereal-grain production of particular importance. Mourning doves are one of the most widespread avian species in North America.

Olive-sided flycatchers are most often associated with forest openings, forest edges near natural openings (e.g., meadows, canyons, rivers) or human-made openings (e.g., harvest units), or open to semi-open forest stands. In Douglas-fir forests of northwest California, Olive-sided Flycatcher is the only common species detected more often at forest edges than in forest interior (Rosenberg and Raphael 1986). In rain forests of western Oregon, which are characterized by dense canopy closure and function as unsuitable habitat, Olive-sided flycatchers occur primarily in harvest units where at least a few large snags and live trees are retained.

Rufus hummingbirds' breeding habitat includes coniferous forest, second growth, thickets and brushy hillsides, foraging in adjacent scrubby areas and meadows with abundant nectaring flowers. They are associated with secondary succession communities and forest openings (Healy and Calder 2006). Nest sites are located in a variety of plants and sites including shrubs and drooping lower branches of conifers and oaks. There are reports of colonies of up to 20 nests only a few yards from each other in timber or second growth (Bent 1940).

The **purple finch** is likely to be found in the proposed project. In summer, purple finch mainly breed in moderately moist, open conifer forests, and edge habitat at low -to-mid elevations. They use a variety of habitats including deciduous woodlands, riparian corridors and edge habitat (Marshall et al. 2003). In winter they are more widespread, using forests, shrubby areas, weedy fields, hedgerows, and backyards.

Golden Eagle

Currently, the golden eagle is not recognized as a federally-listed (under the Endangered Species Act) or state listed species, or under the Bureau's Special Status Species program. However, protection is afforded under the Bald and Golden Eagle Protection Act. Under the 1995 Medford District RMP, golden eagle nest sites are protected with a 30-acre no harvest and no new road construction buffer. Disturbance would also be avoided during the nesting season within this buffer (USDI 1995, p.46).

In Oregon, golden eagles inhabit a wide range of habitats, including shrub steppe, grasslands, juniper, open ponderosa pine, and mixed conifer/deciduous habitats. The preferred foraging habitat is generally open areas with a shrub component that provides food and cover for prey (primarily black-tailed jackrabbit). Nests are typically large (3-10' tall and 3' wide), and often built in large live ponderosa pines (>30" DBH) or on ledges along rims and cliffs (Marshall et al. 2003). There are 3 known golden eagles nests or breeding areas in the Project Area.

e. Deer Winter Range and Elk Management Area

On BLM-administered lands, approximately 12,603 acres of the South Fork Little Butte Wildlife Analysis Area are in the Big Game Winter Range as identified in the Medford District RMP (USDI 1995, Map 7). More than 75percent of these areas are located behind locked gates or in unroaded areas. The inaccessibility of much of the winter range/ management area to vehicles provides seclusion for deer and elk at a time when they are under physiological stress in winter due to low temperatures and reduced forage quality and availability. This is a benefit because nutritional reserves are not depleted on avoidance behavior.

On BLM-administered lands within the Wildlife Analysis Area, approximately 6,689 acres serve as foraging areas (grass, brush, woodland, and early seral vegetation condition classes). Approximately 17,900 acres serve as thermal cover (mid-seral and mature forest with a high degree of canopy closure). Thus, approximately 67percent of the Wildlife Analysis Area on BLM-administered lands is currently providing thermal cover. Generally, brushland/shrubland and mature conifer forest vegetation condition classes also provide hiding cover.

Management for deer and elk in these areas is focused primarily on improving forage and cover conditions and decreasing the density of roads that are open to vehicular traffic, particularly in the winter. Winter range is located at lower to mid-elevations in the Wildlife Analysis Area, and generally on south to west facing slopes where solar radiation is most intense. Concentrating foraging and other life functions on these aspects allows the animals to maintain normal body temperature with less energy expenditure. "Thermal cover for big game winter range is not as critical in Little Butte Creek Watershed as it is in eastern Oregon due to the milder winters west of the Cascades. Although thermal cover may not be a major issue in this watershed, it can benefit big game by moderating thermal extremes (USDI and USDA 1997)."

5. Environmental Consequences

Impacts to wildlife from the proposed actions are best measured by the predicted potential changes in stand structure within different habitat types that would result from the activities proposed under each Alternative. Quantifying the predicted changes in wildlife habitat is the best method to evaluate the potential affects to wildlife species because they reflect the modification to and the resulting functionality of the residual stand after treatment. Each wildlife species would respond differently to these stand structure changes; some may be negatively affected, others may benefit, while still others may remain unaffected. The effects to key species associated with these habitats are linked to these changes in stand structures, as well as the magnitude (total treatment acres) and intensity of the treatments. Only federally-listed, Bureau Sensitive species, and NWFP Survey and Manage species known or suspected to occur within the Wildlife Analysis Area and with the potential to be impacted by the proposed actions are addressed further in this EA.

a. Alternative 1— No Action

Under the No Action Alternative, no vegetation management would be implemented and there would be no direct effects to wildlife species on BLM-administered lands. Without treatment , the current stand conditions would likely develop into less complex stand structures and simplified species compositions than that of late-successional stands (Sensenig 2002), or at the very least, would require a much longer time scale to develop into structurally complex forest (Tappeiner et al. 1997). Habitat conditions would remain generally unchanged at the unit scale in the short-term unless a major disturbance such as a wildfire, wind event, ice storm, insect infestation, or disease induced mortality occurred.

Conditions in the proposed thinning units would be most affected in the long-term by this competition of overstory trees. Overstocked stand conditions would result in relatively slow growth rates that would prolong crown differentiation. Eventually, some trees would become dominant and shade out suppressed trees. These suppressed trees would stand as small-diameter snags for a time and ultimately fall, but would not create openings as they occur in late seral stands as large overstory trees die and fall. The remaining dominant trees would soon expand their crowns into any newly-available growing space, increasing the effects of mortality on understory vegetation. Multiple waves of such competition mortality would occur before dominant tree density would be low enough for understory re-initiation. This growth trajectory would be unfavorable to the development of mature and late-successional forest attributes. These processes are discussed in further detail in the Silviculture portion of this EA (Chapter 3. Section B).

Private lands surrounding the Wildlife Analysis Area are made up of early, mid, and late seral forests, agricultural fields, urban areas, and barren land. Most private forest lands are managed as tree farms for production of wood fiber on relatively short forest rotations. It is expected that any remaining late seral forests on private timber lands would be converted to early seral forest over the next one or two decades. For those species dependent on early seral habitat, private forest lands are not expected to provide quality habitat as competing vegetation that includes flowering plants, shrubs and hardwood trees are regularly sprayed to reduce competition with future harvestable trees.

b. Alternative 2 – Proposed Action

All of the treatments proposed under this Proposed Action were designed to meet the following objectives:

1) Reduce stand density to increase tree growth, quality, and vigor of the remaining trees;
2) Create diversified stand structure (height, age, and diameter classes);
3) Develop spatial heterogeneity within stands (e.g. fine-scale structural mosaic);
4) Increase resilience/resistance of forest stands to wildfire, drought, insects, etc. by reducing stand density and ladder fuels;
5) Increase growing space and decrease competition for large and/or legacy pine, oak, and cedar.

Federally Listed or Proposed Species

Northern Spotted Owl (Threatened)

Effects to Northern Spotted Owl Habitat

The proposed actions may affect northern spotted owls to some degree (Likely to Adversely Affect or Not Likely to Adversely Affect), and therefore require consultation under Section 7 of the Endangered Species Act. Consultation with the USFWS has been completed for the activities proposed under this project in the BLMs *Biological Assessment for the South Fork Little Butte Forest Management Project* (SFLB_2015 BA) on January 9, 2015. In their Biological Opinion (FWS Reference Number 01EOFW00-2015-F-0090) transmitted on May 15, 2015, the USFWS determined that the proposed activities "are not likely to jeopardize the spotted owl" and they "do not anticipate that the project will adversely modify critical habitat at the subunit or range wide scale" (USDI FWS 2015, pp. 46-49).

The South Fork Little Butte Project proposes to treat up to 410 acres of NRF habitat and 982 acres of dispersal habitat (Table 3-23). No actions are proposed in the nest patches of historic spotted owl sites.

When discussing changes to spotted owl habitat, the following definitions are used to describe the anticipated effects of the activities associated with the Proposed Action to the NSO habitat types within the South Fork Little Butte Wildlife Analysis Area. Canopy closure is used as one of the critical habitat thresholds because it is highly important to NSO nest site selection and general habitat use, because increased levels of canopy afford protection from predators, and regulate temperature extremes (Courtney et al. 2004). The proposed treatments can be assigned into the following general effect types:

1) A **Treat and Maintain** of NRF or dispersal habitat means an action or activity would occur within NRF or dispersal habitat but would not change the habitat classification post-treatment. The NRF stand would retain an average of 60 percent canopy cover post-treatment, large trees, multi-storied canopy, standing and down dead wood, diverse understory adequate to support prey, and may have some mistletoe or other decay. Dispersal habitat would continue to provide at least 40 percent canopy, flying space, and trees 11 inches diameter at breast height (DBH) or greater, on average. The habitat classification of the stand following treatment would be the same as the pre-treatment habitat classification.

2) A **Downgrade of NRF** alters the condition of spotted owl NRF habitat so that the habitat no longer supports nesting, roosting, and foraging behaviors. Downgraded NRF habitat has enough tree cover to support spotted owl dispersal. Downgrade is defined as occurring when the canopy cover in a NRF stand drops to 40-60 percent at the stand level, and when conditions are altered such that an owl would be unlikely to continue to use that stand for the purpose of nesting, roosting or foraging. Downgraded NRF continues to provide habitat for dispersal.

3) Treatments that **Remove NRF**, or **Remove Dispersal** alter known spotted owl NRF so that the habitat no longer functions as nesting, roosting, foraging or dispersal. Removal generally reduces the canopy cover to less than 40 percent, alters the structural diversity and dead wood in the stand, or otherwise changes the stand so that it no longer supports owls for the nesting, roosting, foraging, or dispersal phases of their life cycle.

Table 3-23. Effects of Alternative 2 Proposed Treatments to NSO Habitat in the Analysis Area

Habitat Type	Pre-Project Acres	Treat and Maintain	Removal	Downgrade	Post-Project Acres	Percent Change
NRF	9,163	177	32	201	8,930	-2.6
Dispersal-only	4,570	895	87	N/A	4,684	+2.5

When analyzing the impacts to spotted owls from timber harvest, the amount, intensity and duration of the harvest are not the only factors to consider. A critical factor to consider is the spatial distribution of the habitat found across the landscape and where the proposed treatments would occur in relation to known NSO nest sites. These areas of use are defined as follows:

- **Nest Patch** is the 300-meter (984-foot) radius area around a known or likely nest site; it is included in the core area (USDI 2015a).
- **Core Area** is a 0.5-mile radius circle (approximately 500 acres) from the nest or center of activity to delineate the area most heavily used by spotted owls during the nesting season; it is included in the provincial home range circle. Core areas represent the areas which are defended by territorial owls and generally do not overlap the core areas of other owl pairs (USDI 2015a).
- **Provincial Home Range** is defined by a circle located around an NSO activity center and represents the area owls are assumed to use for nesting and foraging in any given year. For the Western Cascade Province the home range is a 1.2 mile radius circle (approximately 2,894 acres (USDI 2015a). The home ranges of several owl sites may overlap.

These three areas represent how NSOs utilize the forest environment around their nest sites, and the importance of the habitat located within each spatial scale to a given NSO pair. They also provide a better understanding of how habitat altering treatments may affect NSOs life functions depending on where the treatment would occur in relation to known NSO nest sites.

No harvest treatments are proposed in the Nest Patch of any NSO sites. Research has shown that the habitat quality within 300 meters (984 feet) of a nest site (known as the nest patch) is critically important to determining nest site positioning across the landscape (Perkins et al. 2000).

Under Alternative 2, there are approximately 88 acres of proposed treatment of capable habitat, 283 acres of proposed treat and maintain of dispersal habitat and approximately 50 acres of proposed treat and maintain of NRF habitat, 29 acres of proposed downgrade of NRF habitat, and 1 acre of proposed removal of NRF habitat in the 12 NSO Core Areas combined.

The Proposed Action would take place within the Provincial Home Range of 14 historic northern spotted owl sites. Under Alternative 2, there are 1,394 acres of proposed treatments within these owl home ranges: 247 acres of NRF and 810 acres of dispersal would be treated, but would be maintained and still function the same following treatment; 48 acres of NRF habitat would be downgraded to dispersal habitat; 1.5 acres of NRF habitat and 0.5 acres of dispersal would be removed; and 287 acres of capable would be treated. Across the Wildlife Analysis Area, more than 97 percent of existing suitable (NRF) northern spotted owl habitat would remain untreated. Therefore, only minimal negative effects are anticipated as a result of the proposed treatments.

Effects to Northern Spotted Owl Prey

Timber harvest and associated activity fuels reduction projects could impact foraging by changing habitat conditions for prey. Some disturbance of habitat can improve forage conditions by stimulating new herbaceous growth. Removal of some tree canopy cover brings more light resources into the stand, stimulating forbs, shrubs and other herbaceous sources of forage for prey species.

While some reports suggest negative impacts of thinning on flying squirrels (Wilson 2010, Holloway and Smith 2011), there exists counter information as to these effects (Gomez et al. 2005, Ransome et al. 2004, Waters and Zabel 1995). Flying squirrel densities are correlated with high tree cavity density, large amounts of hypogeous fungi, and crown-class differentiation (Carey et al. 1999, Carey et al. 2000). Gomez et al. (2005) noted that commercial thinning in young stands of Coastal Oregon Douglas-fir (35-45 years in age) did not have a measurable short-term effect on density, survival, or body mass of northern flying squirrels. Similarly, Waters and Zabel (1995) compared squirrel densities and body mass in shelterwoods, old, and young stands in the northern Sierras and found no difference in body mass or recapture rates between young and old stands in northern, more mesic forest habitats. However, they did conclude that heavy logging site preparation (burning) in the shelterwoods negatively affected flying squirrels. Ritchie et al. (2009) found negative landscape effects on flying squirrels when harvesting stands resulted in open conditions.

Treatments proposed under Alternative 2 that would remove, downgrade, or maintain spotted owl habitat may impact foraging by changing habitat for spotted owl prey species (USFWS 2006). Residual trees, snags, and down wood retained in the thinned stands would provide cover for prey species over time, and would help minimize harvest impacts to prey species, such as dusky-footed woodrats. Treatment implementation would be spread out temporally and spatially within the Wildlife Analysis Area, which would provide areas for spotted owl foraging during project implementation and reduce the impact of these short-term effects at the project level.

Edges created from harvest can be areas of good prey availability and potentially increased prey vulnerability (i.e., better hunting for owls) (Zabel et al.1995). Prey animals may be more exposed in the disturbed area or could move away from the disturbed area for the short-term. Changes in prey availability occur as cover is disturbed and prey species move around in the understory. As a result, they can become more exposed and vulnerable to predation.. This disturbance could attract other predators such as hawks, owls, and mammalian predators. This may increase foraging competition for owls in the treatment area, but the reduced cover for prey would improve prey availability for northern spotted owls.

Bingham and Noon (1997) reported that spotted owl core areas (0.5 mile radius around a nest location) provides important habitat elements such as nest sites, roost sites, and access to prey, benefiting spotted owl survival and reproduction. Rosenberg and McKelvey (1999) reported that spotted owls are “central place” animals with the core area being the focal area. Several studies (Wagner and Anthony 1998; Dugger et al. 2005; Zabel et al. 2003; Bingham and Noon 1997) indicate the core area size for the Klamath province is 0.5 miles from the nest site (or 500 acres). Therefore, effects to prey species for each alternative would be assessed by the amount of habitat treated within the core area. Due to the spatial distribution of the proposed

treatments, sufficient prey habitat would remain within the core areas to continue to provide suitable foraging opportunities. Within the South Fork Little Butte Project, there are no treatments proposed within nest patches, and the majority of treatments within core areas would be "treat and maintain" except for about 30 acres, of which 29 acres of NRF would be downgraded and 1.0 acre of NRF would be removed (see preceding Effects to Northern Spotted Owl Habitat section).

Implementation of Project Design Features that would retain and/or place large down wood while also retaining snags in the treatment units would provide cover for prey species, and would help minimize harvest impacts to prey habitat. In general, snags would be retained post-harvest. However some snags may felled due to safety concerns, and some snags would be removed in salvage units to achieve silvicultural prescription objectives. In both of these cases it is anticipated that adequate snag numbers would be retained at a landscape scale (40-acre scale) to accommodate the needs of snag associated species.

Effects of Noise Disturbance to Northern Spotted Owls

Mandatory PDFs would be incorporated into all project activities. Nesting owls are confined to an area close to the nest, but once the young fledge, they can move away from noise and activities that might cause them harm. Since all project activities would follow mandatory PDFs that restrict activities to outside of the critical breeding season (March 1st to June 30th) and beyond recommended disturbance distance thresholds (see Table 2-17), as established by the US Fish and Wildlife Service, no harm to nesting owls, or their young, is expected from project related noise.

Effects of Fuels Reduction Treatments to Northern Spotted Owls

Alternative 2 proposes to treat slash created from harvest treatments. The fuels reduction treatments as proposed in Chapter 2 would not alter the overstory forest structure or remove additional key habitat components related to spotted owl habitat. In thinning units, these treatments reduce understory density and improve flight paths within stands, increasing the accessibility of the forest floor to owls and thus improving access to ground dwelling prey species (Sakai and Noon 1993 and 1997).

Large down woody debris, patches of unburned vegetation in draws and cooler aspects, and some unburned slash piles would continue to provide ground cover habitat during and after proposed treatments. These untreated areas and residual habitat features, along with the spatial and temporal staggering of treatments across the landscape would ameliorate the potential negative effects (e.g., removal of cover; disruption of normal feeding, breeding, and sheltering activities) of these fuels treatments on prey species at the landscape level.

Effects of Road Construction to Northern Spotted Owls

Trombulak and Frissel (2000) conducted a literature review on the ecological effects of roads. These effects range from direct mortality to alteration of the chemical environment. They stressed the need to retain remaining roadless areas, remove or restore existing roads, and to consider the full range of ecological processes when designing a new road. The fact that there is an array of possible negative effects associated from building roads is not debatable. The magnitude of these effects from implementing the proposed project is discussed in this analysis. From a terrestrial wildlife standpoint, the BLM has incorporated PDFs into the project design to limit some of the described negative effects, which include (but are not limited to) wildlife surveys, seasonal restrictions, placement of the roads to avoid large trees, and the retention of large woody material.

There are a number of ways roads affect wildlife (in addition to habitat removal), including vehicular noise disturbance (which affects behavior patterns), increased potential for poaching, increased potential for over-hunting along roads due to easy access, and microclimatic changes to the habitat adjacent to roads.

Under Alternative 2, the BLM proposes to utilize and maintain (as needed) about 123 miles of existing roads (i.e., road grading, rock surfacing, and water drainage improvements). Road maintenance has the potential to impact wildlife species through noise and displacement, but would be of short duration and is subject to wildlife seasonal PDFs.

Approximately 3.84 miles of new road would be constructed under Alternative 2. Of this road construction, 0.4 miles would be in NRF habitat and 1.1 miles would be in Dispersal habitat with the remaining 2.3 miles in capable habitat. Seasonal restrictions listed as PDFs would avoid adverse disturbance to adjacent nesting spotted owls during road construction. Following use, all newly constructed permanent roads would receive adequate rock surfacing or would be closed with a gate or blocked.

Effects to Northern Spotted Owl Critical Habitat

Actions proposed under Alternative 2 are located within 2012 critical habitat sub-unit KLE-5 on 1,879 acres. Of these treatment acres there are 1,009 acres of treat and maintain thinning in dispersal habitat and 261 acres in nesting, roosting and foraging (NRF) habitat. There are also 26 acres of dispersal removal, 0.5 acre of NRF habitat removal and 57 acres of NRF downgrade to dispersal habitat. The remaining 526 acres of proposed treatment are found in capable habitat, which currently does not function as suitable spotted owl habitat.

The Proposed Action is not expected to affect the intended conservation function of this unit (north-south connectivity between subunits and demographic support) because the combination of 9,233 acres of NRF and dispersal habitat in KLE-5 would allow spotted owls to effectively disperse within and beyond this critical habitat sub-unit. Although the Proposed Action would remove 26 aces of dispersal habitat and 0.5 acres of NRF habitat, within the KLE-5 sub-unit, the overall objectives of the proposed actions are to restore ecological processes or long-term forest health to forested landscapes (see summation below), which is consistent with the 2011 Revised Recovery Plan and the 2012 Final CHU designation (Table 3-24).

Treatments proposed that would maintain NRF and dispersal habitat within critical habitat subunit KLE-5 are anticipated to have an inconsequential effect to critical habitat because:

- Canopy cover within treated NRF stands would be retained at or above 60 percent;
- Canopy cover within affected dispersal-only stands would be maintained at 40 percent or greater post-treatment;
- Any multi-canopy, uneven-aged tree structure that was present prior to treatment would remain post-treatment;
- No spotted owl nest trees would be removed;
- Within NRF habitat, decadent woody material, such as large snags and down wood, would be retained in the same condition as prior to the treatment except for some harvest of merchantable snags in units identified for salvage treatments;
- Within dispersal habitat, decadent woody material, such as large snags and down wood, would be retained because proposed prescriptions call for the retention of existing snags and coarse wood in amounts consistent with the Medford District RMP (USDI 1995) or better; and
- The proposed treatments would be dispersed in relatively small patches within the CHU to further minimize the potential for adversely affecting stand characteristics for dispersal habitat.

With regard to the downgrade of 57 acres of NRF habitat and the removal of 0.5 acres of NRF habitat in the South Fork Little Butte Project:

- Downgrade of NRF habitat associated with activities is designed to promote forest health.
- Silvicultural prescriptions that result in the downgrade of spotted owl NRF habitat may reduce key habitat elements, including trees with nesting cavities or platforms, multiple canopy layers, adequate forest cover, as well as hunting perches used by spotted owls.
- Implementation of treatments that downgrade spotted owl NRF habitat have the potential to reduce nesting, roosting, foraging and dispersal opportunities in the action area (USDI FWS 2012).

- The removal of 0.5 acres of roosting and foraging habitat as a result of road construction would remove a linear stretch of habitat. However, the particular location in question is near the top of a ridge and has been rated as being low in "relative habitat suitability" for NSOs and would be expected to have minimal impact to the species. "Relative habitat suitability" is based on modeling of forest habitat based on data from many studies regarding habitat use and selection by NSOs. This modeling provides an indication of the likelihood of NSO use, for various life cycle phases, of a particular forest stand.

Table 3-24. Effects to PCEs in Critical Habitat Subunit KLE-5 resulting from implementation of the South Fork Little Butte Forest Management Project (Alternative 2)

Primary Constituent Elements	KLE-5 Acres	Treat and Maintain	Downgrade	Removal	Post-Project Acres	Percent Change
NRF	6169	261	57	0.5	6111.5	-1%
Dispersal only	3090	1009	-	26	3121	+1%

In the consultation process with the USFWS, effects were quantified using Section 7 Watershed data due to the lack of a habitat layer which covered the entire CHU subunit. The acres in this table were calculated from a more recent and comprehensive dataset, the Northwest Forest Plan 15-year monitoring Spotted Owl Habitat layer (Davis 2011).

The long-term (>10 years) effects of the Proposed Action are anticipated to increase the health and vigor of the residual stands post-treatment. It is likely that the treated stands would develop into more complex, structurally diverse forests in the long-term in comparison to the No Action Alternative. In fact, thinning dense stands may be necessary in order to achieve old-growth forest characteristics in the absence of natural disturbance events (Tappeiner et al. 1997). Thinning younger forest stands may provide growing conditions that more closely approximate those historically found in developing old-growth stands (Hayes et al. 1997). Many of the treatments as proposed under Alternative 2, especially those that would occur in dispersal habitat, would have long-term beneficial effects to NSOs by increasing growth rates of the residual stand and accelerating the development of late-successional structural complexity within the treated areas than would occur if left untreated.

Spotted owl habitat at all 14 NSO sites within the Wildlife Analysis Area is already below a threshold point, at which any habitat effects in a home range would trigger a required consultation with the US Fish and Wildlife Service. The Proposed Action would treat and maintain 1009 acres of dispersal and 261 acres of NRF habitat. Under Alternative 2, 57 acres of NRF habitat would be downgraded to dispersal habitat, 0.5 acres of NRF would be removed and 26 acres of dispersal habitat would be removed (Table 3-24). Consultation with the Service was initiated in the fall of 2014 and the BLM submitted a Biological Assessment (SFLB_2015 BA) in January, 2015 (USDI 2015a). The USFWS released a Biological Opinion (BO) (Reference Number 01EOFW00-2015-F-0090) on May 15, 2015 (USDI FWS 2015).

Conservation Measures that would reduce impacts to northern spotted owls or key habitat areas are:

- Spotted owl habitat assessments were used to reduce impacts to NRF and eliminate treatments in RA-32 habitat;
- Protection and buffering of Special Status Species sites found during protocol surveys;
- Protection of sensitive plants (by delineation and preservation of buffer areas) that occur in the treatment areas provides additional protection of small areas of untreated NSO habitat;
- Incorporation of Riparian Reserve buffers, which provide habitat for terrestrial wildlife species associated with late-successional forest habitat (USDI 1995, p.26);
- Protection and buffering of all known mining adit locations sometimes preserves small areas of untreated NSO habitat;
- Project design that incorporates historic owl survey data;

- Proposed project activities would not occur in Late-Successional Reserves (USDI 1995);
- No activities would occur within Known Spotted Owl Activity Centers (KSOACs). KSOACs are the best 100 acres of NSO habitat around NSO nest sites or activity centers that were documented as of January 1, 1994 on Matrix lands, and are managed as Late-Successional Reserves (LSR) (USDI 1995, p.47). The criteria for mapping these areas is identified on pages C-10 and C-11 of the Northwest Forest Plan Standards and Guidelines (USDA and USDI 1994); and
- None of the proposed treatments would occur within a NSO nest patch.

In summary, Alterative 2 would have minimal impacts to the NSOs found within the Wildlife Analysis Area for the reasons stated above and because:

- Negative impacts to NSO prey are anticipated to only occur in the short-term (<5 years) and would be spatially separated and well distributed across the Analysis Area; and
- Seasonal restrictions would reduce the likelihood of noise disturbance to nesting owls.

Pacific Fisher (Proposed)

The U.S. Fish and Wildlife Service issued a proposal to list the West Coast Distinct Population Segment (DPS) of fisher (*Pekania pennanti*) as a threatened species under the Endangered Species Act in the Federal Register on October 7, 2014 (Federal Register, Vol 79, no. 194, 10/7/14 pgs. 604190-60443). The South Fork Little Butte Project falls within the range of the West Coast DPS of fisher. A final ruling is expected from the USFWS by April 2016. Fisher remains a BLM Bureau Sensitive Species.

Fisher 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 (Aubry and Lewis 2003). Forest type is probably not as important to fishers as the vegetative and structural complexity that lead to abundant prey populations and potential den sites (Lofroth et al. 2010). Currently, there is a lack of research regarding fisher habitat use and preferences in the Oregon Cascade Mountains. The most applicable data available to the BLM where these key structural habitat components occur across the landscape are the northern spotted owl nesting, roosting and foraging (NRF) habitat models. Habitat classified as (NRF) by these models generally possesses the vegetative and structural components important to fishers for their life cycle functions.

There is considerable information on the importance of structural elements (e.g., large trees and snags with cavities) for fisher. The strongest and most consistent habitat association observed across all fisher studies in the West Coast DPS was the use of cavities in live trees and snags by reproductive females with kits. Natal dens are typically found in the largest trees available in a stand and there is a preference towards hardwood cavities when present on the landscape. These large trees with cavities and platforms are also used extensively by both sexes for resting sites. Naney et al. (2012) stated that the reduction in structural elements used for denning and resting distributed across the landscape was the highest ranked and geographically most consistent threat to fishers. Currently, there are no defined empirical thresholds at which the reduction of structural elements may begin to negatively affect fishers (Naney et al. 2012).

Other threats to fishers in SW Oregon include overstory reduction, roads, habitat fragmentation, uncharacteristically severe wildfires, and the reduction of structural elements mentioned above (Naney et al. 2012). These changes in habitat have the greatest effect on fisher new home range establishment. Fishers typically have large home ranges, use habitat at multiple spatial scales, and avoid areas with little or no contiguous canopy cover (Lofroth et al. 2010). Fragmentation is primarily a product of land ownership patterns and management practices. The threat of further fragmentation is greater on commercial timber lands (Naney et al. 2012) due to management practices. These effects likely have the strongest influence on females due to the smaller spatial scale of the average female fisher home range. Males utilize larger home ranges and may adjust their landscape level use patterns to compensate for habitat modifying activities. Although not always successful, dispersing juveniles have been documented moving long distances and navigating across or around landscape features including rivers, highways and rural communities (Lofroth et

al. 2010). In a study in the south Oregon Cascades, juvenile males averaged a dispersal distance of 18 miles (Aubry and Raley 2006).

In the southern Oregon Cascade Mountains the home range of a non-breeding male fisher averages 24 mi^2 (15,320 acres) while home range of a female fisher averages 9.6 mi^2 (6,177 acres) (Aubry and Raley 2006). Fisher home ranges in the Wildlife Analysis Area may be larger than those in Aubry and Raley (2006) due to the larger proportion of woodland and grassland than that occurring within the south Cascades fisher population study. Since female home ranges frequently overlap, the Wildlife Analysis Area has the potential to contain at least 10 female home ranges and 4 or more male home ranges, depending on their home range juxtaposition on the landscape. Baited camera station surveys conducted in the Wildlife Analysis Area detected fisher presence at one location.

A considerable amount of research exists describing denning and resting habitat use and landscape-level selection (Lofroth et al. 2010), but very little is known regarding how forestry practices affect fishers' continued use of treated habitats. As previously mentioned, the best tool for determining suitable fisher habitat, while not implying a level of fitness, is to use spotted owl habitat models. Field surveys have shown that spotted owl NRF habitat can contain similar decadent attributes or structural elements that fisher use for denning and rest sites. The proposed treatments in Alternative 2 would treat and maintain 177 acres, downgrade 201 acres, and remove 32 acres out of 9,163 acres (total) of NRF habitat in the Wildlife Analysis Area.

The proposed commercial treatments under Alternative 2 would have negative effects to habitat for some fisher prey species due to the reduced vegetation. These effects are relatively short-term, as understory vegetation typically returns within 5 years and some of the fishers' prey species take advantage of early seral stages. The immediate effects to fisher foraging opportunities would be minimal, because the large amount of untreated area within the Wildlife Analysis Area would continue to provide hunting habitat while canopy cover in the treated stands increases. Additionally, treatments would retain key habitat characteristics such as large snags and coarse woody debris (CWD) to maintain existing and provide for future habitat for fishers.

Disturbance from treatment activities would likely be the principal effect to fisher within the Wildlife Analysis Area. However, fishers are highly mobile and with large home ranges, they would likely move to another part of their home range while the activity is taking place. Unrelated to disturbance, radio telemetry work in the nearby Ashland watershed has shown that fishers are quick to respond to environmental changes (e.g. heavy snowfall) and move to other parts of their home ranges (Clayton 2012a).

Under Alternative 2, there are Project Design Features that would minimize impacts to fishers. These include the retention of key structural elements such as mature and decadent trees (including mistletoe-infected trees), snags, CWD, and large hardwoods for denning. While 5 percent of the Wildlife Analysis Area is proposed for treatments (1,676 acres of commercial treatments and 1,553 acres of non-commercial treatments), areas such as Riparian Reserves, NSO RA 32 habitat, 100-acre KSOAC owl cores, NSO Nest Patches, and other designated reserves would continue to provide undisturbed habitat for fishers. Adjoining the Wildlife Analysis Area to the east is a large Late Successional Reserve (LSR) that is located on USFS-administered land, which would also continue to provide habitat for fishers. Because of the retention of these habitat features in the Wildlife Analysis Area, effects to fishers from implementation of this project are expected to be minor, and would not trend this species towards further listing.

Gray Wolf

The January 9, 2015 South Fork Little Butte (SFLB) Biological Assessment (BA) addressed effects to wolves and made a No Effect determination for wolves because the proposed activities would not disturb key wolf areas such as den sites and rendezvous sites, would not change prey availability, and would not increase public access in the area known to be used for denning and rendezvous sites (USDI 2015a). The BA also indicated the SFLB Project was within the known wolf activity area that ODFW had identified for OR-7 (ODFW 2014).

Shortly before the SFLB BA was submitted to USFWS, ODFW identified OR-7, his mate, and pups as the Rogue Pack. Then on January 13, 2015, ODFW identified additional wolf activity in the Keno area. The known wolf activity maps for the Rogue Pack and the new Keno wolf pair was updated on the ODFW website on January 13, 2015. The South Fork Little Butte Project is no longer within the Rogue Pack (OR-7) Activity Area and is not within the new Keno Activity Area. This new information does not change the effects determination for the SFLB Project. Additionally, as indicated in the BA, if a den or rendezvous site is identified prior to or during project activities, Section 7 Consultation PDC for wolves will be followed (USDI 2015a, Appendix A). Seasonal restrictions would be put in place (March 1 to June 30) for project activities located within one mile of a den or rendezvous site. Because these sites are difficult to locate and can change from year to year, this will need to be assessed on an ongoing basis throughout the life of this project through annual updates and communication with the USFWS and ODFW.

Survey and Manage Species

Great Gray Owls

The Wildlife Analysis Area is home to 13 known GGO reproductive sites. In 2014, BLM surveys for great gray owl (GGO) in the Wildlife Analysis Area detected numerous great gray owls, but no nests were located. Reproduction was confirmed through the location of great gray owl fledglings at two locations and these would be protected as known sites. A second year of surveys is currently underway in the 2015 breeding season.

Alternative 2 proposes treatment in approximately 559 acres of suitable GGO nesting habitat. Most NSO NRF habitat within the Wildlife Analysis Area (approximately 9,163 acres) also has the potential to serve as nesting habitat for GGOs as NRF habitat in this area tends to occur near natural openings or has a mosaic of small natural openings throughout. Selective thinning, group selection, density management, understory reduction, and mortality salvage treatments are proposed for some of these stands. The reduction of canopy cover and removal of a proportion of live and dead or dying trees from these treatments would not impact owl nesting opportunities, as the majority of broken-topped snags in the Wildlife Analysis Area would remain in place, post-harvest. These broken-topped snags are the preferred nesting substrate of great gray owls in the Cascade Range in Southwestern Oregon (Godwin 2012). Additionally, the project was designed to protect known GGO reproductive locations by incorporating a ¼-mile (approximately 120-acres) no-harvest protection zone. Meadows and natural openings with which GGOs are associated have also received no-harvest buffer of 300 feet. These no-harvest areas combined with Riparian Reserves and other protected areas provide a large amount of GGO nesting and foraging habitat in which no actions would take place.

Long-term beneficial effects of proposed treatments include accelerated development of late-successional forest habitat suitable for nesting and improved foraging habitat as understories respond from increased light penetrating to the forest floor and prey populations increase in response to this flush of herbaceous growth. In addition, implementing required PDFs (seasonal restrictions, retaining snags, cull material, down woody debris, and placing woody debris (logs) in RMP deficient treatment areas) would be beneficial to this species prey base.

Less than 0.3 miles of the proposed new road construction would occur in suitable great gray owl habitat. Some trees, including snags, would be removed in the process of this road building. The majority of potential nest trees in the stand through which this new road would pass would remain post-construction.

Road construction and timber harvest, as proposed, are expected to have a minimal effect on great gray owls, and a minimal effect on the potential for great gray owls to use this habitat for breeding, foraging, and dispersing in the future. The majority of habitat used by GGO would remain intact, post-treatment. The proposed treatments would not cause this species to trend towards further listing as either a Bureau Sensitive species, or a federally Threatened or Endangered species. No meaningful cumulative effects are anticipated to this species.

Terrestrial Mollusks

Surveys conducted in 2014 and 2015 resulted in 9 known or suspected Special Status Species mollusks locations within proposed treatment areas. If confirmed, these sites would receive protection buffers with a radius equal to approximately one average site tree. Buffers would be installed according to professional judgment, with the goal the preservation of microclimate environmental conditions (e.g. canopy, ground cover, woody debris, rocky substrate) around known species' locations to provide for the persistence of the species at these sites.

In the short-term, thinning of forest canopies could desiccate fine scale habitats, but the canopies would eventually fill back in. Impacts from implementing treatments in Alternative 2 are likely to have minimal effects and would not trend these species towards listing because:

- The dispersed impact of the proposed treatments in relation to the Wildlife Analysis Area and the proximate undisturbed habitat for species to recolonize the impacted areas.
- Perennial riparian areas and water sources are buffered.
- Large CWD would be maintained and in some areas where it is determined to be lacking, cull material would be retained or the BLM could fell trees to help reach RMP standards.
- Any known locations would receive protection buffers or management recommendations.

Bureau Sensitive Species

Bald Eagle

One bald eagle nest tree was located within the Wildlife Analysis Area. This known bald eagle nest location is approximately 0.4 miles from the nearest proposed project activity site. The removal of large overstory tree in this area would be avoided in an effort to retain potential future bald eagle nest trees. Harvest and road building activities would be restricted as per PDFs if this nest is active during the same year as any of these potential disruptive activities. Effects to bald eagles are expected to be minimal as habitat features would be retained, and therefore, the potential to add a cumulative effect is not anticipated.

Bats

The three Bureau Sensitive bat species (Townsend's big-eared, Pallid, and Fringed Myotis) utilize mines, caves, manmade structures, snags and rock outcroppings for roosting and hibernacula sites. No surveys have been conducted for these species. Even though the Proposed Action may potentially adversely disrupt local bat populations, and may cause the loss of habitat in some cases, this project is not expected to affect long-term population viability of any bat species in the Wildlife Analysis Area. Project design PDFs requiring the retention of snags, decadent wildlife trees, buffering of mines, and avoidance of Riparian Reserves, 100-acre spotted owl cores (KSOACs), NSO Nest Patches, and other reserves, would continue to provide undisturbed habitat for these sensitive bat species. With implementation of this project, effects to bats are expected to be minimal. The proposed actions would not cause bat species occurring in the Wildlife Analysis Area to trend towards further listing. As such, no potential for cumulative effects are anticipated to these species.

Johnson's Hairstreak

No surveys have been conducted for this species in the Wildlife Analysis Area. The nearest confirmed location for this species is approximately 6 miles southeast of the southernmost end of the Wildlife Analysis Area. If present, this butterfly may be impacted through removal of conifer trees and the mistletoe which they host. Johnson's Hairstreaks lay their eggs on conifer mistletoes. As mistletoe would not be eradicated from the area, suitable habitat would continue to persist in the Wildlife Analysis Area and the proposed actions would have minimal impacts to the species. Implementation of proposed actions would not cause this species to trend towards further listing; therefore, cumulative effects are not anticipated to this species.

Siskiyou short-horned grasshopper

This species has been documented in at least 13 grassland areas within the Wildlife Analysis Area. These areas would not be treated under the SFLB Project. There would be no effect to this species with implementation of proposed actions, and would not have the potential to add a cumulative effect.

Western Bumblebee

The grassland/shrubland habitat of this species would not be treated under the SFLB Project, and consequently, there would be no effect to this species with implementation of the proposed actions. There would be no potential for cumulative impacts.

Pond Turtle

Pond turtles are known to occur at several locations within the Wildlife Analysis Area. The aquatic habitat of this species would not be treated under the SFLB Project. The upland areas immediately adjacent to this aquatic habitat would be protected by riparian buffers. It is possible that individuals of this species overwintering in forested areas may be disturbed or harmed by the activities planned under the SFLB Project. This sort of impact to individuals would not be expected to contribute to the need to list this species as federally Threatened or Endangered, nor would it have the potential to add a cumulative effect.

Other Wildlife Species of Concern

USFWS Birds of Conservation Concern and Game Birds Below Desired Condition

Some migratory bird individuals other than USFWS species of concern may be disturbed or displaced during project activities. Some nests may be destroyed from timber harvest occurring during active nesting periods. However, there would be no perceptible shift in species composition the following breeding season because of the limited scale of habitat modifications in relation to the Wildlife Analysis Area. Adequate undisturbed areas within and adjacent to the Wildlife Analysis Area would maintain habitat for displaced individuals. Overall, populations in the region would be unaffected due to this small amount of habitat and/or reproduction loss. These effects would not be measurable at the regional scale. Analyzing bird populations at this scale is supported by Partners in Flight (California Partners in Flight 2002).

As described in the Affected Environment, the five USFWS species of concern (band-tailed pigeon, mourning dove, olive-sided flycatcher, rufous hummingbird and purple finch) known or suspected to occur in the Wildlife Analysis Area prefer open to semi-open forests, stand edges, woodlands, brush, and agriculture land to nest and forage. Indirect effects from habitat changes that would occur as a result of implementing Alternative 2 would be beneficial to these species while the forest matures into a mid- to late-successional seral stage. With implementation of proposed actions, direct effects to these bird species are expected to be minimal, and would not have the potential to add a cumulative effect.

Golden Eagles

There are three known golden eagle nest sites or breeding territories within the Wildlife Analysis Area. Golden eagles are regularly observed in the Little Butte Creek watershed. Due to the suitable habitat available to golden eagles within this watershed, any impact to the species from the SFLB Project is expected to be minimal. Over 97 percent of older forested habitat types within the Wildlife Analysis Area would be retained. These older forests are the most likely to support nesting by golden eagles. Most large suitable nest trees would be retained post-harvest. There are grasslands suitable for foraging in the area (which would not be treated) and would remain usable by golden eagles to their present extent post-treatment. With implementation of this project, direct effects to golden eagles are expected to be minimal and would not trend this species towards further listing. No potential for cumulative effects is anticipated for this species.

Big Game Winter Range and Elk Management Area

The primary effects to big game winter range as a result of implementing actions proposed in Alternative 2 would be the reduction in thermal cover effectiveness due to a reduction in canopy closure in the

commercial-sized conifer stands. Thermal cover provides protection from extreme temperatures and thus, reduces stress on these animals. Optimal thermal cover requires conifer/evergreen canopy cover of greater than 70 percent. Currently, approximately 17,900 acres of BLM-administered land within the Wildlife Analysis Area serve as thermal cover (mid-seral and mature forest with a high degree of canopy cover). Thus, approximately 70 percent of BLM-administered lands in the Wildlife Analysis Area is currently providing thermal cover. Under Alternative 2, approximately 281 acres would be treated within the Big Game Winter Range area. Even if these 281 acres are not included as thermal cover in the Wildlife Analysis Area, there would still be more than 17,600 acres that functions as thermal cover. Thus, 69 percent of BLM-administered lands within the Wildlife Analysis Area would continue to function as thermal cover, an amount that exceeds the minimal thermal cover retention of 20 percent provided by the 1995 RMP (USDI 1995, p.45).

Post-harvest most project units (except approximately 32 acres of NRF removal and approximately 87 acres of dispersal for removal) would have canopy covers of 40 to 60 percent. Although not optimal, the thermal cover effectiveness of the stands would still be about 50 percent based on data in Thomas et al. (1979). The proposed treatments would likely improve forage conditions in treated stands by stimulating the growth and abundance of shrub and herbaceous species.

Additionally, the concept that thermal cover moderated weather conditions, and thus, was important to survival and reproduction in ungulates has recently been challenged (Cook et al., 2004a). Cook et al. (2004a) conclude that "the primary benefit attributed to cover is probably not operative across a considerable range of climate, including those in boreal ecosystems of the northeastern U.S., maritime ecosystems of the inland Pacific Northwest, and cold, dry ecosystems of the central Rocky Mountains." This finding indicates that the reduction in thermal cover effectiveness would be of little consequence to wintering deer or elk. Therefore, effects to big game species from the proposed actions are expected to be minimal.

Under Alternative 2, the BLM proposes to maintain about 123 miles of roads (i.e., road grading, rock surfacing, and water drainage improvements). Approximately 3.84 miles of new road would be constructed under this alternative. New road construction would allow a slight increase in vehicular activity in previously inaccessible areas within the Big Game Winter Range area. There are a number of ways roads affect big game species in addition to habitat removal. Some of the more common ones are vehicular noise disturbance which affects behavior patterns, increased potential for poaching, increased potential for over hunting along roads due to easy access, and microclimatic changes to the habitat adjacent to roads. Road maintenance has the potential to influence wildlife species through noise, but would be of short duration and subject to wildlife seasonal PDFs. More than 75 percent of the Big Game Winter Range and Elk Management Area is in a portion of the Wildlife Analysis Area located behind locked gates or otherwise inaccessible to motorized vehicles. The deer and elk in these areas do not have to waste energy in avoidance behavior. Effects to big game as a result of project implementation are expected to be minimal, and no significant cumulative effects are anticipated to these species.

Vegetation Conditions and Terrestrial Wildlife Habitats (General)

Alternative 2 proposes modification of NRF or Dispersal NSO habitat (currently classified as late successional habitat) totaling 320 acres. Post treatment, these acres would be unlikely to be classified as late successional habitat. This would result in a reduction of late successional habitat in the 5th field watershed from 31,106 acres on BLM to 30,786 acres. Total BLM managed land in this watershed is 75,057. Post treatment, 41 percent of BLM managed land in this 5th field watershed will remain classified as late successional habitat.

c. Alternative 3

The effects to terrestrial wildlife from implementing actions proposed under Alternative 3 would be very similar to Alternative 2, except the overall effects would be lessened as fewer acres are proposed for treatment. Under Alternative 3 there would also be no new road construction. Approximately 109 miles of existing road would be maintained or improved. About 909 acres of forest land proposed for treatment under Alternative 2 would receive no treatment under Alternative 3. These reductions in acres of potential

impacts would result in a proportionate reduction in effects. For many species, however, this reduction in effects is not quantifiable. Therefore, the analysis and discussion in Alternative 2 is reasonably applicable under Alternative 3, as well. Species for which a measurable reduction in effects can be calculated are analyzed in detail below.

Federally Listed or Proposed Species

Northern Spotted Owl (Threatened)

Effects to spotted owls, spotted owl habitat, and spotted owl prey species under Alternative 3 would be similar to the effects of Alternative 2, but reduced quantitatively. The discussion in Alternative 2 is reasonably applicable under this alternative as well. The elimination of treatments in 229 acres of dispersal habitat and the elimination of new road construction contribute to this alternative being of lesser impact to northern spotted owls (Table 3-25). Alternative 3 has a net decrease of 53 acres of NRF treatment acres. Alternative 3 proposes a reduction of 143 acres of NRF downgrade and a reduction of approximately 31 acres of NRF removal over the Alternative 2 proposal. Alternative 3 proposes an increase of NRF treat and maintain acres from 177 acres under Alternative 2 to a total of 299 acres. No habitat would be lost to road-building. Overall, Alternative 3 would be expected to have less effect to NSOs and NSO habitat than Alternative 2 due to the overall reduction in treatment acres.

Table 3-25. Effects of Alternative 3 Proposed Treatments to NSO Habitat in the Wildlife Analysis Area

Habitat Type	Pre-Project Acres	Treat and Maintain	Downgrade	Removal	Post-Project Acres	Percent Change
NRF	9,163	299	58	0.4	9,105	-0.7
Dispersal-	4,570	752	N/A	1.05	4,627	+1.2

The following Table 3-26 summarizes the effects of Alternative 3 to NSO Critical Habitat by acres and habitat type.

Table 3-26. Effects to PCEs in NSO Critical Habitat Subunit KLE-5 Resulting from Implementation of the South Fork Little Butte Forest Management Project (Alternative 3)

Primary Constituent Elements	KLE-5 Acres	Treat and Maintain	Downgrade	Removal	Post-Project Acres	Percent Change
NRF	6,169	87	0	0.4	6,168.6	-0.001
Dispersal	3,090	632	N/A	1.05	3,088.95	-0.01

In the consultation process with the USFWS, effects were quantified using Section 7 Watershed data due to the lack of a habitat layer which covered the entire CHU subunit. The acres in this table were calculated from a more recent and comprehensive dataset, the Northwest Forest Plan 15-year monitoring Spotted Owl Habitat layer (Davis 2011).

The long-term (>10 years) effects of the proposed actions are anticipated to increase the health and vigor of the residual stands post-treatment. It is likely that the treated stands would develop into more complex, structurally diverse forests in the long-term in comparison to the No Action Alternative. In fact, thinning dense stands may be necessary in order to achieve old-growth forest characteristics in the absence of natural disturbance events (Tappeiner et al. 1997). Thinning younger forest stands may provide growing conditions that more closely approximate those historically found in developing old-growth stands (Hayes et al. 1997). Many of the treatments as proposed under Alternative 3, especially those that would occur in dispersal habitat, would have long-term beneficial effects to NSOs by increasing growth rates of the residual stand and accelerating the development of late-successional structural complexity within the treated areas than would occur if left untreated.

Spotted owl habitat at all 14 NSO sites within the Wildlife Analysis Area is already below a threshold point, at which any habitat effects in a home range would trigger a required consultation with the US Fish and Wildlife Service. Actions proposed under Alternative 3 would treat and maintain 632 acres of dispersal habitat and 87 acres of NRF habitat. No NRF habitat would be downgraded to dispersal habitat; however, 0.4 acres of NRF would be removed and 1.05 acres of dispersal habitat would be removed. Consultation with the Service was initiated in the fall of 2014 and the BLM submitted a Biological Assessment (SFLB_2015 BA) in January 2015. The USFWS released a Biological Opinion (BO) (Reference Number 01EOFW00-2015-F-0090) on May 15, 2015.

Big Game Winter Range and Elk Management Area

Currently, approximately 17,900 acres of BLM-administered land with the Analysis Area serve as thermal cover (mid-seral and mature forest with a high degree of canopy closure). Thus, approximately 70 percent of BLM-administered lands in the Wildlife Analysis Area is currently providing thermal cover. Under Alternative 3, approximately 90 acres of treatment would occur within the area identified as Big Game Winter Range. All of these 90 acres of proposed treatment are typed as capable or dispersal and thus do not currently function as thermal cover. Thus, 67 percent of BLM-administered lands with the Analysis Area would continue to function as thermal cover, an amount that exceeds the minimal thermal cover retention of 20 percent provided by the 1995 RMP (USDI 1995, p. 45).

Vegetation Conditions and Terrestrial Wildlife Habitats (General)

Alternative 3 proposes modification of NRF or Dispersal NSO habitat (currently classified as late successional habitat) totaling approximately 60 acres. Post treatment, these acres would be unlikely to be classified as late successional habitat. This would result in a reduction of late successional habitat in the 5th field watershed from 31,106 acres on BLM to 31,046 acres. Total BLM managed land in this watershed is 75,057. Post treatment, 41 percent of BLM managed land in this 5th field watershed will remain classified as late successional habitat.

Cumulative Effects

Cumulative effects are environmental changes that are affected by more than one land-use activity, and include beneficial changes. Cumulative effects for wildlife species and habitat are reviewed at the watershed level to capture the varying habitats, species home ranges, and varying degrees of species mobility. Technical issues that complicate analysis of cumulative effects include the large spatial and temporal scales involved, the wide variety of processes and interactions that influence cumulative effects, and the lengthy lag-times that often separate a land-use activity and the landscape's response to that activity. Fire suppression, road building, and timber harvest throughout the Wildlife Analysis Area have resulted in habitat modification and fragmentation, and have changed the distribution and abundance of wildlife species surrounding the Wildlife Analysis Area. Timber harvest has occurred on BLM-administered lands in the Wildlife Analysis Area for decades. The associated habitat modification has negatively affected late-successional forest habitat-dependent species by reducing stand seral stage and changing habitat structure. However, species associated with younger forested conditions have benefited from these changes due to the increased acres of young stands within the watershed.

Private lands surrounding the Wildlife Analysis Area are made up of early, mid-, and late seral forests, agricultural land, urban areas, and barren land. Most private forest lands are managed as tree farms for production of wood fiber on forest rotations. It is expected that any remaining late seral forests on private timber lands would be converted to early seral forest over the next one or two decades. For those species dependent on early seral habitat, private forest lands do not always provide quality habitat as competing vegetation that includes flowering plants, shrubs and hardwood trees are regularly sprayed to reduce competition with future harvestable trees. The majority of state and private forests in Washington, Oregon, and Northern California are managed for timber production. Non-federal lands are not expected to provide demographic support for spotted owls across and between physiographic provinces (Thomas et al. 1990; USDA and USDI 1994b). Historically, non-federal landowners practiced even-aged management (clear-cutting) of timber over extensive acreages. Private industrial forest lands are managed for timber production and would typically be harvested between 40 and 60 years of age, in accordance with State Forest Practices

Act standards. In 2008, during the development of the District Analysis and 2008 Biological Assessment of Forest Habitat (DA 08 BAFH), data was requested from Oregon Department of Forestry and the Pacific Northwest Inventory and Analysis team to help determine harvest rates in the past decade on private lands within the Medford district. These records indicated private harvest rates in Jackson and Josephine Counties have never exceeded 1.08 percent of the total private lands per year since 1998. These records did not provide information of pre-treatment habitat conditions. We anticipate some loss of owl habitat on private lands, but cannot predict the rate of loss, or the specific location of harvest.

The proposed SFLB Project treatment acres represent approximately 13 and 8 percent of the total BLM-administered lands in the Wildlife Analysis Area for Alternatives 2 and 3 respectively. On the landscape scale at which this analysis is conducted this difference in percent of BLM-administered land treated is not considerable enough to warrant a separate analysis of cumulative effects. Thus, cumulative effects for Alternatives 2 and 3 are covered together in the analysis below.

Northern Spotted Owl

The South Fork Little Butte project proposes commercial treatments on up to 410 acres of NRF, 982acres of dispersal-only, and 301 acres of capable NSO habitat(Alternative 2)- or 357 acres of NRF, 753 acres of dispersal-only, and 480 acres of capable NSO habitat (Alternative 3). These treatments, coupled with the other recent and reasonably foreseeable projects described above, would increase fragmentation within the watersheds. However, the only activity, other than the South Fork Little Butte project, that is likely to remove NRF habitat within the watersheds would be timber harvest on private lands. Previously analyzed BLM projects with proposed treatment units within the SFLB Wildlife Analysis Area include: Rio Climax Forest Management Project, Conde Forest Management Project, and Heppsie Forest Management Project. If the actions proposed under these project EAs are implemented the primary effect will be additional acres of treatment in NSO dispersal and capable habitat. The only planned removal of habitat is approximately 30 acres of NSO dispersal habitat in the Heppsie Forest Management Project. This small amount of removal at the watershed level would not preclude spotted owls or other late-successional forest species from dispersing within or through the watersheds. Additionally, even when the SFLB Project is combined with current and foreseeable actions, it is unlikely the actions proposed in this project would appreciably reduce or diminish the chances of survival or recovery of the northern spotted owl. This is because of the small percentage of suitable habitat affected at the provincial and the regional population levels. The level of harvest associated with this project would not preclude owls occupying historic home ranges and continuing to reproduce in the Wildlife Analysis Area and watersheds. An additional threat to NSOs is the barred owl. As relatively recent immigrant to the forests of the Pacific Northwest, barred owls have been documented as competitors with NSOs for prey and habitat. Barred owls have been documented in the Wildlife Analysis Area and it is likely that they have negatively affected spotted owl populations. It is anticipated that the protection of RA 32 habitat would provide refugia from the intrusion of barred owls.

Non-federal lands are not expected to provide demographic support for spotted owls across and between physiographic provinces (Thomas et al., 1990; USDA and USDI 1994). The Medford BLM assumes these past management practices would continue and reduce the amount of NRF habitat for spotted owl on non-federal lands over time.

Fisher

Fishers are likely currently using the proposed treatment units and other areas that have received treatments in the past. No habitat management guidelines have been established for fisher relative to quantities of particular habitat elements to retain. Patches of older forest habitat would remain within adjacent Riparian Reserves, NSO nest patches, and Late-Successional Reserves (LSRs) on adjacent USFS lands that would provide ample corridors of habitat that is appropriate for denning, resting and dispersal. Results from surveys can only be used to make rough inferences on presence and not habitat selection since the fishers are baited in to the survey camera stations.

Impacts of the action alternatives on fishers are predicted to be low, since a patchwork mosaic of stand types and ages would remain in the Wildlife Analysis Area, and fishers have not been documented in most of the

area. Most CWD and snags, except for those that present a safety hazard and some snags located in salvage units, would be maintained. Areas of closed canopy would remain scattered throughout the Wildlife Analysis Area. The Northwest Forest Plan was designed with a network of Late-Successional Reserves surrounded by younger, managed forests. Although these reserves 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 (USDA and USDI 1994b, Appendix J2-470). With implementation of the South Fork Little Butte Forest Management Project, cumulative effects to fishers are expected to be minimal and would not trend this species towards further listing. The treatments proposed under this project would have long-term beneficial effects to the forested stands in this area and thus have the potential to contribute to the persistence and recovery of the fisher population in this area.

As with the NSO, some effects to fisher from previously analyzed BLM projects with proposed treatment units within the South Fork Little Butte WLAA (Rio Climax Forest Management Project, Conde Forest Management Project, and Heppsie Forest Management Project) are anticipated. However, due to the very limited spatial scale and low intensity of harvest prescriptions, cumulative effects from these projects are not be expected to affect the use of the WLAA by fisher at the landscape scale.

Other Wildlife Species

This section addresses the potential cumulative effects to wildlife species (other than northern spotted owl or fisher) listed as Survey and Manage or Bureau Sensitive discussed in the Affected Environment portion of this analysis. There is no evidence that current forest practices on federal lands immediately threaten any terrestrial vertebrate species in Oregon. Even though the proposed actions may potentially adversely disrupt local individuals of wildlife species and may cause the loss of habitat in some cases, this project is not expected to affect long-term population viability of any Bureau Sensitive, or Survey and Manage wildlife species known to be in the area. Implementation of all potential treatments proposed under Alternatives 2 and 3 would treat only 8 percent or less of the Wildlife Analysis Area. Therefore, this project combined with other actions in the watershed, would not contribute to the need to federally list any Bureau Sensitive or Survey and Manage wildlife species because of the small scope of the Proposed Action compared to the available habitat within the Wildlife Analysis Area. Implementation of previously analyzed BLM projects within the South Fork Little Butte Wildlife Analysis Area is at a limited spatial scale and limited intensity and would not be expected to add measurably to cumulative effects for these species.

H. BOTANY

1. Introduction

Special Status Species are officially designated by the State director. The most recent Special Status Species list went into effect on December 21, 2011 (IM OR 2012-018). This new list has two categories, Sensitive and Strategic. Bureau Strategic species do not require protection or effects analysis and therefore will not be addressed further in this document. The BLM collects population and habitat data on these plant species to ascertain if a status upgrade to Sensitive or removal as a common species is warranted.

Bureau Sensitive Oregon (BSO) plants, lichens, and fungi include species that are listed as threatened or endangered under the Endangered Species Act (ESA), proposed or candidates for listing, State listed, and Bureau-designated Sensitive Species. Per BLM Manual 6840 (Section .06), BSO plants, lichens, and fungi will be managed consistent with species and habitat management objectives in land use and implementation plans to promote their conservation and to minimize the likelihood and need for listing under the ESA. Project implementation will adhere to the requirements set forth in Section 6840.2.C.

Survey and Manage (S&M) plant species are rare and little-known species thought to be associated with late-successional and old-growth forests in the Northwest Forest Plan area. The survey and manage guidelines of the NWFP Record of Decision (ROD) (USDA and USDI 1994) provide an adaptive-management process for managing rare and uncommon, poorly understood old-growth forest associated species. The adaptive-management process is based on managing species and their habitats consistent with the best current

information, and utilizing a comprehensive program of information gathering, analysis, and interpretation to guide management actions while providing for the likelihood of persistence for late-successional old-growth (LSOG) forest-associated species. The South Fork Little Butte Forest Management Project applied the S&M species list from, and meets the direction included in, the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards*.

The Analysis Area for federally-listed threatened, endangered, BSO and S&M plant species including fungi considers all lands where ground-disturbing activities (harvest, road-building, road decommissioning, landing construction, and understory reduction) are proposed for this project (also referred to as the Project Area). This includes mostly BLM-administered lands and select private lands where roads and landing locations would be utilized within the Upper South Fork Little Butte Creek and portions of the Lower South Fork Little Butte Creek sub-watersheds, or 6th field hydrologic units (HUC6s).

2. Issues

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the Proposed Action. These effects may or may not occur as a result of the Proposed Action but were of concern to members of the public or ID team specialists.

- Degrading habitat for threatened, endangered, Bureau Special Status, or Survey and Manage species may result in further population declines and/or trends away from recovery of the species.
- Habitat alteration including reduced canopy cover and soil compaction associated with harvest and road construction activities may degrade habitat for native plant (including Special Status and Survey and Manage plant and fungi species) populations.
- Ground disturbance associated with harvest activities may impact stems and propagules of native plant species (including Special Status and Survey and Manage plant and fungi species).
- Ground disturbance and road building provide vectors for expansion of invasive plant populations.
- Invasive plant species may become established or become more widespread as a result of habitat manipulation.

3. Affected Environment

The forested areas in the Analysis Area consist primarily of four plant series: Douglas-fir, White fir, Ponderosa pine and White oak. These four plant series provide habitat for several Special Status and S&M plant species (Table 3-27). For a more detailed description of vegetation conditions see the Affected Environment in the Silviculture section. .

The project is outside the range of any federally-listed threatened or endangered plant species, including *Fritillaria gentneri*. Only BSO and S&M plant and fungi species will be considered during analysis.

a. Survey Methods and Completion

Most of the proposed treatment areas have been surveyed for BSO and S&M vascular and nonvascular (lichens and bryophytes) plants and fungi. Surveys are conducted to conform to the 1998 survey protocol for S&M species (USDI 1998a), which serves as a proxy for BSS species surveys (BLM Manual 6840, Section 2.C.1.). Of the 2,488 acres proposed for various treatments, 702 acres of proposed units, proposed roads and proposed landings still require surveys. Spring 2015 surveys have been complete. Two additional survey periods will occur during summer and fall of 2015.

Surveys are conducted using the intuitive controlled survey method. This method includes a complete survey in habitats with the highest potential for locating BSO and S&M species. Surveys are completed by walking routes that cover a representative cross-section (approximately 80 percent) of all major topographic (e.g., slopes, draws, benches, and ridges) and special features (i.e., wet areas, rock outcrops, riparian areas,

serpentine areas) of each unit. In areas of high potential habitat, a more thorough and intensive survey is made. Field work is conducted during the stage of plant phenological development that assures visibility of characteristics necessary for accurate identification of special status plant species. Multiple survey visits may be required in some habitats for certain species to ensure that the phenological development is such that accurate identification is possible. Timing of fieldwork takes into consideration seasonal climate, elevation, aspect, target species, and suitable habitat.

Table 3-27. Proposed Treatment Areas Needing Surveys

T-R-S	Unit ID/Proposed Activity	Survey needed	Acres
37-2E-14	Landing	vascular/non-vascular/weeds	1
37-2E-15	Landing	vascular/non-vascular/weeds	1
37-2E-17	Temporary Road - Spurs 17-1 (0.86 miles) and 17-2 (0.24 miles)	vascular/non-vascular/weeds	12
37-2E-20	Temporary Road - Spur 20-3 (0.23 miles)	vascular/non-vascular/weeds	2
37-2E-21	Landing	vascular/non-vascular/weeds	1
37-2E-22	Landing (2)	vascular/non-vascular/weeds	2
37-2E-23	23-13, 23-14	vascular/non-vascular/weeds	32
37-2E-25	25-7	vascular/non-vascular/weeds	3
37-2E/3E-25/30	30-6, 30-7	vascular/non-vascular/weeds	13
37-2E-33	Landing	vascular/non-vascular/weeds	1
37-2E-33	33-14, 33-15, 33-16, 33-17	vascular/non-vascular/weeds	124
37-2E-33	33-17	fungi (3 seasons)	3
37-2E-34	Landing	vascular/non-vascular/weeds	1
37-3E-29	29-5	vascular/non-vascular/weeds	3
37-3E-30	Landing	vascular/non-vascular/weeds	1
37-3E-30	Portions of 30-5, 30-8	vascular/non-vascular/weeds	8
38-2E-01	Portions of 1-9, 6-9, 1-10	vascular/non-vascular/weeds	176
38-2E-03	3-12, 3-13	vascular/non-vascular/weeds	29
38-2E-03	Landing	vascular/non-vascular/weeds	1
38-3E-06	Portions of 6-8, 6-9	vascular/non-vascular/weeds	39
38-3E-17	17-7, 17-8	fungi (2 more seasons)	5
38-3E-20	Temporary Road - Spur 20—2 (0.14 miles)	vascular/non-vascular/weeds	2
38-3E-21	21-8	fungi (2 seasons)	35
38-3E-21	21-8, 21-9	vascular/non-vascular/weeds	134
38-3E-23	Portion of Temporary Road - Spur 23-1 (300 feet)	vascular/non-vascular/weeds	1
38-3E-23	Portion of 22-1	vascular/non-vascular/weeds	13
38-3E-27	27-2, 27-4	fungi (1 season)	16
38-3E-27	27-2, 27-4	fungi (2 seasons)	48
38-3E-29	29-1	fungi (1 season)	8

b. Vascular and Non-Vascular Plants

Botanical surveys documented 15 occurrences of Bureau Sensitive and/or Survey and Manage vascular and non-vascular plant species within the Analysis Area. No other occurrences of federally-listed, Bureau Special Status or S&M plant species have been detected within the Analysis Area.

Table 3-28. Bureau Special Status and Survey and Manage Plant Species in the South Fork Little Butte Analysis Area

Lifeform	Species name (followed by number of occurrences in proposed treatments)	Common Name	Status	Occurrences in NWFP area[1]
Vascular	*Cypripedium fasciculatum* (1)	Clustered Lady's-slipper	BSO, S&M C	1020
Vascular	*Hackelia bella* (1)	Showy Stickseed	BSO	63
Vascular	*Nemacladus capillaris* (2)	Giant Death Camas	BSO	55
Lichen	*Chaenotheca ferruginea* (8)	Black Pin Lichen	S&M B	617
Lichen	*Chaenotheca subroscida* (2)	Lemondrop Pin Lichen	S&M E	265
Lichen	*Leptogium teretiusculum* (1)	Olive-thorn lichen	S&M E	222

Status definitions:

BSO=Bureau Sensitive Oregon – manage so treatments do not trend species towards listing under ESA (BLM Manual 6840);

S&M B: Rare, pre-disturbance surveys not practical - manage all known sites and minimize inadvertent loss of undiscovered species;

S&M C: Uncommon, pre-disturbance surveys practical – manage all known sites to provide for reasonable assurance of taxon's persistence at the site level (FS, BLM, 2001).

S&M E: Survey and Manage Category E – Rare, status undetermined, manage all known sites while determining if the taxon meets the basic criteria for Survey and Manage (USDA/USDI, 2001)

[1]BLM Database: Geographic Biological Observations (GeoBOB).

*Many sites detected over 15 years ago – see Environmental Effects section.

Detected Bureau Special Status and Survey and Manage species descriptions are as follows:

Cypripedium fasciculatum: Clustered lady's slipper occurs in a variety of coniferous habitats all of which seem to have a filtered light condition in common and most frequently occurs on moderately steep slopes at mid elevations. It is most often associated with Douglas-fir and is usually tucked under some type of hardwood tree in areas with relatively little competition from other understory plants. This species has a scattered range in Washington, Oregon, Idaho, Montana, Wyoming, Colorado, Utah, and California.

Hackelia bella: is a native perennial that is found in forest openings, stream banks, and roadsides in California and Oregon. It is considered rare in Oregon being known only from Jackson and Klamath Counties.

Nemacladus capillaris: is a native annual herb found in openings on dry slopes and burned areas. It is considered rare in Oregon being known only from Jackson County. It is more common in California.

Chaenotheca ferruginea: is a black stubble or pin lichen. The typical substrate is the sheltered bark or wood of large old trees. In the Analysis Area, it is found in late seral Douglas-fir forests on the trunks and bases of Incense cedar and Douglas-fir. *Chaenotheca ferruginea* is globally widespread in cool to temperate areas.

Chaenotheca subroscida: is a yellowish stubble or pin lichen. The typical substrate is the sheltered bark or wood of large old trees. In the Analysis Area, it is found in late seral Douglas-fir forests on the trunks and bases of Incense cedar and Douglas-fir. *Chaenotheca subroscida* is globally widespread in cool to temperate areas.

Leptogium teretiusculum: is a fruticose lichen that is widespread in North America and Europe, but rarely collected due to its small size and high variability in appearance. It grows mostly on the bark of hardwood trees – primarily *Quercus* and *Acer* spp. in or near riparian areas.

c. Fungi

The 2001 Survey and Manage Record of Decision (ROD) Standards and Guidelines established timelines for the completion of Strategic Surveys for Category B fungi species (Standards and Guidelines, p. 9). If timelines for Strategic Survey completion are not met, the species will require "equivalent-effort" pre-disturbance surveys for projects in old-growth forests (in this case, defined as stands 180 years or older). For the Category B fungal species, the deadline for completion of Strategic Surveys was the beginning of fiscal year 2011. Since an evaluation of Strategic Survey results for Category B fungi has not been completed, equivalent-effort pre-disturbance surveys are required in those stands that meet the criteria for being considered "old-growth." The BLM assumes that surveying for fungi in stands 180-plus years old, protecting known and future found sites, and the existence of late-successional forest stands in reserves (i.e., Riparian Reserves, owl cores, etc.) across the landscape will ensure that Sensitive fungi species will not trend toward listing, and Survey and Manage fungi species will persist (OSO IB-OR-2004-145).

Fungi surveys have recently occurred, and are ongoing to meet survey protocol on 115 acres of forested stands over 180 years old. These stands require 8 visits over two years – two visits each fall and spring season.

Prior to the removal of pre-disturbance survey requirements for fungi, approximately 250 acres in or adjacent to proposed treatment areas were surveyed – three visits during fall and spring 2000-2001 during peak sporocarp fruiting time (USDI 2015b). Most fungi sites detected during these surveys were determined to be common and were removed from the S&M list in 2003.

Fourteen Bureau Sensitive fungi are documented or suspected of occurring on the Medford District BLM-administered lands (Table 3-29). Most Sensitive and S&M fungi grow in late-successional forested stands. Some are associated with moister conifer stands while others grow in the drier hardwood-conifer plant associations. Twenty-four occurrences of three S&M fungi species have been detected so far from surveys in the Analysis Area (Table 3-30).

Detected Survey and Manage fungi species descriptions are as follows:

Albatrellus ellisii is a polypore fungus that grows out of soil/duff in a variety of coniferous forests from the Olympic peninsula in Washington to Mendocino County, CA.

Clavariadelphus sachalinensis is a club fungus that grows out of soil/duff in mixed coniferous forests in North America and Northern Europe. In North America it is known to occur from Canada to Mendocino County, CA.

Gomphus kaufmanii is a chanterelle-related species that grows in deep humus soil beneath *Pinus* and *Abies* species from Mendocino County, CA to western Canada from the Cascade mountains to the coast.

d. Noxious Weeds

Noxious weeds are generally non-native plants that cause or are likely to cause economic or environmental harm or harm to human health. Introduced plants are species that are non-native to the ecosystem under consideration. Introduced plants may adversely affect the proper functioning condition of the ecosystem. "noxious weed" describes any plant classified by the Oregon State Weed Board that is injurious to public health, agriculture, recreation, wildlife, or any public or private property (ODA 2012, p.4).

The Medford District ROD/RMP states the objectives for noxious weeds are to continue to survey for, avoid introducing or spreading, and contain or reduce infestations on BLM-administered land (USDI 1995, p. 92-93).

The Oregon Department of Agriculture designates and classifies noxious weeds according to their detrimental effects, reproductive strategies, distribution, and difficulty of control (Table 3-31).

Table 3-29. Medford District Sensitive Fungi Species

Scientific Name	Status	ORBIC List[1]	NWFP Sites[2]	Miles to nearest site
Arcangeliella camphorata	BSO, S&M B	1	6	76
Boletus pulcherrimus	BSO, S&M B	1	23	0.9
Chamonixia caespitosa	BSO, S&M B	2	3	62
Dermocybe humboldtensis	BSO, S&M B	1	4	56
Gastroboletus vividus	BSO, S&M B	1	5	38
Gymnomyces fragrans	BSO, S&M B	3	2	24
Helvella crassitunicata	BSO, S&M B	1	29	35
Phaeocollybia californica	BSO, S&M B	3	50	43
Phaeocollybia oregonensis	BSO, S&M B	1	15	53
Pseudorhizina californica	BSO, S&M B	3	42	12
Ramaria spinulosa var. *diminutiva*[3]	BSO, S&M B	3	1	~200
Rhizopogon chamalelotinus	BSO, S&M B	1	1	51
Rhizopogon ellipsosporus	BSO, S&M B	2	5	27
Rhizopogon exiguus	BSO, S&M B	2	3	46

Status definitions:

BSO=Bureau Sensitive Oregon – manage so treatments do not trend species towards listing under ESA (BLM Manual 6840);

S&M B: Survey and Manage Category B – manage all known sites and minimize inadvertent loss of undiscovered species (USDA/USDI, 2001).

[1]ORBIC List: Oregon Biodiversity Information Center maintains extensive databases of Oregon biodiversity, concentrating on rare and endangered plants, animals, and ecosystems.

1 = taxa which are threatened or endangered throughout their range or which are presumed extinct.

2 = taxa which are threatened, endangered, or possibly extirpated from Oregon but are stable or more common elsewhere.

3 = taxa for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range.

4 = taxa which are very rare but are currently secure, as well as taxa which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered.

Table 3-30. Survey and Manage Fungi present in the South Fork Little Butte Analysis Area

Species name (followed by number of occurrences in proposed treatments)	Morphological Habit	Status	Occurrences in NWFP area[1]
Albatrellus ellisii (1)	Polypore	S&M B	39
Clavariadelphus sachalinensis (21)	Club	S&M B	292
Gomphus kaufmanii (2)	Chanterelle	S&M B, Str	65

Status definitions:

S&M B: Rare, pre-disturbance surveys not practical - manage all known sites and minimize inadvertent loss of undiscovered species;

Str - Bureau Strategic: unknown rarity; collect species information; no protection or NEPA analysis required.

[1]BLM Database: Geographic Biological Observations (GeoBOB).

Table 3-31. ODA Noxious Weed Control Rating System (ODA, 2012, p.6)

Category	Criteria	Recommended Action
A	Weeds that occur in the state in small enough infestations to make eradication or containment possible; or are not known to occur, but their presence in neighboring states makes future occurrence in Oregon seem imminent.	Infestations subject to eradication or intensive control when and where found.
B	Regionally abundant weed, but which may have limited distribution in some counties.	Limited to intensive control at the state, county, or regional level as determined on a case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the main control approach.
T	A select group of A or B designated weeds.	Identified by the Oregon State Weed Board as a priority target on which the Oregon Department of Agriculture will develop and implement a statewide management plan.

All of the proposed treatment areas were surveyed for noxious weeds by qualified botanists over a time period extending from 1998 through 2015. Surveys have documented nine species of ODA listed noxious weeds occurring primarily along roads in the Analysis Area (Table 3-32).

Table 3-32. Noxious Weeds in the South Fork Little Butte Analysis Area

Species	Common Name	Status	Number of Sites in Analysis Area	Ecology and Habitat*	Ashland Resource Area Management Strategy
Centaurea solstitialis	Yellow star-thistle	B/T	Over 20	Annual, occasional biennial. Reproduces from seeds; one plant can produce more than 10,000 seeds. Root system consumes more water than native vegetation. Extensive infestations in degraded grasslands and along disturbed areas.	Focus treatments on populations along roads, in quarries, near Special Status plant sites or other special areas, and in fuels reduction units.
Centaurea diffusa	Diffuse Knapweed	B/T	2	Biennial or short-lived perennial. Reproduces by seed. Displaces native vegetation via competition and allelopathy.	Relatively uncommon on Medford BLM. Eradicate small sites, control larger ones.
Chondrilla juncea	Rush Skeletonweed	B/T	2	Perennial, reproduces by seed and vegetatively. Roots can reach 8 feet depth. Root parts can form new shoots from 4 foot depth.	Relatively uncommon on Medford BLM. Eradicate small sites, control larger ones.
Cirsium arvense	Canada thistle	B/T	2	Perennial herbaceous plant. Reproduces from seeds. Common along roadsides and disturbed moist areas, where soil is	Treat specific populations in high risk areas (Special Status plant sites, special

Species	Common Name	Status	Number of Sites in Analysis Area	Ecology and Habitat*	Ashland Resource Area Management Strategy
				disturbed and canopy cover removed.	areas)
Cirsium vulgare	Bull thistle	B	13	Biennial herbaceous plant. Reproduces from seeds. Common along roadsides and disturbed moist areas, where soil is disturbed and canopy cover removed.	Treat specific populations in high risk areas (Special Status plant sites, special areas)
Cytisus scoparius	Scotch Broom	B	2	Perennial shrub, reproduces from seed. Common along roadsides and disturbed moist areas, where soil is disturbed and canopy cover removed.	Treat specific populations in high risk areas (Special Status plant sites, special areas)
Dipsacus laciniatus	Cutleaf Teasel	B	1	Biennial. Reproduces by seed. Common in grasslands, savannahs and waste areas.	Relatively uncommon on Medford BLM. Eradicate all known sites, Early Detection and Rapid Response (EDRR).
Hypericum perforatum	St. Johns wort	B	11	Perennial herbaceous plant. Reproduces vegetatively via rhizomes. Invades roadsides and disturbed areas.	Treat populations in quarries, near rare plant sites, special areas. A beetle introduced as biocontrol has been somewhat effective at lower to mid elevations.
Isatis tinctoria	Dyer's Woad	B	1	Biennial, winter annual, or short-lived perennial. Reproduces by seed. Taproots to 5 ft depth. Disturbed and undisturbed sites. Displaces native vegetation, allelopathic.	Treat sites via herbicides early, digging and pulling later. Target small outlier sites, control larger ones.
Lathyrus latifolia	Perennial Peavine	B	2	Perennial. Reproduces by seeds and vegetatively. Displaces low-growing native vegetation. Occupies wide range of climatic conditions.	Often overlooked as invasive, increasingly a problem in W Oregon. Treat sites near activity areas and outliers.
Rubus armeniacus	Himalayan blackberry	B	Abundant along roads - < 1 percent of BLM land in Planning Area	Perennial shrub. Reproduces both by seed and vegetatively. Canes can grow more than 20 feet per season with rootstocks more than 30 feet long. Seeds dispersed by birds and animals. In Jackson County, grows in riparian areas, pastures, and meadows, and along roads.	Treat specific populations in high risk areas (Special Status plant sites, special areas). Trial treatments on mowed/cut roadsides in South Fork Little Butte Analysis Area.
Taeniatheru	Medusahead	B	3	Winter annual. Reproduces by	No effective treatment

Species	Common Name	Status	Number of Sites in Analysis Area	Ecology and Habitat*	Ashland Resource Area Management Strategy
m caput-medusae	Rye			seed. Displaces desirable vegetation on grasslands. Thatch changes soil temperature/moisture dynamics.	method available at this time. Properly timed Rx burn would help, but timing usually off.

Oregon Department of Agriculture (ODA) Noxious Weed Control Program: provides a statewide leadership role for coordination and management of state listed noxious weeds.

A= a weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent.

B= a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties.

T= a priority noxious weed designated by the Oregon State Weed Board as a target for which the ODA will develop and implement a statewide management plan. "T" designated noxious weeds are species selected from either the "A" or "B" list.

* (Oregon State University Extension Service 2003; DiTomaso and Healy, 2007)

Weeds spread via seeds, which are carried from one location to another by air, water, animals, humans, or vehicles. Some weeds also spread when roots or other plant parts break off and re-sprout to create new plants. Most weeds have reproductive and life cycle characteristics that give them an advantage over native plants in establishing quickly. These characteristics include high seed production, good dispersal mechanisms, fall germination and rosette development, production of long taproots that capture water at different levels in the soil profile, and early or late season growth and bloom times to avoid competition with native species. Noxious weeds also have an advantage over natives because they occupy hostile sites with exposed, bare ground; tolerate drought; and form persistent seed banks that lie dormant until the next disturbance event provides new openings in which to become established. Because they originated from other countries, noxious weeds lack the predators that keep them under control in their native habitats and ecological areas.

Newly disturbed areas are most vulnerable to noxious weed establishment. Soil disturbance creates favorable conditions for the establishment of noxious weeds by removing competing vegetation. Weed seeds that have been suppressed in the soil have an opportunity to germinate and develop before native species are able to become reestablished. The disturbed soil is also a ready seed bed if weed seeds or other plant parts are transported or blow into the area by natural processes.

Roads are common avenues of invasion, as seeds lodge in tire treads or undercarriages and can be carried from infested areas into newly disturbed unoccupied areas. Activities that introduce or spread noxious weeds include road construction, timber harvest, farming, over-grazing, recreation, and residential development. Natural processes, such as wind, seasonal flooding, and migration patterns of birds or animals also contribute to the spread of noxious weeds (Table 3-33).

Table 3-33. Factors Affecting Noxious Weed Spread

Activity	Role in Dispersing Noxious Weed Seed
Private Lands	Private lands host a perpetual source for noxious weed seed, which can be dispersed when seeds attach to tires, feet, fur, feathers, or feces, or when natural processes such as wind and/or flooding events transport the seed from its source to other geographical vicinities.
Farming and Grazing	Farming creates soil disturbance and openings that noxious weeds can occupy. Farming equipment may move noxious weed seed from one area to another. Agricultural seed may be contaminated with noxious weed seed and spread during farming activities. Overgrazing of pastures or rangelands removes vegetation leaving bare, open spaces that noxious weeds may invade. If livestock are fed grain or hay containing noxious weed seed or parts, or consume noxious weeds, they may disperse them when they move to non-infested pastures or range.
Logging on Private Lands	Logging activity presents a key dispersal opportunity for noxious weed seeds. They may attach to tires or tracks of mechanized logging equipment, tires of log trucks, and various other logging-related substrates and be subsequently transported from their source to another geographic vicinity. Logging creates openings during ground disturbance and canopy removal which noxious weeds may colonize. Not using Project Design Features, such as equipment/vehicle washing, etc., also increases the risk of introducing or spreading noxious weed seed during logging operations.
Motor Vehicle Traffic (including Log Trucks)	Roads on public land are for public use, which results in a plethora of seed-dispersal activities occurring on a daily basis. Private landowners use public roads to haul logs, undertake recreational pursuits, and/or access their properties. This transportation often occurs along BLM-administered roads, which are situated within a checkerboard ownership arrangement. How or when seed detachment occurs is a random event and could take place within feet or miles from the work site/seed source, presenting a high likelihood of detachment on public lands.
Recreational Use	The public often recreates on BLM-managed lands and can spread seed from their residences or other areas to public lands in a variety of ways, including attachment to vehicle tires; recreational equipment; hikers' socks, shoes, or other clothing; fur of domestic animals, etc.
Rural and Urban Development	Because of BLM's checkerboard land ownership, BLM parcels are generally interspersed with private lands, many of which are used for homesites, businesses, or agricultural endeavors. Rural and Urban Development often involves ground disturbance during building or road construction which creates openings for noxious weeds to occupy. See "Motor Vehicle Traffic" and "Private Land" for additional information about how this affects the spread of noxious weeds from private to public lands.
Natural Processes	Wind, seasonal flooding, fire, and migration patterns of birds or animals are a few of the natural processes that contribute to the spread of noxious weeds. Wind, water, or wildlife carry seeds or other plant parts and deposit them at new locations at random intervals. Wildfire removes ground cover and leaves areas open to invasion by noxious weeds if a seed source is nearby.

Noxious weed populations are treated on BLM-administered lands under the *Medford District Integrated Weed Management Plan and Environmental Assessment* (EA #OR-110-98-14) (USDI 1998b). The Medford District BLM Noxious Weed List is a subset of the state list. It contains category A, B and T species that occur in the District and are targeted for detection and control (USDI 1998b: 1-2). The BLM also treats all categories of weed species at high priority sites such as Special Status plant sites, special areas (Area of Critical Environmental Concern (ACEC)), contiguous blocks of BLM-administered land and within project areas that pose a risk of spreading weeds during project implementation. Depending on the species and what has been determined to be effective eradication or treatment method, the BLM treats weeds by manual, chemical, mechanical or biological means.

Adjacent private lands in the Little Butte watershed are also known to harbor many populations of various noxious weeds. The BLM is not authorized to survey private lands and as a consequence, the extent of these populations and infestations is currently unknown.

4. Environmental Consequences

This section discusses the direct and indirect effects of implementing each of the alternatives and the impacts it would have on botanical resources. This section also discusses any cumulative effects, which considers the range of alternatives plus the effects of other actions that are currently happening or will be happening in the foreseeable future.

a. Alternative 1 – No Action

Direct and Indirect Effects

Special Status and S&M Vascular and Non-vascular Plants and Fungi

Under Alternative 1, the No Action Alternative, the BLM would not implement any new management actions. Because no ground disturbance or changes in canopy cover or environmental conditions would occur, implementing Alternative 1 would not result in negative direct or indirect impacts to BSO or S&M vascular and nonvascular plants and fungi. There would be **"no effect"** to federally-listed Threatened or Endangered plants. Due to the absence of habitat manipulation or mechanical damage, Bureau Sensitive plants would not trend toward listing, and Survey and Manage species persistence would not be directly affected.

Forest stands with diverse species composition that are structurally complex and resilient to extreme fire behavior or insect or disease outbreaks provide the most favorable habitat for rare forest-associated plants and fungi. Different species have different habitat requirements, but the presence of large conifers, large and small woody debris, and an intact layer of organic duff are common requirements for many rare species, especially fungi. Without vegetation treatment, these conditions would continue to decline in the Analysis Area. Forest structure and species diversity would continue to decline as stand densities increase due to fire suppression. Pine and hardwoods would decline and Douglas-fir would increase. As a result, there would be a loss of varied habitat types which provide for a diversity of herbaceous and fungi associates.

Noxious Weeds

Under the No Action Alternative, the BLM would not implement new management actions that could result in ground disturbance, changes in canopy cover, or importation of noxious weed seeds or plant parts into the Project Area. Implementing Alternative 1 would result in no direct impacts to noxious weeds. The Analysis Area would be a relatively lower priority for weed control other than rare plant sites, contiguous blocks of BLM-administered land, or special areas. When the BLM decides to implement a project in a specific area, it raises the priority level for treating local infestations.

Without treatment, noxious weeds and non-native plants will continue to spread where existing and where human or natural processes facilitate importation and spread. Without forest stand treatments, the potential remains for high intensity stand replacement fires that would produce favorable habitat for weed invasion (see Table 3-33).

Native plant communities, including rare plant habitat, would continue to degrade due to private land use and condition (development, farming/ranching, industrial conversion, etc.), and increased vegetation density and fire risk. Human activities and natural disturbances would continue to facilitate the existence and spread of noxious weeds and non-native plants.

b. Alternative 2 – Proposed Action

Direct and Indirect Effects

The South Fork Little Butte project is outside the range of known Threatened and Endangered plant species including *Fritillaria gentneri*, and none were found during surveys of the Project Area. There will be no effect on these species as a result of implementing the project.

Bureau Sensitive Oregon and Survey and Manage Plant Species

Fifteen occurrences of six BSO and S&M plant species are present within units proposed for treatment under Alternative 2. All currently known sites of BSO and S&M plant species are protected by no disturbance protection buffers.

If sites are detected during surveys occurring this season (2015) before a Decision Record is issued, they will be protected by no disturbance protection buffers, or seasonal restrictions, or prescription modification per PDF's. These additional protection areas and the species they would protect will be clearly identified in the Decision Record document. Thus, Alternatives 2 will have no adverse effect on BSO or S&M plant species.

Although surveys are conducted to ensure a high probability of detecting BSO and S&M species in the Analysis Area, individuals may be undetected in the treatment units. These individuals could be impacted by commercial harvest, road construction, helicopter landing construction, understory reduction, or post-harvest fuels reduction. Impacts to undetected plants could include:

- Damage to or mortality of individual plants from logging equipment during timber harvest activities, road construction, or creation of landings;
- Mortality of plants, reduced plant vigor, or reproductive success from changes in environmental conditions when overstory trees are removed, resulting in increased light or temperature and reduced relative humidity;
- Mortality of plants, reduced vigor or reproductive success as a result of disturbing mycorrhizal connections and food cycling between conifers or hardwoods and rare plants when overstory trees are removed;
- Damage to, or mortality of, individual plants from heat or flames during post-harvest slash pile burning;
- Reduced plant vigor as a result of damaging associated mycorrhizal fungi during timber harvest or handpile burning;
- Removal of late-successional forest that provides habitat for expansion of existing BSO or S&M vascular plant populations or occupation by new populations; and
- Competition to BSO or S&M vascular plants from noxious weeds introduced or spread during timber harvest, road work, helicopter landing or understory reduction treatments.

It is expected that the protection measures described in Table 3-34 will protect BSO plants and populations by not trending them towards listing, and will assure local persistence of S&M species and their habitat. There will be no effect on BSO or S&M plant species as a result of implementing Alternative 2.

Table 3-34. Bureau Sensitive Oregon and Survey and Manage Plant Species Protection

Species name (followed by number of occurrences)	Status	Protection
Cypripedium fasciculatum (1)	BSO, S&M C	50-100 foot no treatment buffer depending on relocating site, and site conditions – fuels treatments that reduce dense understory while retaining canopy can be beneficial – no mechanical disturbance
Hackelia bella (1)	BSO	25 foot/variable size buffer depending on population size
Nemacladus capillaris (2)	BSO	Variable size buffers depending on population size - no mechanical disturbance
Chaenotheca ferruginea (8)	S&M B	25 foot buffer and large conifer retention prescription
Chaenotheca subroscida (2)	S&M E	25 foot buffer and large conifer retention prescription
Leptogium teretiusculum (1)	S&M E	25 foot buffer and large hardwood retention prescription

BSO=Bureau Sensitive Oregon – manage so treatments do not trend species towards listing under ESA (BLM Manual 6840);
S&M B: Survey and Manage Category B – manage all known sites and minimize inadvertent loss of undiscovered species (USDA/USDI, 2001).
S&M C: Survey and Manage Category C – Uncommon, pre-disturbance surveys practical, manage all known sites to provide for reasonable assurance of the taxon's persistence (USDA/USDI, 2001)
S&M E: Survey and Manage Category E – Rare, status undetermined, manage all known sites while determining if the taxon meets the basic criteria for Survey and Manage (USDA/USDI, 2001)

Protection measures are designed to prevent or reduce direct physical effects that could occur during forest management activities. No-treatment buffers would protect rare plant populations from timber harvest, road construction, helicopter landing construction, understory reduction, and post-harvest fuels reduction treatments. Buffer sizes vary depending on the type of treatment proposed, the species being protected, and current environmental and ecological conditions at the site.

Indirect effects from project activities include increases in sunlight and temperatures due to decreased canopy cover. It is likely that these conditions are somewhat closer to historical conditions when fire was more pervasive on the landscape. Indirect effects from plant protection buffers include potential habitat deterioration within the buffer from slowly increased forest density and vegetation competition for resources. Localized fire risk would continue to increase inside the protection buffers.

Fungi

Timber harvest can have varying degrees of adverse effects on fungi, depending on the level of tree removal and ground disturbance. Activities that remove, disturb, or compact the top layer of organic material and mineral soil negatively impact fungi. The main and most extensive part of a fungus consists of a mycelial network that resides in the top few inches of mineral soil. In one study, mycelial networks ranged in size from 1.5 to 27 square meters (16 to 291 square feet) (Dahlberg and Stenlid 1995). During timber harvest, tractors and yarding equipment disturb and compact soil, which could damage fungal mycelia.

Removing conifers during timber harvest could indirectly affect fungi in the short-term because it could break mycorrhizal connections between the trees and fungal mycelia. Removing host trees halts the transfer of nutrients produced during photosynthesis to the fungi. Mycorrhizal associations could reestablish as new conifers grow if the fungal hyphae persists through the period of stress caused from disruption of the mycorrhizal connections and changes in environmental conditions and if large enough conifers remain in the vicinity for mycelia to form connections with their root systems.

Removal of the overstory canopy during timber harvest can change environmental conditions which indirectly affects fungi. Relative humidity drops, light exposure increases, and air and soil temperatures rise. Hotter, drier conditions inhibit sporocarp production, reproductive success, and fungal persistence.

Construction of 3.84 miles of new roads would impact an estimated 15 acres. It is expected that this small of an area would not affect fungi in the Analysis Area. Decommissioning old roads would not impact fungi as

compacted old roads do not provide suitable habitat for BSO or S&M fungi. Road maintenance and renovation would not affect fungi as the road prism and ditches do not provide suitable habitat for fungi.

Burning post-treatment slash piles also poses potential impacts to rare fungi. After timber harvest and non-commercial understory treatments, the remaining slash is often piled and burned, or scattered in lighter fuel accumulations. If rare fungi are present beneath the slash piles, the mycelia and spores would be damaged or destroyed by the intense heat generated during burning. Other detrimental effects to fungi from slash burning include loss of litter and organic matter, resulting in reduced moisture retention capability and a loss of nutrient sources. The effect of these activities on fungi is a loss of species diversity and abundance (Amaranthus et al. 1996). Under Alternative 2, the BLM would pile and burn post-treatment slash on up to 2,488 acres. The total area potentially impacted by burn piles would be 3 to 5 percent (see Soil Resources section) of the units for a total of 75 to 124 acres impacted within the Analysis Area.

Thinning forested stands presents some risks of impacting BSO and S&M species as described above, but it would also create more open conditions that a fire could burn through without causing a high intensity burn or stand-replacing wildfire. Late-successional forest lands not proposed for timber harvest or other treatments would provide refugia and sources for mycelia and mycorrhizal fungi that could spread to treated areas after harvest and burning activities thus restoring fungal communities.

Furthermore, the BLM assumes that conducting surveys for BSO and S&M fungi in 180-plus year old stands, protecting known and future found populations, and the presence of late-successional forest stands in reserves (i.e., Riparian, Late-successional, RA 32, NSO nest patches and other special management areas) across the landscape would prevent Sensitive species from trending toward listing or threaten S&M species' persistence (USDI 2004, p. 5-2).

Noxious Weeds

Historic and recent inventories detected twelve species of Oregon State designated noxious weeds within the Analysis Area: Yellow starthistle, Diffuse knapweed, Rush skeletonweed, Canada thistle, Bull thistle, Scotch broom, Cutleaf teasel, St. John's wort, Dyers woad, Perennial peavine, Armenian (Himalayan) blackberry, and Medusahead rye (Table 3-32). Currently, treatments and monitoring of weed infestations show that Yellow starthistle has decreased due to weed control efforts during the past two years. Most other infestations were treated during the 2014 growing season. It is expected that the treatments in the Analysis Area will contribute to their control and/or local eradication.

Timber harvest and the associated road work and fuels treatments could introduce or spread noxious weeds within the Analysis Area unless Project Design Features (Chapter 2) in conjunction with active weed control are applied. Management activities which disturb the soil and remove existing vegetation leave areas open for possible invasion by noxious weeds. Burning post-harvest slash and non-commercial excess vegetation in handpiles would also remove ground cover under the piles leaving those areas open to occupation by weeds. Burning fuels could occur on up to 2,488 acres in the Analysis Area.

Noxious weed seeds or plant parts could be transported from infested areas outside the Analysis Area to non-infested areas within the Analysis Area along the 122.28 miles of haul routes on equipment or vehicles used for timber harvest or road work. Implementing vehicle washing prior to deployment of equipment would mitigate this risk (see Chapter 2, PDFs).

In the short-term (approximately 1 to 5 years), proposed timber harvest activities within the Analysis Area could result in a moderate probability of introducing or spreading noxious weeds and non-native introduced plants. Non-native annual grasses may invade newly disturbed areas. However, the rate at which weeds could potentially spread as a result of these activities cannot be predicted due to the indistinguishable causal effect of other activities and factors listed in Table 3-33. Implementing PDFs and continuing weed treatments would mitigate the risk of overall spread, as well as likely improve habitat in the watershed by eliminating small infestations and decreasing larger ones.

c. Alternative 3

The acreages of harvest and other silvicultural treatments, road construction (none proposed), helicopter landing construction, haul routes, and fuels treatments are less than Alternative 2 (see Comparison of Alternatives). Therefore, the impacts to BSO and S&M plants and fungi, and noxious weeds, are less than but not sufficiently different to warrant separate analysis in this section. There is a decreased risk for weed spread under Alternative 3 due to less proposed harvest acreage and no road construction. Otherwise, the qualitative effects remain the same as described in Alternative 2, but on a lesser spatial scale.

d. Cumulative Effects - Alternatives 2 and 3

Bureau Sensitive Oregon and Survey & Manage Plants and Fungi

Land ownership within the South Fork Little Butte Planning Area is a mix of BLM-administered and privately owned lands. Landscape conditions in the sub-watersheds are strongly influenced by conditions and activities on private lands.

Forested private lands are likely to be intensively managed for timber production and are not likely to provide good habitat for BSO or S&M plant and fungi species. The proposed Pacific Connector Gas Pipeline construction may impact BSO and/or S&M plant and fungi species, but is not expected to trend any BSO species towards listing nor insufficiently provide for persistence of S&M species (FERC 2014). Most BLM-administered lands in the Planning Area are open to grazing during spring to fall. Open areas and water sources receive the most grazing activity within the allotments. The forested areas receive much less use except perhaps shady areas near opening and water sources. Although opening the canopy may slightly increase cattle use, it is unlikely that continued grazing would have detectable increased impacts on BSO and S&M species occurring in forested stands. Various recreational activities including OHV use on private and BLM-administered lands are likely to continue. Implementing road decommissioning and closures may protect some populations of BSO and S&M species, as well as potentially lessen the risk of noxious weed spread. Because the BLM surveys and protects BSO and S&M species from impacts as a result of its various activities, other foreseen BLM projects will not affect BSO or S&M species.

As the BLM has surveyed proposed treatment units, landings, and areas proposed for road construction/decommissioning for BSO and S&M vascular and nonvascular plants and for BSO and S&M fungi in 180-plus year old stands, and would protect any sites discovered, project activities proposed under both Alternatives 2 and 3 would not result in any direct or indirect effect to these species; therefore, there is no potential for cumulative impacts.

Noxious Weeds

Human activities (development, farming/ranching, industrial conversion, etc.) and natural processes will likely continue to present a risk of introducing new noxious weeds and spreading existing populations. However, the BLM has an on-going program of inventory and treatment of noxious weeds in and around the South Fork Little Butte Analysis Area. Treatments in the past few years have focused on quarries and road systems, with populations treated by herbicide spraying and manual removal. On-going treatments and monitoring by the BLM and continued collaboration with outside groups, such as the Jackson County Roads Dept., participants in the Jackson County Cooperative Weed Management Area board, and The Nature Conservancy's Early Detection and Rapid Response (EDRR) program, increase the chances of containing or reducing noxious weed populations on BLM-administered lands in the watershed and the Analysis Area.

Added to past, current, and reasonably foreseeable future activities, the proposed commercial timber harvest and related road, landings, and activity fuels treatments, as well as non-commercial treatments, could add cumulative effects to noxious weeds in the Analysis Area without the use of the proposed PDFs and an active control program. The risk of introducing or spreading noxious weeds as a result of activities proposed in Alternative 2 is low-moderate if weed treatments continue to be funded and remain moderate if not funded. The proper implementation of PDFs would reduce the risks that activities in Alternatives 2 and 3 would add cumulative effects to noxious weeds in the Analysis Area.

I. RECREATION

1. Issues

- Timber harvest and hauling operations could impact winter recreation use along the Table Mountain winter use trails system.
- Forest management activities may affect recreation values that may be provided by unroaded sections of public lands within the Project Area.
- Decommissioning roads may affect public access to some areas and limit enjoyment of public lands, and should be left open instead of decommissioned.

2. Affected Environment

Recreational resources in the South Fork Little Butte Planning Area are managed under the Medford District BLM's 1995 Resource Management Plan. Recreation use across the Medford District BLM is described in the Medford District Proposed Resource Management Plan/Environmental Impact Statement (USDI 1994). BLM-administered lands fall into two recreation management categories; Special Recreation Management Areas (SRMA) and Extensive Recreation Management Areas (ERMA). ERMAs are all BLM-administered lands not included in SRMAs identified in the Medford District PRMP/FEIS (USDI 1994, p. 3-71) that provide for dispersed recreation opportunities across the Medford District BLM. SRMAs are those areas identified with high concentrations of recreation use and developed facilities.

a. Dispersed Recreation

The South Fork Little Butte Planning Area encompasses a large swath of land in the Little Butte Creek watershed. The dispersed recreation occurring within the South Fork Little Butte Planning Area includes hiking, horseback riding, mountain biking, driving for pleasure, hunting, target practice, dispersed camping, winter recreation activities, and some Off Highway Vehicle (OHV) use. An extensive network of BLM system roads provides the recreation user opportunities to discover a multitude of recreation activities. Road densities are reported as high for lands in the Planning Area, providing access for most BLM-administered land parcels within the Planning Area. Most dispersed camping occurs in association with hunting (primarily deer season).

An estimated 799,243 acres provide for dispersed recreation use across the Medford District (USDI 1994, p. 3-84). The majority of the South Fork Little Butte Planning Area is an ERMA. These areas are characterized as low use recreational areas where no developed or designated recreational sites or activities exist. However, the southern end of the South Fork Little Butte Planning Area is overlain by the Hyatt Lake-Howard Prairie SRMA (USDI 1995, Map 9). The majority of summer recreation in this SRMA occurs south to southeast of the South Fork Little Butte Planning Area in dispersed and developed recreation areas (trails, campgrounds, resorts, wildlife viewing areas) surrounding Howard Prairie and Hyatt Lake Reservoirs. Recreation in the Planning Area includes hiking, sightseeing, OHV activities, fishing, driving for pleasure, hunting, and winter recreation activities.

b. Hyatt-Howard Special Recreation Management Area

Roughly 10 percent of the South Fork Little Butte Planning Area is within the Hyatt-Howard Special Recreation Management Area (SRMA). The Hyatt-Howard SRMA is approximately 17,000 acres and encompasses the lakes, facilities, and slopes around Hyatt Lake and Howard Prairie Reservoir on the Dead Indian Plateau, approximately 18 miles east of Ashland, OR. SRMAs are managed to realize their potential to provide appropriate/prescribed recreational experience opportunities while protecting sensitive resources, increasing public awareness, reducing conflicts and diversifying the regional economy (USDI 1995). Due to its year around accessibility and many resource values there are numerous outdoor recreational opportunities available in the SRMA. A heavily used multi-use winter trails system (32 miles), open to both motorized and non-motorized uses, exists within the Hyatt-Howard SRMA. Based on field observation, administrative file documentation and comments from the public the major recreation activities that people take part in

include hiking, photography, equestrian use, Nordic Skiing, snowmobiling, fishing, camping, hunting, and sledding at Table Mountain Winter Play Area within the SRMA.

c. Buck Prairie Nordic Trail System

The Buck Prairie Nordic skis trails could be affected from timber harvesting activities in Units 29-1 and 20-1. Located at the summit of the Dead Indian Memorial Highway approximately 13 miles east of Ashland is the Buck Prairie Cross Country Ski Trail parking area. The trail system consists of approximately 17 miles of interconnected trails on public and private lands on the ridges just west of Howard Prairie and Hyatt Reservoirs. All trails share the same route for the first 1.25 miles from the parking area. All trails return to the parking area by the same route.

d. Winter Snowmobile and Snowshoe Use

Dispersed winter recreation occurs in the southern end of the Planning Area and SRMA when adequate snow accumulations allow. Roads and trail south of Dead Indian Memorial Highway are used by recreationists for snowshoeing and snowmobiling. The primary winter recreation use period occurs generally from mid-November to mid-April, but varies annually depending on snow fall.

e. Winter Play Area

Table Mountain downhill sledding area is located in the vicinity, but there are no proposed units adjacent to it. Visitors may experience trucks in the general area and some additional noise from operations. Overall, there would not be any direct affect to this area due to timber harvest and hauling operations in the Planning Area.

f. OHV Use and Non-System Routes

OHV activity in the area shows moderate levels of use. There are several active trails in the 38-3E-17 and 37-2E-02 road areas adjacent to Units 31-2a, 30-1a, and 30-2a. There are trails that either branch off the terminus of the system roads, go around certain barricades or earthen berms, or attempt to go off of established routes.

Through a recent inventory process, there have been approximately 169 miles of non-system roads and trails identified in the SFLB drainages (see Water Resources section). The majority of these routes are located on non-BLM-administered lands, owned by private individuals or companies. These routes range in length from 0.08 miles to 1.42 miles in length. The classifications of these routes and trails range from user created trails, old Jeep routes, skid trails, to widened vehicle routes. The majority of the routes are overgrown with vegetation, showing little recent activity. Some however, are being utilized by OHV traffic, 4x4 type vehicles, and mountain bike use on BLM administered lands.

3. Environmental Consequences

a. Alternative 1 - No Action

People who enjoy the use of public lands in the South Fork Little Butte Planning Area for their outdoor recreation experiences would continue to use the area undisturbed from any timber sale operations on public lands.

b. Alternative 2 – Proposed Action

The greatest potential for impacts to recreation use from the implementation of the SFLB Project is associated with the winter cross country skiing and snowmobiling trails if roads are plowed for winter timber hauling. However, Project Design Features are included to restrict plowing on designated cross country ski trails from mid-November to mid-April to avoid conflicts with this popular winter cross country ski and snowmobile use area.

(1) Sounds from chainsaws and yarding equipment associated with timber operations occurring in the southern portions of the SFLB Planning Area may be noticed by people recreating around the northern end of Howard Prairie Reservoir. However, these sounds would not be a significant impact to recreation as other ambient sounds such as motorboats, private citizens utilizing chainsaws, and road noise from Dead Indian Memorial Highway can all be heard in the Planning Area as well. The addition of new haul routes, or the maintenance of overgrown roads could lead to the development of new OHV routes in the Planning Area. New OHV activity would be minimized through careful transportation management planning, route decommissioning, signage, and staff monitoring. Blockage for new road entrances shall consist of constructing an earthen trench barrier to prevent motorized vehicle use for an extended/indefinite period. Prior to closure the road will be left in an erosion-resistant condition. These blockages will be monitored by staff to ensure OHVs are not accessing areas behind the earthen berms.

Timber operations occurring intermittently in the SFLB Planning Area could disrupt Extensive Recreation Use Areas in several ways: 1) timber sale units and landing areas could be closed or generally just avoided by the public while operations are taking place for public safety concerns; 2) noise disturbance from helicopters, logging trucks, and other timber harvesting equipment, 3) increased road congestion from logging trucks and timber operators. It is difficult to predict or quantify the degree of effect to each person as people may be affected differently depending on the values each person places on the various uses of public lands. Regardless of the degree each person may be affected, the loss of use of less than 0.2 percent of the Extensive Recreation Management Areas available across the Medford District, intermittently, would minimally impact the recreating public for the following reasons: 1) standard safety precautions such as signing and closures would be used to avoid conflicts between the recreating public and timber sale operations; and 2) recreation use for Extensive Recreation Management Areas is considered relatively light across the Medford District.

Thirteen treatment units are within the roughly 10 percent of the Planning Area that falls within the Hyatt-Howard Special Recreation Management Area. These units are located on the periphery of the high visitation recreation sites such as Hyatt Lake Recreation Area, Table Mountain Snow Play area, Pacific Crest National Scenic Trail and as such would not cause adverse effects to the users of the areas. Additionally, timber sale operations would not take place on the entire area simultaneously; disruptions would last the life of the contracts only, and would occur intermittently as seasonal operating restrictions would limit operations during certain time of the year.

c. Alternative 3

Alternative 3 would treat fewer acres throughout the Planning Area than Alternative 2. Alternative 3 would also not propose any new road construction. Acres within the Special Recreation Management Area would remain the same for Alternative 3. Alternative 3 proposes similar methods to harvest the timber, and similar times of year and methods for vehicle hauling. The same PDFs would be in place to protect the winter cross country trails at Buck Prairie. Therefore, the effects under Alternative 3 would be similar to Alternative 2. Through implementation of PDFs, cross country ski trails would be kept un-plowed for winter use.

J. VISUAL RESOURCES MANAGEMENT

1. Issues

- Forest management activities may alter visual character (evidence of management) and may impact attainment of Visual Resource Management Objectives.

2. Affected Environment

"Visual Resources are the land, water, vegetation, structures, and cultural modifications that make up the scenery of BLM-administered land" (USDI 1994, p. 3-70). Medford District BLM-administered lands have been classified under a Visual Resource Management (VRM) Inventory Class system established by the BLM. The criteria used to determine VRM classes were scenery quality ratings, public sensitivity ratings and distance zone-seen area mapping criteria.

Approximately 60 percent of the viewsheds in the Medford District have fragmented land ownership patterns with private lands dominating the viewed landscape (USDI 1994, p. 3-70). The majority of the project units in the South Fork Little Butte Planning Area are classified as VRM Class III; however, there are roughly 10 percent of units near VRM Class II managed lands.

> **Class II Objective**. The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
>
> **Class III Objective**. The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. The level of change to the characteristic landscape should be moderate and not dominate the view of the casual observer. Changes should repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

The VRM Class II lands located within the South Fork Little Butte Planning Area are within the boundary of the Hyatt Lake-Howard Prairie Lake SRMA. The SRMA designation provides that recreation management issues will be included within watershed analysis and project planning efforts (USDI 1995, p. 68). Units in T.38S., R.03E., Sections 11, 19, 21, 22, and 27 fall within this VRM Class II zone. The characteristic landscape within this zone is typical of an area that has had much vegetative manipulation, and retains the look of a fragmented forest and landform view.

All other units within the SFLB Planning Area that are not located within the Hyatt Lake-Howard Prairie Lake SRMA are in the VRM Class III zone, comprising the majority of the Planning Area. The characteristic landscape within this zone is typical of a highly managed and altered forest scene. Past activities such as extensive road building, complete conifer harvest on adjacent private lands and extensive hardwood stands scattered throughout, create a highly modified forest scene.

3. Environmental Consequences

a. Alternative 1 - No Action

Under the No Action Alternative, there would be no immediate change to the visual resources on BLM administered lands as viewed from various locations throughout the Planning Area. Changes to the characteristic landscape over time may occur as a result of tree mortality or wildfire. Changes may be gradual, if small cases of individual or group mortality occur, or the changes may become more noticeable if a large-scale stand replacement wildfire occurred.

b. Alternatives 2 and 3

The proposed treatments and harvest methods for units within the VRM Class II zone would result in a less fragmented view, more in concert with the appearance of adjacent stands. A know observation point (KOP) for this zone is located along the main access road for the Buck Prairie cross country ski area, BLM road 38 3E 29.3. Views are brief from this aspect, mostly screened by foreground vegetation or topographical features. These units will not be detectable to the casual observer. The units in the VRM Class II will have sufficient foreground vegetation and be small enough in size to meet VRM Class II objectives.

For units within the VRM Class III zone, comprising the majority of the Planning Area, the proposed treatments and harvest methods will not increase visual contrasts. A known observation point (KOP) is located on the western edge of the Planning Area, along Conde Shale road (Hole in the Rock ACEC in the background). Other viewpoints are scattered throughout the area on the various roads and are not subject to scenic viewing by the public due to their remote location and difficulty of access. These units will meet VRM Class III objectives.

The Planning Area was evaluated through the VRM Contrast Rating Worksheet in the field. This tool is used to evaluate the existing visual scene, and assess the probable change to the characteristic landscape from proposed actions. This analysis concluded that the Proposed Action meets visual resource management objectives for the two different VRM classes inventoried within the Planning Area. Therefore, no adverse effects to visual resources would occur as a result of implementing Alternatives 2 and 3.

K. SPECIAL AREA DESIGNATIONS

1. Affected Environment

There are two areas located within the South Fork Little Butte Planning Area that are designated under the Medford District RMP to be managed as Special Areas to protect the primary values for which they are recognized. The two areas are: 1) Hole-in-the-Rock Area of Critical Environmental Concern (ACEC) and 2) Lost Lake Research Natural Area (RNA). The following text provides a brief summary of the areas.

a. Hole-in-the-Rock ACEC

The Hole-in-the-Rock ACEC was established for its scenic and geological values. The 63-acre Hole-in-the-Rock ACEC encompasses natural arches spanning over 35 feet. The arches occupy an area of about 50 by 200 feet (about 0.25 acre). The Hole-in-the-Rock arches are the only documented geomorphic feature of this type in southern Oregon and northern California within the Cascade Range. Although no documented visitation records exist for this area, the area is assumed to receive low use due to lack of roads and steep terrain. A trail is reported to have been constructed by a volunteer group in the late 1980s to provide access to the site. But the trail was inadequately designed and received little if any use.

b. Lost Lake RNA

The Lost Lake RNA was established to protect Lost Lake, the primary feature for which the RNA is named. Lost Lake is a small, narrow lake formed as a result of a landslide across Lost Creek. Lost Lake is protected for its value as the best representation of a low elevation natural lake within the southern Cascades. The Medford District RMP set aside about 400 acres of BLM-administered land surrounding the lake feature. This 400-acre area is of sufficient size to protect the lake feature from adjacent forest management activities (USDI 1994, p. 4-83).

2. Environmental Consequences

a. Alternative 1 – No Action

Under the No Action Alternative, the two areas with special designations would receive no change in their respective management or appearance.

b. Alternatives 2 and 3

The Hole-in-the-Rock ACEC would not be affected by the South Fork Little Butte Project because timber harvest and road building activities are not allowed in this ACEC. Additionally, the 63 acre buffer around the 0.25 acre site occupied by the arches would sufficiently buffer the arches themselves and the vegetation surrounding the arches.

Because Research Natural Areas are to be managed to preserve natural features in as nearly an undisturbed state as possible, recreation use of the area has the greatest potential to impact the values for which it is set aside. Access to the Lost Lake RNA is somewhat difficult due to the steep terrain surrounding the lake which limits the amount of use in the area. However, the area has and continues to experience some recreation use; people access the lake from the north on an old Jeep road. The South Fork Little Butte Project does not propose any activities that would increase human access to the Lost Lake RNA, therefore, no adverse impacts are anticipated as a result of implementing either action alternative (Alternatives 2 and 3). People would likely continue to access the lake along the old Jeep road. Steep canyon walls would continue to prohibit any vehicle access from the upstream area.

In summary, the two areas that are managed under Special Area designations, Lost Lake RNA and Hole in the Rock ACEC do not have timber activities proposed within their boundaries under either action alternative (Alternatives 2 and 3). Each of these areas has a buffer around the perimeter which will provide a visual barrier to their respective locations. Visitors will still be able to utilize access points to these areas.

Therefore, the South Fork Little Butte Project would have no effect on any lands with Special Area designations.

L. RANGELAND RESOURCES/GRAZING

1. Affected Environment

There are seven active grazing allotments within the 35,383-acre South Fork Little Butte Forest Management Project Planning Area, which will be the Analysis Area for this section. Conde Creek, Deer Creek-Reno Lease, and Poole Hill allotments are entirely encompassed by the Planning Area boundary, while only portions of the Deadwood, Grizzly, Lake Creek Spring, and Lake Creek Summer allotments are within the Planning Area boundary (Map 3-9). There are 18,035 acres of BLM-administered lands within the Planning Area, of which 15,071 acres are within an active allotment. Therefore, 85 percent of BLM-administered lands and 43 percent of all lands in the Planning Area are available for grazing. There are four lessees who have a total of seven grazing leases within the Planning Area for authorization to graze 1,162 cattle, utilizing 2,992 AUMs. The 1,162 cattle authorized to graze 2,992 AUMs is calculated using entire allotment acreage, which includes use outside of the Analysis Area.

The former Keene Creek Allotment is also within the Planning Area boundary. The allotment was donated to the Secretary of the Interior and the livestock grazing was permanently ended on that allotment in accordance with Public Law 111-011.

Allotment information in Table 3-35 includes active allotment acreage within the Planning Area. Authorized cattle numbers, authorized AUMs, and season of use in Table 3-35 are calculated for the whole grazing allotment.

An AUM is the amount of forage required to sustain a cow/calf pair for one month. The seasons of use range from May 1st to October 15th annually.

Grazing leases that expire, are transferred, or are waived are temporarily renewed under The Consolidated Appropriations Act (Public Law 113-76) with the same terms and conditions as the expired, transferred, or waived lease until the lease can be processed in compliance with applicable laws and regulations. The Omnibus Bill passed in December 2014 making the Appropriation Act permanent to annually extend grazing leases until the federal agency has completed the environmental review for lease renewal that is targeted to occur every 10 years. Leases operating under the Appropriation Act are shown under lease status in Table 3-35 below. An environmental analysis for lease renewals on the Conde and Deadwood allotments is anticipated to be completed in 2015. The timing of the environmental analysis for the remainder of the lease renewals is unknown at this time. The terms and conditions contained in the expired, transferred, or waived leases “shall continue in effect under the renewed permit or lease until such time as the Secretary of the Interior . . . completes processing of such permit or lease in compliance with all applicable laws and regulations (Public Law 113-76).”

Map 3-9. Livestock Grazing Allotments and Range Improvements within the South Fork Little Butte Planning Area.

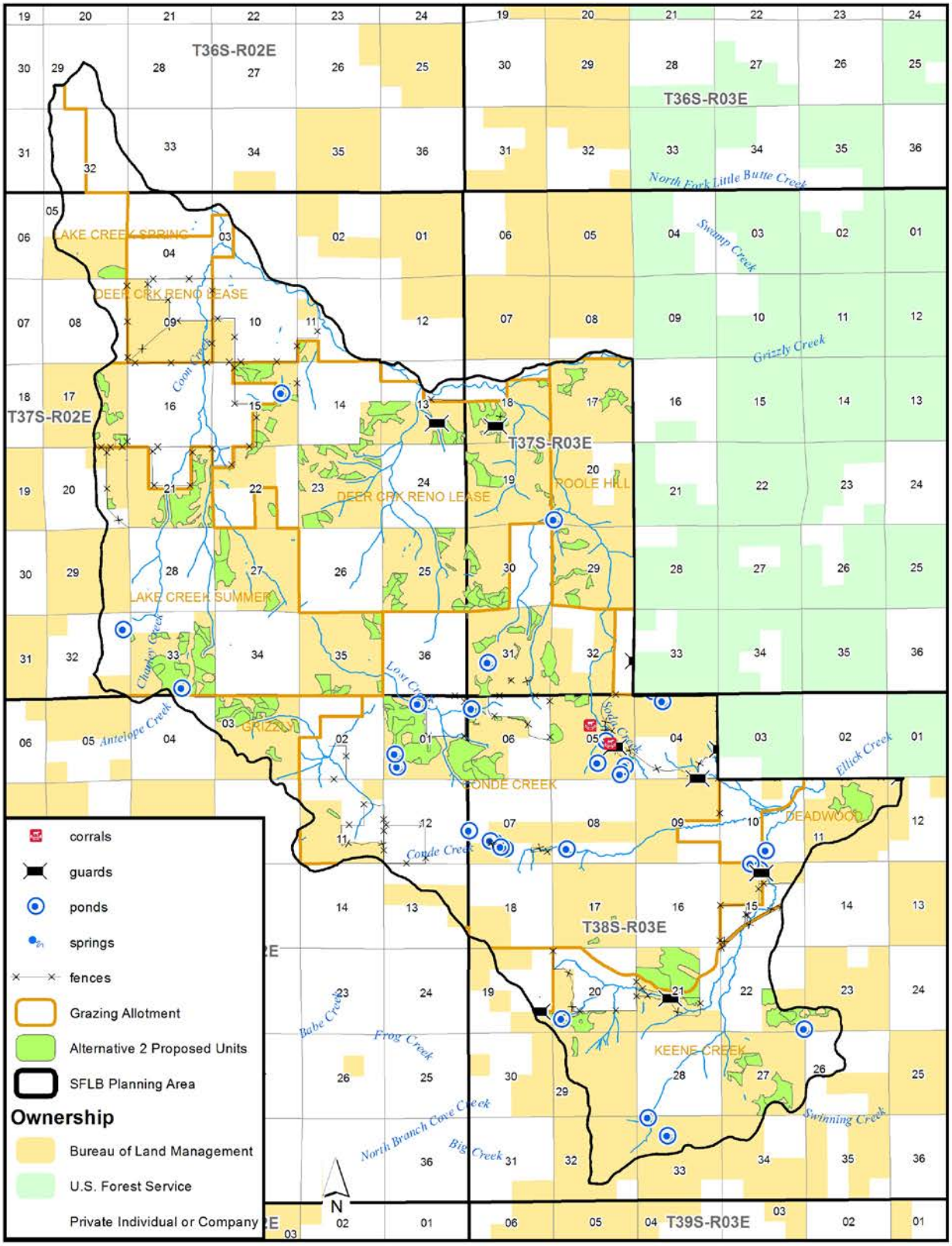


Table 3-35. Active Grazing Allotments in the South Fork Little Butte Planning Area

Allotment Name (number of leases)	Allotment Acres in SFLB	Percent Allotment Acres	Current. Authorized AUMs	Current Authorized (#cattle)	Season of Use	Lease Status
Conde Ck (2)	5,349	100%	591	168	6/16 – 9/30	Appropriation Act
Deadwood (2)	511	6%	789	393	6/16 – 8/15	Appropriation Act
Deer Ck-Reno Lease (1)	4,063	100%	312	62	5/1 – 9/30	Appropriation Act
Grizzly (2)	511	10%	378	84	6/1 – 10/15	Appropriation Act
Lake Ck Spring (1)	214	5%	347	173	5/16 – 7/15	Appropriation Act
Lake Ck Summer (1)	2,698	49%	550	182	7/16 – 10/15	Appropriation Act
Poole Hill (1)	1,725	100%	25	100	10/1 – 10/15	Expires 2018
Total	**15,071**	**43%**	**2,992**	**1,162**	**5/1-10/15**	

2. Environmental Consequences

a. Alternative 1 - No Action

The forested portions of these grazing allotments are seldom accessed by livestock resulting in utilization levels that are generally none to slight (0-10 percent) within the forest plant community. The AUM rates/carrying capacities that are approved in a grazing lease account for the 0-10 percent use in forested areas. If the proposed silvicultural treatments are not implemented, forest stands would remain dense with no increase in forage production for livestock. Forest encroachment on meadows and other open areas that receive sunlight and produce grass species foraged by cattle, would continue to decrease in size and gradually decrease AUM availability over time for the seven grazing allotments listed in Table 3-35.

b. Alternative 2 – Proposed Action

The South Fork Little Butte Forest Management Project would decrease stand density which would increase forage production by allowing more light to the forest floor for understory growth of herbaceous vegetation in the seven allotments in Table 3-35. Harvest and hauling activities could influence known patterns of grazing use and distribution, but is not likely due to treatment locations and the amount of acres treated in comparison to the amount of acres that are available for grazing use. Annual compliance and utilization monitoring occurs within these seven allotments and would occur where timber harvest and hauling is proposed.

Proposed new temporary and permanent road construction under Alternative 2 would not likely influence livestock distribution or use patterns in any considerable way. Cattle distribution from temporary and permanent road construction would be minimal because proposed road lengths are mostly short in duration, or they are located in areas where livestock distribution patterns are already established. There would be minimal effect on the upland vegetation, wetland use would be monitored, and coordination with the lessee would result in management changes of livestock, if needed.

Ongoing monitoring established in areas of concern would identify any increases to grazing effects resulting from the implementation of South Fork Little Butte Forest Management Project. The monitoring and coordination with the lessees along with the terms and conditions of leases that requires herding and salting livestock away from riparian areas are key to minimizing resource effects. Effects following timber harvest and hauling activities are expected to remain as currently authorized; however, usable forage would increase

in areas where forest canopy has been reduced enough to allow new forage production. New forage availability may draw and spread livestock into harvested units that were previously unused. This may disperse grazing intensity in small portions of the allotment, which could result in reduced utilization and compaction on meadow and riparian resources as cattle move into upland areas where there would be little to no effects from the grazing.

c. Alternative 3

Alternative 3 would have nearly the same effect as Alternative 2 on the seven grazing allotments identified in Table 3-35. There would most likely be less forage production due to harvest activities because there is less acres proposed for treatment in Alternative 3. Forage production from timber harvest is dependent on the amount of forest canopy removed to provide enough sunlight to allow herbaceous species to grow. High canopy cover retention would is not likely to increase forage production.

With the elimination of any new road construction under Alternative 3, there would be no anticipated change to livestock usage patterns or grazing intensity related to road construction or renovation.

M. OTHER EFFECTS

1. Cultural Resources

In accordance with the State Protocol for Managing Cultural Resources on Lands Administered by the BLM and the National Historic Preservation Act of 1966 (specifically, Section 106), as amended, a literature review and archaeological reconnaissance was conducted for the South Fork Little Butte (SFLB) Project Area. One new site and one isolated find were located during the cultural resource survey. Previous survey has occurred within the designated boundary of the SFLB Project. There are previously recorded cultural sites within the project boundary. Proposed management direction includes protecting and managing the integrity of all historic/prehistoric sites identified in the cultural survey and within the Area of Potential Effect (APE). Activities which could potentially damage cultural resources include timber removal, road building, controlled burning, fuel hazard reduction methods and restoration projects. The minimum level of protection for sites is avoidance.

The SFLB Project Area was reviewed for the potential for adverse impacts to cultural resources. Any known cultural sites within the Area of Potential Effect (APE) have been flagged for avoidance and unit boundaries adjusted for protection of the resource. When coupled with the Project Design Features listed in Chapter 2, no direct, indirect, or cumulative impacts are expected for cultural resources within the SFLB Forest Management Project.

If, during project implementation, the contractor encounters or becomes aware of any objects or sites of cultural value on federal lands, such as historical or pre-historical ruins, graves, grave markers, or artifacts, the contractor shall immediately suspend all operations in the vicinity of the cultural value and notify the Contracting Officer Representative (COR). The project may be redesigned to protect the cultural resource values present, or evaluation and mitigation procedures would be implemented based on recommendations from the Resource Area Archaeologist with concurrence by the Ashland Field Manager and the State Historic Preservation Office. Therefore, no direct, indirect, or cumulative impacts on cultural resources are anticipated.

2. Air Quality

a. Effects on Air Quality - Use of Plastic Covering for Burn Piles

The Oregon Department of Forestry Smoke Management Plan addresses the issue of utilizing plastic to cover piles. In section 629-048-0210, Best Burn Practices; Emission Reduction Techniques, it states that “Best burn Practices” involves methods that ensure the most rapid and complete combustion of forest fuels. Covering of handpiles is a “Best Burn Practice”. Also in this section it states “When covers will not be removed and thus will be burned along with the piled forest fuels, the covers must not consist of materials

prohibited under OAR 340-264-0060 (3), except that polyethylene sheeting that complies with the following may be used: a) Only polyethylene may be used. All other plastics are prohibited".

An addendum to the original Wrobel and Reinhart literature review (2003) on the use of polyethylene sheeting to enhance combustion efficiency, discusses the rules affecting polyethylene (PE) burning. Oregon and New Mexico are the only western states that allow burning of PE pile covers. Oregon has addressed the issue based on the findings reported by Wrobel and Reinhart (2003). The Oregon Department of Environmental Quality and the Oregon Department of Forestry developed an MOU for PE that was adopted in 2005. The MOU suggests that the plastic material is removed prior to burning when practicable. Adequate debris/slash is placed over the plastic sheeting to ensure the plastic remains covering the piles until the piles are burned. As stated above this ensures the most rapid and complete combustion of slash debris. Due to the difficulty of removing the plastic cover from below the debris, especially after long-term exposure to the elements, it is operationally and economically impractical to remove the plastic prior to burning. Therefore, the plastic is usually left in place and burned along with the pile. As required, polyethylene sheeting is used to cover piles. In a 2009 study, Jung et al. concluded that no increase in any hazardous chemical species as a function of low density polyethylene was found.

Commenters have suggested from pervious projects that Kraft Paper should be used in place of PE to cover the burn piles. Combustion studies involving lignocellulosic materials suggest that uncoated Kraft Paper may produce some of the same substances as polyethylene (Garcia and others 2003). It also states that from an operational standpoint, Kraft paper is a more expensive, less durable, and less effective means of minimizing moisture intrusion into the pile because of its tendency to degrade more rapidly than PE. In turn, fuel moisture is increased, combustion efficiency is reduced, and more accelerants may be needed for pile ignition.

Additionally, the weight and means of packaging Kraft paper contributes to decreased production and increased per unit cost of covering piles. The use of Kraft paper averages 55 pounds per square bundle compared to 12 pounds per roll for polyethylene use. It takes 3 bundles of Kraft paper (165 pounds) to cover the same number of piles that one roll of PE (12 pounds) will cover. Kraft paper bundles are 4 by 4 foot square and are awkward to pack into a unit compared to a roll of polyethylene that can be easily packed into the unit. The size and shape of Kraft paper bundles combined with increased weight could also contribute to increased potential for worker injuries (e.g. knee, back, and ankle sprains) during operations.

b. Effects on Air Quality - Smoke Impacts

The Proposed Action proposes to use prescribed fire so consequently there would be some smoke related impacts. Prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan (OSMP) and the Visibility Protection Plan. Prescribed burning is not expected to affect visibility within the Crater Lake National and neighboring wilderness smoke sensitive Class I areas (Kalmiopsis and Mountain Lakes Wilderness Areas) during the visibility protection period (July 1 to September 15). Prescribed burning is not routinely conducted during this period primarily due to the risk of an escape wildfire.

Prescribed burning emissions are not expected to adversely affect annual PM 2.5 attainment within the Grants Pass, Klamath Falls, and Medford/Ashland SSRA. Any smoke intrusions into these areas from prescribed burning are anticipated to be light and of short duration.

Handpiles would be covered to keep material dry to permit burning during the rainy season where there is a stronger possibility of atmospheric mixing and/or scrubbing. Prescribed burning would be scheduled primarily during the period starting in November and ending in June. This treatment period minimizes the amount of smoke emissions. Smoke dispersal is easier to achieve due to the general weather conditions that occur at this time of year. Finally, prescribed burning operations would follow all requirements of the Oregon Smoke Management Plan and the Department of Environmental Quality Air Quality and Visibility Protection Program.

Finally, prescribed burning operations would follow all requirements of the Oregon Smoke Management Plan and the Department of Environmental Quality Air Quality and Visibility Protection Program. Under the authority of the State Forester, prescribed burning throughout southwest Oregon is administered, coordinated, and in situations where air quality of the entire State or part thereof is, or would likely become adversely affected by smoke, additional restrictions are applied to avoid cumulative effects of prescribed burning across multiple ownerships.

3. Economics

The Medford District RMP directs that all silvicultural systems (forest system strategies) applied to achieve forest stand objectives would be economically practical (USDI 1995, p. 180). The economic feasibility of forest management actions is affected by the ease of access from the existing transportation system. Tractor yarding is usually the least expensive logging system, followed by cable yarding. Helicopter yarding is usually the most expensive system. As the yarding distance increases, so does the cost for each of the yarding methods.

Under Alternative 2, the BLM proposes to construct twenty (20) new segments of road (Tables 2-5 and 2-6), to improve the economic feasibility of logging nineteen (19) units in the South Fork Little Butte Project. An estimated 0.80 miles of new roads would be permanent and an estimated 3.04 miles of new roads would be temporary. For these units, the economic effect of building the proposed roads results in reducing the logging costs by $602,012.25 ($669,652.21 less the cost of the road construction $67,639.96, (Tables 3-36 and 3-37). The savings that would be experienced is attributed to the change in logging systems from helicopter yarding to conventional yarding systems (tractor or cable), or reduced yarding distances for cable or tractor systems. This analysis of the logging systems is for this entry only and does not model or amortize future harvest entries back to net present value. It does not model fuels management project savings that would be expected in some cases due to improved access to units, nor does it model any differences in log haul costs.

Table 3-36. Logging Cost Summary of Harvest Units Affected by Proposed Road Construction*

Unit	Logging with new roads as proposed				Logging without new roads as proposed			Yarding Cost Difference
	Logging Method	Yarding cost (per MBF)	Estimated MBF	Total Unit Logging Cost	Logging Method	Yarding cost (per MBF)	Total Unit Logging Cost	
1-4a	Cable	$224.10	8	$1,792.80	Cable	$298.79	$2,390.32	$597.52
5-4	Tractor	$122.26	174	$21,273.24	Helicopter	$682.87	$118,819.38	$97,546.14
13-1a	Cable	$298.79	154	$46,013.66	Helicopter	$438.99	$67,604.46	$21,590.80
17-4	Tractor	$122.26	102	$12,470.52	Helicopter	$682.87	$69,652.74	$57,182.22
17-5	Tractor	$122.26	102	$12,470.52	Helicopter	$472.76	$48,221.52	$35,751.00
15-1a	Tractor	$122.26	540	$66,020.40	Helicopter	$614.59	$331,878.60	$265,858.20
15-1b	Tractor	$122.26	36	$4,401.36	Helicopter	$614.59	$22,125.24	$17,723.88
15-3	Tractor	$122.26	56	$6,846.56	Helicopter	$438.99	$24,583.44	$17,736.88
15-5	Tractor	$122.26	20	$2,445.20	Helicopter	$438.99	$8,779.80	$6,334.60
18-4c	Cable	$224.10	60	$13,446.00	Helicopter	$438.99	$26,339.40	$12,893.40
19-1a	Tractor	$122.26	270	$33,010.20	Tractor	$146.71	$39,611.70	$6,601.50
22-4	Cable	$298.79	225	$67,227.75	Helicopter	$438.99	$98,772.75	$31,545.00
22-1	Tractor	$122.26	48	$5,868.48	Tractor	$183.39	$8,802.72	$2,934.24
25-3b	Cable	$224.10	285	$63,868.50	Helicopter	$438.99	$125,112.15	$61,243.65

30-2b	Cable	$224.10	16	$3,585.60	Helicopter	$438.99	$7,023.84	$3,438.24
30-2c	Tractor	$122.26	266	$32,521.16	Tractor	$146.71	$39,024.86	$6,503.70
30-3b	Cable	$224.10	92	$20,617.20	Helicopter	$438.99	$40,387.08	$19,769.88
20-1	Tractor	$122.26	36	$4,401.36	Tractor	$183.39	$6,602.04	$2,200.68
20-3	Tractor	$122.26	36	$4,401.36	Tractor	$183.39	$6,602.04	$2,200.68
Total				$422,681.87			$1,092,334.08	$669,652.21

* The estimates for logging costs were derived from, *Logging Costs Estimates by Synergy Consulting, Inc.*

Table 3-37. Road Construction Cost Summary

Road Number	Construction Cost*
37-2E-14.00C	$1,256.77
37-2E-5.00	$13,075.91
37-2E-24.04C	$1,256.77
37-2E-15.00A	$3,979.62
T37 R2E Spur 13-1	$628.39
T37 R2E Spur 15-1	$7,674.99
T37 R2E Spur 15-4	$8,243.51
T37 R2E Spur 17-1	$10,808.26
T37 R2E Spur 17-2	$3,016.26
T37 R3E Spur 18-1	$628.39
T37 R2E Spur 20-3	$2,890.58
T37 R2E Spurs 25-1, 25-2, 25-3	$1,759.48
T37 R3E Spur 20-1	$628.39
T37 R3E Spur 30-1	$1,508.13
T37 R3E Spur 30-2	$1,989.81
T38 R2E Spur 1-1	$754.06
T38 R3E Spur 20-2	$1,759.48
T38 R3E Spur 23-1	$5,781.16
Total	$67,639.96

* Road Construction Estimates were derived from Civil Engineering Technicians at the Bureau of Land Management Medford, OR.

4. Environmental Justice

This project was reviewed for the potential for disproportionately high or adverse effects on minority or low-income populations. No adverse impacts to minority or low-income populations would occur, per Executive Order 12898 (Environmental Justice).

CHAPTER 4 - PUBLIC PARTICIPATION

A letter briefly describing the preliminary Proposed Action and inviting comments was mailed to adjacent landowners, interested individuals, organizations, and other agencies on xx. The scoping letter requested that people contact the BLM using an attached Interest Response Form (IRF), or by sending a comment letter if they wanted to be updated as the project progressed.

During the scoping process the BLM received four (4) written comment letters and 26 IRFs regarding the proposed project. As described in Chapter 1 of the EA, the BLM interdisciplinary team of resource specialists reviewed public input received, and identified relevant issues to be addressed during the environmental analysis. Some issues identified as relevant to this project proposal were analyzed in association with broader level environmental analyses. Where appropriate, this EA incorporates by reference the analysis from broader level NEPA documents (40 CFR § 1508.28), to be considered along with project specific analysis.

This South Fork Little Butte Forest Management Project EA will be made available online, through publication of a legal notice in the Medford Mail Tribune newspaper, and at the Medford District BLM office to all individuals for a 30-day public comment period. A copy of the EA will be sent to those parties who submitted an Interest Response Form or provided scoping comments, and to the Organizations and Agencies listed below. Copies will be sent either via email or via standard mail depending on what was requested.

Organizations and Agencies

American Forest Resource Council
Bureau of Reclamation: Bend Field Office
Cascadia Wildlands
Center for Biological Diversity
Klamath Siskiyou Wildlands Center
Little Butte Creek Watershed Council
Oregon Wild
Soda Mountain Wilderness Council
Southern Oregon Forest Restoration Collaborative
Southern Oregon Timber Industry Association
US Fish and Wildlife Service

REFERENCES

Agee, J.K, and M.H. Huff. 1986. Structure and process goals for vegetation in wildnerness areas. GTR-INT-212. USDA Forest Service Intermountain Research Station, Ogden, Utah. In Brown, R.T., J.K. Agee, and J.F. Franklin. 2004. Forest restoration and fire: principles in the context of place. Conservation Biology, 18(4): 903-912.

Agee, J.K. 1993. Fire Ecology of Pacific Northwest Forests. Island Press. Washington. D.C.

Agee, J.K. 1996. The influence of forest structure on fire behavior. P. 52-68, in Proceedings of the 17th Forest Vegetation Management Conference. Jan. 16-18, 1996 Redding, CA.

Agee, J.K. 1998. The landscape ecology of western fire regimes. Northwest Science 72:24-34. In D. McKenzie, Z. Gedalof, D.L. Peterson, and P. Mote. 2004. Climatic change, wildfire, and conservation. Conservation Biology, 18(4):890-902.

Agee, J.K. 2002. The fallacy of passive management. Conservation Biology in Practice 3(1)18-25. In Brown, et. al. 2004. Forest restoration and fire. Conservation Biology, 18(4): 903-912.

Agee, J.K., Skinner, C.N. 2005. Basic principles of forest fuel reduction treatments. Forest Ecology and Management 2005. © 2005 Elsevier B.V.

Albini, F.A. 1976. Estimating Wildfire Behavior and Effects. USDA Forest Service GTR, INT-30.

Aramanthus, M., Rice, R., Barr, N., & Ziemer, R. (1985). Logging and Forest Roads Related to Increased Debris Slides in Southwestern Oregon. *Journal of Forestry*, 229-233.

Amaranthus, M.P., D. Page-Dumroese, A. Harvey, E. Cazares, and L.F. Bednar. 1996. *Soil Compaction and Organic Matter Affect Conifer Seedling Nonmycorrhizal and Ectomycorrhizal Root Tip Abundance and Diversity*. Research Paper, PNW-RP-494. Portland, OR

Anthony R.G., E.D. Forsman, A.B. Franklin, D.R. Anderson, K.P. Burnham, G.C. White, C.J. Schwarz, J.D. Nichols, J.E. Hines, G.S. Olson, S.H. Ackers, S. Andrews, B.L. Biswell, P.C. Carlson, L.V. Diller, K.M. Dugger, K.E. Fehring, T.L. Fleming, R.P. Gerhardt, S.A. Gremel, R.J. Gutiérrez, P.J. Happe, D.R. Herter, J.M. Higley, R.B. Horn, L.L. Irwin, P.J. Loschl, J.A. Reid, S.S. Sovern. 2004. Status and trends in demography of northern spotted owls, 1985–2003. Final Report to Interagency Regional Monitoring Program, Portland, Oregon. Oregon Cooperative Fish and Wildlife Research Unit, Corvallis, USA.

Anthony R.G., S. Andrews, E. Fleigel, L. Friar, D. Strejc and F. Wagner. 2010. Demographic Characteristics and Ecology of Northern Spotted Owls (*Strix occidentalis caurina*) in the Southern Oregon Cascades. Oregon Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife, Oregon State University, Corvallis, Oregon.

Atzet, T., Wheeler, D. 1982. “Historical and Ecological Perspectives on Fire Activity in the Klamath Geological Province of the Rogue River and Siskiyou National Forests” USDA- Forest Service Pacific Northwest Region Portland, Oregon July 1982.

Atzet, T., Powers, R. F., McNabb, D. H., Amaranthus, M. P., & Gross, E. R. (1987). Maintaining Long-Term Forest Productivity in Southwest Oregon and Northern California. (pp. 185-201). Portland: Timber Press Inc.

Aubry, K.B., and C.M. Raley. 2002. Ecological characteristics of fishers in the southern Oregon Cascade Range. Final progress report. USDA Forest Service, Pacific Northwest Research Station, Olympia, WA

Aubry, K.B. and J.C. Lewis. 2003. Extirpation and reintroduction of fishers (*Martes pennanti*) in Oregon: implications for their conservation in the Pacific states. Biological Conservation 114 (1):79-90.

Aubry, K., and C. Raley. 2006. Ecological characteristics of fishers (Martes pennati) in the southern Oregon Cascade Range. USDA Forest Service, Pacific Northwest Research Station, Olympia Forestry Sciences Laboratory, Olympia, WA.

Baker, W.L. and D. Ehle. 2001. Uncertainty in surface-fire history: the case of ponderosa pine forests in the western United States. Canadian Journal of Forest Research 31:1205-1226. In D. McKenzie, Z. Gedalof, D.L. Peterson, and P. Mote. 2004. Climatic change, wildfire, and conservation. Conservation Biology, 18(4):890-902.

Barbour, M.G., J.H. Burk, and W.D. Pitts. 1987. Terrestrial Plant Ecology. The Benjamin/Cummings Publishing Company, Inc., Menlo Park, CA, pp. 65.

Beechie, T. J., G. Pess, P. Kennard, R. Bilby, and S. Boltan. 1999. *Modeling Recovery Rates and Pathways for Woody Debris Recruitment in Northwestern Washington Streams.* North American Journal of Fisheries Management: Vol. 20, no. 2, pp. 436-452.

Bent, A. C. 1940. Life histories of North American cuckoos, goatsuckers, hummingbirds, and their allies. U.S. Natl. Mus. Bull. 176.

Beschta, R. L. (1978). Long-term patterns of sediment production following road construction and logging in the Oregon Coast Range. *Water Resources research*, 1011-1016.

Bingham, B. and B.R. Noon. 1997. Mitigation of Habitat Take: Application to Habitat Conservation Planning. Conservation Biology 11(1):127-139.

Biswell, H.H, H.R. Kallander, R. Komarek, R.J. Vogl, and H. Weaver. 1973. Ponderosa fire management, Miscellaneous publication 2. Tall timbers Research Station, Tallahassee, Florida. In Brown, et. al. 2004. Forest restoration and fire. Conservation biology, 18(4): 903-912.

Bradshaw, G. (1979). *Preplanned skid trails and winching versus conventional harvesting on a partial cut.* Corvallis: Oregon State University.

Braun, C. E. 1994. Band-tailed Pigeon. Pages 61-74 in *Migratory shore and upland game bird management in North America*. (Tacha, T. and C. E. Braun, Eds.) Int. Assoc. Fish Wildl. Agencies, Washington, D.C.

Brown, R. T., J.K. Agee and J.F. Franklin. 2004. Forest Restoration and Fire: Principles in the Context of Place. Conservation Biology 18(4): 903-912.

Bull, E.L., and M.G. Henjum. 1990. Ecology of the great gray owl. General Technical Report. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. 39.

Buskirk. S., and R.A. Powell. 1994. Habitat ecology of fishers and American martens. Pages 283-296. In S.W. Buskirk, A.S. Harestad. M.G. Raphael. and R.A. Powell (editors). Martens, Sables and Fisher: Biology and Conservation. Cornell University Press, Ithaca New York.

California Partners in Flight. 2002. Version 2.0. The oak woodland bird conservation plan: a strategy for protecting and managing oak woodland habitats and associated birds in California (S. Zack, lead author). Point Rayes Bird Observatory, Stinson Beach, CA.

Carey, A. B., Janet Kershner, Brian Biswell and Laura Domínguez de Toledo *Wildlife Monographs* , Ecological Scale and Forest Development: Squirrels, Dietary Fungi, and Vascular Plants in Managed and Unmanaged Forests. No. 142, Ecological Scale and Forest Development: Squirrels, Dietary Fungi, and Vascular Plants in Managed and Unmanaged Forests (Jan., 1999), pp. 3-71

Carey, Andrew B. 2000. EFFECTS OF NEW FOREST MANAGEMENT STRATEGIES ON SQUIRREL POPULATIONS. Ecological Applications 10:248–257

Childs, S.W, S.P Shade, D.W.R Miles, E Shepard, and H.A Froehlich. "Soil Physical Properties: Importance to Long-Term Forest Productivity." 1989. 53-66.

Christiansen, E., R.H. Waring, and A.A. Berryman. 1987. Resistance of Conifers to Bark Beetle Attack: Searching for General Relationships. Forest Ecology and Management, 22, 89-106.

Chadwick, Kristen L. and Eglitis, Andris. 2007. Health Assessment of the Lost Forest Research Natural Area. USDA Forest Service. Forest Health Protection. Central Oregon Service Center for Insects and Diseases. Bend, OR.

Clayton, Dave. 2012 a. Fisher movement in response to environmental conditions. Personal Communication in February, 2012. Rouge Siskiyou National Forest Biologist.

Cochran, P.H. 1992. Stocking levels and underlying assumptions for even-aged ponderosa pine stands. USDA Forest Service, Pacific Northwest Research Station Research Note PNW-RN-509. 10 p.

Cook, Rachel, Cook, John G., and Mech, L. David. 2004. "Nutritional Condition of Northern Yellowstone Elk." *USGS Northern Prairie Wildlife Research Center.* Paper 68.

Courtney, S. P., J. A. Blakesley, R. E. Bigley, M. L. Cody, J. P. Dumbacher, R. C. Fleischer, A.B. Franklin, J. F. Franklin, R. J. Gutiérrez, J. M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the Northern Spotted Owl. Sustainable Ecosystems Institute. Portland, OR.

Cowley, E.R., T.A. Burton, and S.J. Smith. 2006. *Monitoring Streambanks and Riparian Vegetation—Multiple Indicators.* Technical Bulletin No. 2005-02, Version 2.0. U.S. Department of the Interior Bureau of Land Management Idaho State Office. Boise, ID.

Christner, J. and R.D. Harr. 1982. *Peak streamflows for the transient snow zone*. Paper presented at the Western Snow Conference, April 20, 1982. Reno, NV.

Curtis, Robert O. 1982. A Simple Index of Stand Density for Douglas-fir. Forest Science 28(1): 92-94.

Dahlberg, A. and J. Stenlid. 1995. Spatiotemporal patterns in ectomychorrhizal populations. Canadian Journal of Botany 73 (Supplement). Pp. S1222-S1230.

Davis, Raymond J.; Dugger, Katie M.; Mohoric, Shawne; Evers, Louisa; Aney, William C. 2011**.** Northwest Forest Plan—the first 15 years (1994–2008): status and trends of northern spotted owl

populations and habitats. Gen. Tech. Rep. PNWGTR-850. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 147 p.

Davis, Ra; R. Horn, P. Caldwell, S.Cross, R. Crutchley, K. Fukuda, C. Larson, H. Wise. 2010. Demographic characteristics of northern spotted owls (*Strix occidentalis caurina*) in the

Klamath Mountain Province of Oregon, 1990-2010. Last accessed February 1, 2012 at: http://www.reo.gov/monitoring/reports/northen-spotted-owl-reports-publications.shtml

DellaSala, D.A., R.G. Anthony, T.A. Spies, and K.A. Engel. 1998. Management of bald eagle communal roosts in fire-adapted mixed conifer forests. J. Wildlife Mangement 62(1):322-333.

DellaSala, D.A. and E. Frost. 2001. An ecologically based strategy for fire and fuels management in national forest roadless areas. Fire management today 61(2): 12-23.

DeMars, C.J. Jr. and B.H. Roettgering, 1982. Western Pine Beetle. USDA Forest Service. Forest Insect and Disease Leaflet 1.

DiTomaso and Healy. 2007. Weeds of California and Other Western States. Volumes 1 and 2.

Dolph, Robert E. 1985. Growth and vigor information in thinned second-growth ponderosa pine stands on the Deschutes and Ochoco National Forests. 10pp.

Doppelt, B., R. Hamilton, C. Deacon, and M. Koopman. 2008. Preparing for climate change in the Rogue River Basin of southwest Oregon. Climate Change Leadership Initiative. University of Oregon, Eugene, OR. 43 pp.

Drew, R.E., J.G. Hallett, K.B. Aubry, K.W. Culling, S.M. Koepf, and W.J. Zielinski. 2003. Conservation genetics of the fisher (Martes pennanti) based on mitochondrial DNA sequencing. Molecular Ecology 12: 51-62.

Drew, T.J. and J.W. Flewelling. 1979. Stand density management: an alternative approach and its application to Douglas-fir plantations. Forest Science, Vol. 25, No. 3, pp. 518-532.

Dugger, K.M., F. Wagner, R.G. Anthony, and G.S. Olson. 2005. ―The relationship between habitat characteristics and demographic performance of northern spotted owls in southern Oregon.‖ Condor 107:863-878.

Duncan, N., T. Burke, S. Dowlan, and P. Hohenlohe. 2003. Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan, Version 3.0. Government Printing Office, Portland, OR.

Dyrness, C. (1967). Soil surface conditions following skyline logging. *USDA Forest Service Reseach Note PNW-55 8 p.* Pacific Northwest Forest and Range Experiment Station, Portland Oregon Energy Information Administration. "Emissions of Greenhouse Gases in the United States 2008." Washington, DC: US Department of Energy, 2009. 58.

Farber, S.L., and T. Franklin. 2005. Presence-absence surveys for Pacific fisher (Martes pennanti) in the Eastern Klamath Province of Interior Northern California. Timber Products Company, Yreka, CA. 35.

Federal Energy Regulatory Commission (FERC), Office of Energy Products. 2014. *Draft Environmental Impact Statement: Jordan Cove Energy and Pacific Connector Gas Pipeline Project—FERC/EIS—0256D.* Cooperating Agencies: USDA Forest Service, Department of the Army, Corp of Engineers, US Environmental Protection Agency, US Department of Homeland Security

Coast Guard, US Department of Transportation Pipeline and Hazardous Materials Safety Administration, USDI Bureau of Reclamation, USDI Fish and Wildlife Service.

Federal Register. 2014. 79(194) FR 60419, 7 October, 2014. Pages 60419 – 60443.

Federal Register, 1999. *Designated Critical Habitat; Central California Coast and Southern Oregon/Northern California Coasts Coho Salmon.* Vol. 64, No. 86. 24049.

Fettig, Christopher J., Kier D. Klepzig, Ronald F. Billings, A Steven Munson, T. Evan Nebeker, Jose F. Negron, and John T. Nowak. 2007. In Press. The effectiveness of vegetation management practices for prevention and control of bark beetle infestations in coniferous forests of western and southern United States. Forest Ecology and Management: 238 (1-3): 24-53.

Finney, M.A. 2001. Design of regular landscape fuel treatment patterns for modifying fire growth and behavior. Forest Science 47:219-228.

Finney, M.A., Charles W. McHugh, and Isaac C. Grenfell. 2005. Stand- and landscape-level effects of prescribed burning on two Arizona wildfires.

Forsman, E.D., R.G. Anthony, E.C. Meslow, and C.J. Zabel. 2004. Diets and Foraging Behavior of Northern Spotted Owls in Oregon. J. of Raptor Res. 38(3):214-230.

Forsman, E.D.; Anthony, R.G.; Dugger, K.M.; Glenn, E.M.; Franklin, A.B.; White, G.C.; Schwarz, C.J.; Burnham, K.P.; Anderson, D.R.; Nichols, J.D.; Hines, J.E.; Lint, J.B.; Davis, R.J.; Ackers, S.H.; Andrews, L.S.; Biswell, B.L.; Carlson, P.C.; Diller, L.V.; Gremel, S.A.; Herter, D.R.; Higley, J.M.; Horn, R.B.; Reid, J.A.; Rockweit, J.; Schaberl, J.; Snetsinger, T.J.; Sovern, S.G. 2011. Population demography of northern spotted owls. Studies in Avian Biology 40. Berkeley, CA: University of California Press. 106 pp.

Forster, P., et al. "Changes in Atmospheric Constituents and in Radiative Forcing." Chap. 2 in *Climate Change 2007 - The Physical Science Basis*, edited by S. Solomon, et al., 129-234. Cambridge, United Kingdom and New York, NY: Cambridge University Press, 2007.

Franklin, J.F., and Agee, J.K. 2003. Forging a Science-Based National Forest Fire Policy; from: Issues in Science and Technology.

Franklin, J.F. & Dyrness, C.T. 1973. Natural vegetation of Oregon and Washington. USDA. Forest Service Pacific Northwest Forest Range Exp. Stat., Gen. Tech. Rep. PNW-8, 417 pp.

Furniss, M.J., S.A. Flanagan, and S.H. Duncan. 2000. *Hydrologically Connected Roads: An Indicator on the Influence of Roads on Chronic Sedimentation, Surface Water Hydrology, and Exposure to Toxic Chemicals.* Stream Notes (July 2000). Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

Furniss, Michael, J, et. al. 2010. *Water, climate change, and forests: watershed stewardship for a changing climate.* Gen. Tech. Rep. PNW-GTR-812. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 75p.

Garcia and others. 2003. Comparison Between Product Yields in the Pyrolysis and Combustion of Different Refuse.

Geppert, R.R., C.W. Lorenz and A.G. Larson. 1984. Cumulative Effects of Forest Practices on the Environment: A State of the Knowledge. Ecosystems, Inc. Olympia, WA.

Godwin, Steve. 2012. Canopy closure at great gray owl nests. Personal Communication in February, 2012. Medford Bureau of Land Management Wildlife Biologist.

Goheen, Ellen M. 2010. Personal Communication. Local area plant pathologist for the USDA Forest Service, Forest Health Protection staff, located in Central Point, Oregon.

Gomez, D. M., R. G. Anthony, and J. P. Hayes. 2005. Influence of thinning of Douglas-fir forests on population parameters and diet of northern flying squirrels. Journal of Wildlife Management 69:1670–1682.

Graham, Russel T., A.E. Harvey, B. Theresa, and R. Jonaliea. 1999. The effects of thinning and similar stand treatments on fire behavior in Western forests. PNW-GTR-463. Portland, OR: USDA, Forest Service, Pacific Northwest Research Station, 27 pp.

Grant, G.E., Lewis, S.L., Swanson, F.J., Cissel, J.H., and McDonnell, J.J. 2008. *Effects of Forest Practices on Peak Flows and Consequent Channel Response: A State-of-Science Report for Western Oregon and Washington*. USDA For. Serv., Pac. Northwest Forest and Range Exp. Station, Portland, OR. General Technical Report PNW-GTR-760

Greacen, E.L, and R Sands. "Compaction of Forest Soils. A Review." *Austrailian Journal of Soil Resources.* Glen Osmond Austrailia, 1980. 163-189.

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

Hann, David W. 2013. ORGANON user's manual. Edition 9.1 Southwest Oregon version. Dept. of Forest Resources, Oregon State University.

Hann, W.J., J.L. Jones, M.G. Karl, P.F. Hessberg, R.E. Keane, D.G. Long, J.P. Menakis, C.H. McNicoll, S.G. Leonard, R.A. Gravenmier, and B.G. Smith. 1977. Landscape dynamics of the basin. Pages 337-1055. In T.M. Quigley and S. Arbelbide. In Forest restoration and fire. 2004. Brown, et. al. Conservation Biology, 18(4): 903-912.

Harr, R.D., R. Fredriksen, and J. Rothacher. 1979. *Changes in streamflow following timber harvest in southwestern Oregon.* Res. Pap. PNW-249. USDA For. Serv., Pac. Northwest Forest and Range Exp. Station, Portland, OR. 22 pp.

Hayes, J.P., Samuel S. Chan, William H. Emmingham, John C. Tappeiner, Loren D. Kellog, and John D. Bailey. 1997. Wildlife Responses to Thinning Young Forests in the Pacific Northwest. Journal of Forestry, Vol. 95, No. 8.

Healy, Susan and William A. Calder. 2006. Rufous Hummingbird (Selasphorus rufus), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/053.

Hessel, Amy E., Don McKenzie, and Richard Schellhaas. 2004. Drought and Pacific Decadal Oscillation Linked to Fire Occurrence in the Inland Pacific Northwest. Ecological Applications, 14(2):425-442.

Holloway, Gillian L. and Winston P. Smith. 2011. A Meta-Analysis of Forest Age and Structure Effects on Northern Flying Squirrel Densities. The Journal of Wildlife Management 75(3): 668-674. 2011.

Huff, M.H., Agee, J.K. 2000. The Role of Prescribed Fire in Restoring Ecosystem Health and Diversity in Southwest Oregon: Part 1. Ecosystem Conditions. Report to Pacific Northwest Research Station Directors Office- Northwest Forest Plan Issue. September 2000.

Hull, R.O. and O. Leonard. 1964. Physiological aspects of parasitism in mistletoes (*Arceuthobium and Phoradendron*). The carbohydrate nutrition of mistletoe. Plant Physiology 39, 996-1007.

Jarvis, R. L. and M. F. Passmore. 1992. Ecology of Band-tailed Pigeons in Oregon. U.S. Fish Wildl. Serv. Biol. Rep. 6.

Joint Fire Science Program (JFSP). 2007. Tested by Fire: What Happens When Wildfires Meet Fuels Treatments? In: Fire Science Brief, Issue 1. October 2007. www.firescience.gov.

Jones, J.A., Swanson, F. J., Wemple, B. C. and Snyder, K. U. 1999. Effects of Roads on Hydrology, Geomorphology, and Disturbance Patches in Stream Networks. *Conservation Biology*. **14(1):** 76-85.

Jung et al. 2009. Influence of Polyethylene Cover of Silivicultural Burn Piles on Emmissions.

Kauffman, J. B. 2004. Death rides the forest: perceptions of fire, land use, and ecological restoration of Western forests. Conservation Biology, 18(4):878-882.

King, J.G., and L.C. Tennyson. 1984. *Alteration of streamflow characteristics following road construction in north central Idaho*. Water Resources Research 20:1159-1163.

Klock, G. (1975). Impact of five postfire salvage logging systems on soils and vegetation. *Journal of Soil and Water Conservation*, 78-81.

KS Wild v. USDI BLM, case No. 06-3076-PA, Order and Judgment 9/10/2007

Landsberg, J. D., Miller, R. E., Anderson, H. W., & Tepp, J. S. (2003). *Bulk Density and Soil Resistance to Penetration as Affected by Commercial Thinning in Northeastern Washington.* Pacific Northwest Research Station: United States Forest Service.

Larsson, S., R. Oren, R.H. Waring, and J.W. Barrett. 1983. Attacks of Mountain Pine Beetle as Related to Tree Vigor of Ponderosa Pine. Forest Science, Vol. 29, No. 2, pp. 395-402.

Lint, J. 2005. Northwest Forest Plan - first ten years (1994-2003): status and trend of northern spotted owl populations and habitat. General Technical Report, PNW-GTR-648. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Lloyd, R. A., Lohse, K. A., & Ferre, T. (2013). Influence on Road Reclamation Techniques on Forest Ecosystem Recovery. *The Ecological Society of America*, 75-81.

Lofroth, E.C., C.M. Raley, J.M. Higley, R.L. Truex, J.S. Yaeger, J.C. Lewis, P.J. Happe, L.L. Finley, R.H. Naney, L.J. Hale, A.L. Krause, S.A. Livingston, A.M. Meyers, and R.N. Brown. 2010. Conservation of Fishers (*Martes pennanti*) in South-Central British Columbia, Western Washington, Western Oregon, and California – Volume 1: Conservation Assessment. USDI Bureau of Land Management, Denver, Colorado, USA.

Lofroth, E.C., J.M. Higley, , R.H. Naney, C.M. Raley, J.S. Yaeger, S.A. Livingston and R.L. Truex. 2011. Conservation of Fishers (*Martes pennanti*) in South-Central British Columbia, Western Washington, Western Oregon, and California – Volume 2: Key Findings From Fisher Habitat Studies in British Columbia, Montana, Idaho, Oregon, and California. USDI Bureau of Land Management, Denver, Colorado, USA.

Luce, C.H. and T.A. Black. 2001. *Effects of Traffic and Ditch Maintenance On Forest Road Sediment Production.* In: Proceedings of the Seventh Federal Interagency Sedimentation Conference, March 25-29, 2001, Reno Nevada, pp. V67-V74.

Luce, C. H. and T. A. Black. 1999. Sediment production from forest roads in western Oregon. *Water Resources Research*, Vol. 35, No. 8, pp. 2561-2570, August 1999.

Lucklow, K. R. (2004). Soil Compaction Study of 20 Timber-harvest Units on the Ouachita National Forest. *USDA Forest Service*.

Macdonald, L.H. and Coe, D.B.R. 2008. *Road Sediment Production and Delivery: Processes and Management.* In: Proceedings of the first world landslide forum, international program on landslides and international strategy for disaster reduction. United Nations University, Tokyo, Japan.

Mallams, K.M. and D.J. Goheen. 2005. Dwarf Mistletoe Broom Development in Mature Douglas-fir trees: A Retrospective Case Study. *Northwest Science* 79(4): 281-288.

Marshall, D.B., M.G. Hunter, and A. L. Contreras, Eds. 2003. *Birds of Oregon: A General Reference*. Oregon State University Press, Corvallis, Oregon. 768 p.

Mathiasen, R.L. 1996. Dwarf Mistletoes in Forest Canopies. *Northwest Science*, Vol. 70, special issue, pp. 61-71.

McIver, J. D., & Starr, L. (2001). A Literature Review of the Environmental Effects of Postfire Logging. *Western Journal of Applied Forestry*, 159-168.

McKenzie, D., Z. Gedalof, D.L. Peterson, and P. Mote. 2004. Climatic change, wildfire, and conservation. Conservation Biology, 18(4):890-902.

McNabb, D., & Froehlich, H. (1983). Conceptual model for predicting forest product losses from soil compaction. *Society of American Foresters National Convention*, 261-265.

Mech, L.D., and L. Boitani. 2010. *Canis lupus*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. Accessed from www.iucnredlist.org; downloaded on February 8, 2012.

Meehan, W. R., Editor. 1991. *Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats.* American Fisheries Society Special Publication 19.

Messier, Michael S.; Jeff P.A. Shatford, David E. Hibbs 2012. Fire exclusion effects on riparian forest dynamics in southwestern Oregon. Forest Ecology and Management, 264, 60-71.

Miller, R. E., Colbert, S. R., & Morris, L. A. (2004). Effects Of Heavy Equipment on Physical Properties of Soils and on Long-Term Productivity: A Review of Literature and Current Research. *National Council For Air And Stream Improvement*, 1-76.

Mitchell, Allen. 2012. Personal communication. Fire Management Officer, Medford District BLM.

Morgan, P., S.C. Bunting, A.E. Black, T. Merrill, and S. Barrett. 1996. Fire regimes in the interior Columbia River Basin; past and present. Final report for RJVA-INT-94913.

Mote, Philip, and Contributors. ND. Impacts of Climate Variability and Change in the Pacific Northwest. The JISAO Climate Impacts Group. Contribution #715

Mote, P. W., E. A. Parson, A. F. Hamlet, K. G. Ideker, W. S. Keeton, D. P. Lettenmaier, N. J. Mantua, E. L. Miles, D. W. Peterson, D. L. Peterson, R. Slaughter, and A. K. Snover. 2003. Preparing for climate change: The water, salmon, and forests of the Pacific Northwest. Climatic Change 61:45-88.

Naney, R.H., L.L. Finley, E.C. Lofroth, P.J. Happe, A.L. Krause, C.M. Raley, R.L. Truex, L.J. Hale, J.M. Higley, A.D. Kosic, J.C. Lewis, S.A. Livingston, D.C. Macfarlane, A.M. Meyers, and , J.S. Yaeger. 2012. Conservation of Fishers (*Martes pennanti*) in South-Central British Columbia, Western Washington, Western Oregon, and California – Volume 3: Threat Assessment. USDI Bureau of Land Management, Denver, Colorado, USA.

Natural Resources Conservation Service. (n.d.). *Suitabilities and Limitations for use.* Retrieved 08 29, 2012, from Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

North, M., J. Chen, B. Oakley, M. Rudnicki, A. Gray and J. Innes. 2004 Forest Stand Structure and Pattern of Old-Growth Western Hemlock/Douglas-Fir and Mixed-Conifer Forests. In: *Forest Science* 50(3) 2004: pp 299-311.

Odion, D.C., E.J. Frost, J.R. Strittholt, H. Jiang, D.D. DellaSala, and M.A. Moritz. 2004. Patterns of fire severity and forest conditions in the Western Klamath Mountains, California. Conservation Biology, 18(4):927-936.

Odion, D.C. and Klamath Siskiyou Wildlands Center. 2012. Personal Communication (between Odion and KSW, and between Odion and Medford BLM). February 5, 2013.

Omi, P.N. and E.J. Martinson. 2002. Effects of fuels treatments on wildfire severity. Western Forest Fire Research Center, Colorado State University.

Oregon Administrative Rules (OAR) 340-041. May 13, 2005. *Oregon Department of Environmental Quality, water pollution, division 41, water quality standards: beneficial uses, policies, and criteria for Oregon.* Internet address: [http://arcweb.sos.state.or.us/rules/OARs_300/OAR_340/340_041.html].

Oregon Department of Agriculture (ODA). 2014. Noxious Weed Policy and Classification System. Available online at: http://www.oregon.gov/ODA/shared/Documents/Publications/Weeds/NoxiousWeedPolicyClassification.pdf

Oregon Department of Environmental Quality (ODEQ). 2004. *Draft Rogue basin riparian condition assessment report.* DEQ, Medford, Oregon.

Oregon Department of Forestry (ODF). 2010b. Southwest Oregon State Forest Management Plan. January 2001 Plan, Habitat Conservation Plan references revised April 2010.

Oregon Department of Fish and Wildlife (ODFW). 2014. http://www.dfw.state.or.us/wolves/wolf_program_updates.asp.

Oregon Department of Fish and Wildlife (ODFW). 1994. Unpublished Data. *Aquatic Inventory Project and Physical Habitat Surveys*; *Little Butte Creek.* Oregon Department of Fish and Wildlife, Corvallis, OR.

Oregon Department of Fish and Wildlife (ODFW). 1994. Unpublished Data. *Aquatic Inventory Project and Physical Habitat Surveys*; *Lake Creek.* Oregon Department of Fish and Wildlife, Corvallis, OR.

Oregon State University Extension Service. 2003. "Pacific Northwest's Least Wanted List: Invasive Weed Identification and Management." Corvallis, OR: Oregon State University, June 2003. 44.

Oregon Water Resources Department (OWRD). 1989. *Rogue River basin programs.* State of Oregon Water Resources Department. Salem, OR.

Pollet, J. and P.N. Omi. 2002. Effects of thinning and prescribed burning on crown fire severity in ponderosa pine forests. Internat. J. Wildland Fire, Vol 11:1-10.

Pollet and Omi. 1999. Effect Of Thinning And Prescribed Burning On Wildfire Severity In Ponderosa Pine Forests. Proceedings from the 1999 Joint Fire Science Conference and Workshop "Crossing the Millennium: Integrating Spatial Technologies and Ecological Principles for a New Age in

Fire Management". Technical Editors: Leon F. Neuenschwander, Professor, Department of Forest Resources, College of Natural Resources, University of Idaho, Moscow Idaho. http://jfsp.nifc.gov/conferenceproc/index.htm

Powell, R. A. and W. J. Zielinski. 1994. Fisher, *in* the scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine: 38-73. Fort Collins, Colorado, USA: USDA Forest Service, Rocky Mountain Forest and Range Experimental Station.

Powers, Robert F, Felipe G Sanchez, Andrew D Scott, and Deborah Page-Dumroese. 2004. *The North American Long-Term Soil Productivity: Coast to Coast Findings from the First Decade.* USDA Forest Service Proceedings RMRS-P-34.

Prichard S.J., David L. Peterson, and Kyle Jacobson. 2010. Fuel treatments reduce the severity of wildfire effects in dry mixed conifer forest, Washington, USA

Pullen, Reg. 1995. Overview of the Environment of Native Inhabitants of Southwest Oregon, Late Prehistoric Era. Medford BLM

Pyle, R.M. 2002. The Butterfiles of Cascadia: A Field Guide to All the Species of Washington, Oregon, and Surrounding Territories. Seattle Audubon Society, Seattle, WA

Ransome, Douglas B., Pontus W.F. Lingren, Druscilla S. Sullivan, and Thomas P. Sullivan. 2004. Long-term responses to ecosystem components to stand thinning in young lodgepole forest. Population dynamics of northern flying squirrels and red squirrels. In Forest Ecology and Management 202 (2004) 355-367.

Reid, L.M., and T. Dunne, 1984. *Sediment Production from forest road surfaces*. Water Resources Research 20: 1753-1761

Rice, R., Rothacher, J., & W.F., a. M. (1972). *Erosional Consequences Of Timber Harvesting: An Appraisal.* National Symposium on Watersheds in Transition.

Ritchie, L.E., M.G. Betts , G. Forbes, K. Vernes. 2009. Effects of landscape composition and configuration on northern flying squirrels in a forest mosaic. Forest Ecology and Management 257 (2009) 1920–1929.

Rosenberg, D.K. and K.S. McKelvey. 1999. Estimation of habitat selection for central-place foraging animals. J. Wildlife Management 63(3):1028-1038.

Rosenberg, K. V. and M. G. Raphael. 1986. Effects of forest fragmentation on vertebrates in Douglas-fir forests. Pages 263-272 *in* Modeling habitat relationships of terrestrial vertebrates. (Verner, J., M. Morrison, and C. J. Ralph, Eds.) Univ. of Wisconsin Press, Madison.

Rothermel, R. 1972. A Mathematical Model for Predicting Fire Spread in Wildland Fuels. Intermountain Forest and Range Experiment Station. Forest Service, USDA. Ogden, Utah.

Sakai, H.F. and B.R. Noon. 1993. Dusky-footed woodrat abundance in different-aged forests in northwestern California. Journal of Wildlife Management 57: 373-382.

Sakai, H. F. and B.R. Noon. 1997. Between-habitat movement of dusky-footed woodrats and vulnerability to predation. Journal of Wildlife Management, 61, 343-350.

Schmidt, K.M., Manakis, J.P., Hardy,C.C., Hann,W.J., Brunnell, D.L. 2002. Development of course-scale spatial data for wildland fire and fuels management. General Technical Report, RMRS-GTR-87,

U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

Sensenig, T.S. 2002. Development, Fire History and Current and Past Growth, of Old-Growth and Young-Growth Forest Stands in the Cascades, Siskiyou and Mid-Coast Mountains of Southwestern Oregon. On file at Medford District BLM.

Skinner, C.N., Martin W. Ritchie, Todd Hamilton, and Julie Symons. 2004. Effects of Thinning and Prescribed Fire on Wildlife Severity. 25th Forest Vegetation Management Conference.

SNEP. 1996. Summary of the Sierra Nevada ecosystem project report. Davis: University of California, Centers for Water and Wildland Resources.

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

Sullivan, K. 1985. Long-term patterns of water quality in a managed watershed in Oregon: 1. suspended sediment. *Water Resources Bulletin*, Vol. 21, No. 6, pp. 977-987, Dec. 1985.

Swift Jr, L. (Vol. 66, 1988). Forest Access Roads: Design, Maintenence, and Soil Loss. *Journal of Ecological Studies*, 313-324.

Switalski, T., Bissonette, J., DeLuca, T., Luce, C., & Madej, M. (2004). Benefits and Impacts of Road Removal. *The Ecological Societly of America*, 21-28.

Tappeiner, J.C., D.A. Maguire, and T. B. Harrington. 2007. Silviculture and Ecology of Western U.S. Forests. Oregon State University Press, Corvallis, pp. 127.

Tappeiner, John C., David Huffman, David Marshall, Thomas A. Spies, John D. Bailey. 1997. Denisty, Ages, and Growth Rates in Old-Growth and Young-Growth Forests in Costal Oregon. Can. J. For. Res. 27: 638-648.

Thomas, J.W., E.D., Forsman, J.B. Lint, E.C. Meslow, B.R. Noon, and J. Verner. 1990. A conservation strategy for the northern spotted owl: report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. USDA Forest Service, USDI Bureau of Land Management, USDI Fish and Wildlife Service, and USDI National Park Service. Portland, OR. 427 pp.

Thomas, Jack Ward, H. Black, Jr., R. Scherzinger and R.J. Pedersen. 1979. Deer and Elk. *In* Wildlife habitats in managed forests – the Blue Mountains of Oregon and Washington, edited by Jack Ward Thomas. USDA Forest Service, Agricultural Handbook, 553. Washington, D.C. pp. 104-127.

Trombulak, S.C. and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology. 14(1): 18-30.

U.S. Department of Agriculture (USDA), Forest Service. 2012. Large Airtanker Modernization Strategy. Final Version Released February 10, 2012.

U.S. Department of Agriculture (USDA), Forest Service. 1998. Pacific Northwest Region, Fremont-Winema National Forest, Klamath Ranger District and Others. South Cascades Late-Successional Reserve Assessments (LSRA) RO227. Appendix F.

U.S. Department of Agriculture (USDA), Forest Service. 1996. Field guide to the forested plant associations of Southwestern Oregon. PNW Region, Technical Paper R6-NR-ECOL-TP-17-96.

U.S. Department of Agriculture (USDA), Forest Service and University of Washington. 1995. Pacific Northwest Research Station. Stand Visualization System.

U.S. Department of Agriculture (USDA), Forest Service ,U.S. Department of the Interior (USDI), Bureau of Land Management, and U.S. Department of the Interior (USDI) Fish and Wildlife Service. 2013. Recovery Plan Implementation Guidance: Interim Recovery Action 10. Medford, OR.

U.S. Department of Agriculture (USDA), Forest Service and U.S. Department of the Interior (USDI), Bureau of Land Management. 2010. RA 32 Habitat Evaluation Methodology. Version 1.3. Medford District BLM and Rogue River-Siskiyou National Forest. Medford, OR.

U.S. Department of Agriculture (USDA), Forest Service and U.S. Department of the Interior (USDI), Bureau of Land Management. 2004. Survey protocol for the great grey owl within the range of the northwest forest plan. Version 3.0. BLM Instruction Memorandum No. OR-2004-050.

U.S. Department of Agriculture (USDA), Forest Service and U.S. Department of the Interior (USDI), Bureau of Land Management. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer and other Mitigation Measures Standards and Guidelines. Government Printing Office. Portland, OR.

U.S. Department of Agriculture (USDA), Forest Service and U.S. Department of the Interior (USDI), Bureau of Land Management. 1999. *Forest Service and Bureau of Land Management protocol for addressing Clean Water Act section 303(d) listed waters* (version 2.0). USDA Forest Service, Pacific Northwest Region, Regional Office, Portland, Oregon.

U.S. Department of Agriculture (USDA), Forest Service and U.S. Department of the Interior (USDI), Bureau of Land Management. 1994. *Record of decision for amendments to Forest Service and Bureau of Land Management planning documents within the Range of the Northern Spotted Owl and standards and guidelines for management of habitat for late successional and old-growth forest related species within the range of the Northern Spotted Owl*. Portland, OR.

U.S. Department of Agriculture (USDA), Forest Service and U.S. Department of the Interior (USDI), Bureau of Land Management. 1994b. 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. Appendix J2 Results of Additional Species Analysis. Portland, Oregon.

U.S. Department of the Interior (USDI), Bureau of Land Management, Medford District Office and U.S. Department of Agriculture (USDA), Forest Service, Rogue River National Forest. 1997. *Little Butte Creek watershed analysis*. Medford District Office, Medford, Oregon.

U.S. Department of the Interior (USDI), Bureau of Land Management. 2015a. Biological Assessment for the South Fork Little Butte Forest Management Project (SFLB_2015BA). Medford District Office, Medford, OR.

U.S. Department of the Interior (USDI), Bureau of Land Management. 2015a. Biological Assessment for the South Fork Little Butte Forest Management Project (Fisheries). Medford District Office, Medford, OR.

U.S. Department of the Interior (USDI), Bureau of Land Management. 2015b. Unpublished data, Botany Surveys and Botanical Sites, Geographic Biotic Observations GIS Database (GeoBOB). Medford District, Ashland Resource Area.

U.S. Department of the Interior (USDI), Bureau of Land Management. 2012. *Medford District Resource Management Plan Maintenance. Updated Best Management Practices to Reduce Sediment Delivery from BLM Roads in Oregon.* Medford, OR.

U.S. Department Of Interior (USDI), Bureau of Land Management. 2011. *Rio Climax Environmental Assessment, pp.3-115.* Medford, OR: Medford District Office, Ashland Resource Area. DOI-BLM-OR-M060-2011-0010-EA.

U.S. Department of the Interior (USDI), Bureau of Land Management. 2011a. *Instruction Memorandum No. OR-2011-074, Incorporating Road and Sediment Best Management Practices into Resource Management Plans*. Portland, OR.

U.S. Department of the Interior (USDI), Bureau of Land Management. 2011b. Instruction Memorandum No. OR-2012-018. Final State Director's Special Status Species List. http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/.

U.S. Department Of Interior (USDI), Bureau of Land Management. 2011b. Instruction Memorandum No. OR-2012-018. Final State Director's Special Status Species List. http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/.

USDI Bureau of Land Management. 2010. Record of Decision (ROD) for the Vegetation Treatments using Herbicides on BLM Lands in Oregon. Portland, OR: Government Printing Office. 2010

USDI Bureau of Land Management. 2010. Western Oregon Transportation Management Plan: Western Oregon Districts. Updated from 1996 and 2002 versions.

U.S. Department Of Interior (USDI), Bureau of Land Management. 2008. Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management Volume I. II vols. Portland, OR: Government Printing Office, 2008.

U.S. Department of the Interior (USDI), Bureau of Land Management. 2008. Instruction Memorandum No. 2009-039. December 17, 2008. Revised 6840 Special Status Species Manual and Direction for State Directors to Review and Revise Existing Bureau Sensitive Species Lists.

U.S. Department of the Interior (USDI), Bureau of Land Management. 2008b. Instruction Memorandum No. OR-2008-050. Migratory Bird Treaty Act – Interim Management Guidance.

U.S. Department of the Interior (USDI), Bureau of Land Management. 2007. *BLM Vegetation Treatments Using Herbicides Final Programmatic EIS Record of Decision*. Appendix B: Herbicide Treatment Standard Operating Procedures. pp. B-1 and B-2. BLM Oregon State Office, Portland, Oregon.

U.S. Department of the Interior (USDI), Bureau of Land Management, Medford District. 2006a. *Water quality restoration plan for the North and South Forks Little Butte Creek Key Watershed.* Medford, OR.

U.S. Department of the Interior (USDI), Bureau of Land Management. 2004. Information Bulletin OR-2004-145. Implementation of Special Status Species Policies for the Former Survey and Manage Species: Project Evaluations for Former S&M Species in Which Surveys are Not Feasible, Attachment 5. July 16, 2004.

U.S. Department of the Interior (USDI), Bureau of Land Management. 1999. Assessment of the 15 percent Standard and Guide. Ashland Resource Area, Medford District BLM. January 27, 1999. On file at the Medford District BLM.

U.S. Department of the Interior (USDI), Bureau of Land Management. 1998a. Instruction Memorandum No. OR-99-026. December 1998. Survey and Manage Survey Protocols – Vascular Plants. Available at: http://www.blm.gov/or/plans/surveyandmanage/files/15-vascular_plants.pdf

U.S. Department of the Interior (USDI), Bureau of Land Management. 1998b. Medford District Integrated Weed Management Plan (IWMP) and Environmental Assessment (EA) OR-110-98-14. In: Medford District Integrated Weed Management Plan (IWMP) and Environmental Assessment (EA) OR-110-98-14. Medford, OR.

U.S. Department of the Interior (USDI), Bureau of Land Management. 1996. Implementation of coarse woody debris standards and guidelines. State Office Information Bulletin No. OR-97-064 (11/20/96). Oregon State Office. Portland, OR.

U.S. Department of the Interior (USDI), Bureau of Land Management, Medford District. 1995. *Final EIS and Record of Decision Medford District Resource Management Plan.* Medford, OR.

U.S. Department of the Interior (USDI), Bureau of Land Management, Medford District. 1995 and 1998. *Stream survey data for the Medford District Bureau of Land Management.* Medford, OR.

U.S. Department of the Interior (USDI), Bureau of Land Management, Medford District. 1994. *Medford District proposed resource management plan/environmental impact statement* (PRMP/EIS). Medford OR.

U.S. Department of the Interior (USDI), Bureau of Land Management. 1994c. Instruction Memorandum: Medford District Watershed Analysis Guidelines. Supplement to the SEIS ROD/Standards and Guidelines and BLM Information Bulletin Nos. Or-93-605, OR-93-605, and OR-94-106. Medford, OR.

USDI Bureau of Land Management, Medford District. 1988. Timber Production Capability Classification (TPCC). Medford District Handbook Update M.2.0. 5251-1.

U.S. Department of the Interior (USDI), Bureau of Land Management. 1992. Manual 9015: Integrated Weed Management. Release 9-321.

U.S. Department of the Interior (USDI), Bureau of Land Management. 1985. *Northwest Area Noxious Weed Control Program Final Environmental Impact Statement.* Oregon State Office. Portland, OR.

U.S. Department of the Interior (USDI), Fish and Wildlife Service. 2015. Biological Opinion Addressing the South Fork Little Butte Forest Management Project (FWS Reference #01EOFW00-2015-F-0090). Roseburg Field Office, Roseburg, OR.

U.S. Department of the Interior (USDI), Fish and Wildlife Service. 2012 Endangered and Threatened Wildlife and Plants; Revised Critical Habitat for the Northern Spotted Owl. 77 FR 14062 14165

U.S. Department of the Interior (USDI), Fish and Wildlife Service. 2011. Revised Recovery Plan for the Northern Spotted Owl (*Strix occidentalis caurina*). U.S. Fish and Wildlife Service, Portland, Oregon. xvi + 258 pp.

U.S. Department of the Interior (USDI), Fish and Wildlife Service. 2008b. Birds of Conservation Concern. Division of Migratory Bird Management, Arlington, VA. http://migratory birds.fw.gov/reports/bcc2008.pdf.

U.S. Department of the Interior (USDI), Fish and Wildlife Service. 2008c. Final Recovery Plan for the Northern Spotted Owl (Strix occidentalis caurina). Region 1, US Fish and Wildlife Service, Portland, OR.

U.S. Department of the Interior (USDI), Fish and Wildlife Service. 2007b. *National Bald Eagle Management Guidelines*. Retrieved online at: http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B008.

U.S. Department of the Interior (USDI), Fish and Wildlife Service. 2006. Endangered and Threatened Wildlife and Plants; Review of Native Species That Are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions. Federal Register September 12, 2006, Vol. 71 (176) 53777. Washington, DC.

U.S. Department of the Interior (USDI), Fish and Wildlife Service. 2004. Northern Spotted Owl Five Year Review: Summary and Evaluation.

U.S. Department of the Interior (USDI), Fish and Wildlife Service. 1992. Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Northern Spotted Owl. Federal Register January 15, 1992, Vol. 57 (10) 1796-1837. Washington, DC.

VanWagtendonk, J.W. 1996. Use of a deterministic fire growth model to test fuel treatments. In: Status of the Sierra Nevada: Sierra Nevada Ecosystem Project, Final Report to Congress Vol. II, Assessment Summaries and Management Strategies. Wildland Resources Center, Univ. of Calif., Davis.

Verts, B.J., and L.N. Carraway. 1998. Land Mammals of Oregon. University of California Press, Berkeley, CA.

Wagner, F.F. and R.G. Anthony. 1998. Reanalysis of northern spotted owl habitat use on the Miller Mountain study area. A report for the Research Project: Identification and evaluation of northern spotted owl habitat in managed forests of southwest Oregon and the development of silvicultural systems for managing such habitat. Oregon Cooperative Wildlife Research Unit, Depar.Fisheries and Wildlife, Oregon State Univ. Corvallis, OR.

Waring, R.H. 2007. Personal Communication. Distinguished Professor, Emeritus Physiological Ecology, Landscape Level Ecosystems Analysis. Department of Forest Science, Oregon State University. Corvallis, Oregon.

Waring, R.H., and G.B. Pitman. 1985. Modifying Lodgepole Pine Stands to Change Susceptibility to Mountain Pine Beetle Attack. Ecology, 66(3), pp. 889-897.

Waring, R.H., and Schlesinger W.H. 1985. Forest Ecosystems: Concepts and Management, Academic, 340 pp.

Waring, R. H., W.G. Thies, and D. Muscato. 1980. Stem growth per unit of leaf area: a measure of tree vigor. Forest Science Vol. 26, No.1, March 1980, pp.112-117.

Waters, J.R. and C.J. Zabel. 1995. Northern flying squirrel densities in fir forests of northeastern California. Journal of Wildlife Management 59:858-866.

Watershed Professionals Network.(WPN) 1999. *Oregon watershed assessment manual*. June 1999. Prepared for the Governor's Watershed Enhancement Board, Salem, Oregon.

Weatherspoon, C.P. 1996. Fire-Silviculture Relationships in Sierra Forests. Sierra Nevada Ecosystem Project: Final Report to Congress, Vol. II, Assessments and scientific basis for management options. Davis: University of California, Centers for Water and Wildland Resources.

Weatherspoon, C.P. and C.N. Skinner. 1995. An assessment of factors associated with damage to tree crowns from the 1987 wildfires in northern California. Forest Science 41:430-451.

Wells, K.L. and C.T. Dougherty. 1997. *Soil management for intensive grazing.* Science News & Views 18(2).

Wemple, B.C., J.A. Jones, and G.E. Grant. 1996. *Channel network extension by logging roads in two basins, western Cascades, Oregon.* Water Resources Bulletin 32(6):1-13.

White, Diane. 2001. Guidelines for snag and down wood prescriptions in Southwestern Oregon. U.S.D.A. Forest Service, Umpqua N.F.

Wilson, T. 2010. Limiting factors for northern flying squirrels in the Pacific Northwest: A spatial-temporal analysis. PhD. Thesis. Union Institute and University, Cincinnati, OH.

Wisely, S.M., S.W. Buskirk, G.A. Russell, K.B. Aubry, and W.J. Zielinski. 2004. Genetic diversity and structure of the fisher (Martes pennanti) in a peninsular and peripheral metapopulation. Journal of Mammalogy 85 (2004): 640-648.

Wrobel & Reinhart. 2003. Review Of Potential Air Emissions From Burning Polyethylene Plastic Sheeting With Piled Forest Debris.

Zabel, C.J., J.R. Dunk, H.B. Stauffer, L.M. Roberts, B.S. Mulder, and A. Wright. 2003. Northern spotted owl habitat models for research and management application in California (USA). Ecological Applications 13(4):1027-1040.

Zabel, C.J., K. McKelvey, and J.P. Ward. 1995. Influence of primary prey on home range size and habitat use patterns of northern spotted owls (Strix occidentalis caurina). Canadian Journal of Zoology 73:433-439.

REFERENCES SUBMITTED DURING SCOPING

Alexander. 2011. Cascade-Siskiyou National Monument: A Summary of Economic Performance in the Surrounding Communities. Headwaters Economics: Bozeman, MT. June. 16 pp

Anlauf, K., Gaeuman, William, and Jones, K. 2011. 'Detection of Regional Trends in Salmonid Habitat in Coastal Streams, Oregon', Transactions of the American Fisheries Society, 140: 1, 52 — 66, First published on: 15 February 2011.

Anlauf, K., K. Jones, and C. Stein. 2009. The Status and Trend of Physical Habitat and Rearing Potential in Coho Bearing Streams in the Oregon Coastal Coho Evolutionary Significant Unit. OPSW-ODFW-2009-5, Oregon Department of Fish and Wildlife, Salem.

Cederholm, C., L. Reid. 1987. Impact of Forest Management on Coho Salmon (Oncorhynchus kisutch) Populations of the Clearwater River, Washington: A Project Summary. Hydrological and Biological Responses to Forest Practices: The Alsea Watershed Study. 373-398.

Churchill, D.J., M.C. Dalhgreen, A.J. Larson, and J.F. Franklin. 2013. The ICO approach to restoring spatial pattern in dry forests: Implementation guide. Version 1.0. Stewardship Forestry, Vashon, Washington, USA.

Colombaroli, D., Gavin, D. 2010. Highly episodic fire and erosion regime over the past 2,000 y in the Siskiyou Mountains, Oregon PNAS 2010 107 (44) 18909-18914; published ahead of print October 18, 2010, doi:10.1073/pnas.1007692107.

Crow, T. and A. Perera. 2004. Emulating natural landscape disturbance in forest management – an introduction. Landscape Ecology 19: 231-233.USDI, BLM. 2013. Soup Creek VRH Environmental Assessment. U.S. Dept. of the Interior - Bureau of Land Management, North Bend, OR.

Dillaha, T.A. and S.P. Inamdar. 1996. Buffer zones as sediment traps or sources. Pp.33-42 in N.E. Haycock, F.P. Burt, K.W.T. Goulding and F,. Pinay (eds*.) Buffer Zones: Their Processes and Potential in Water Projection:* Proc. Intl. Conf. on Buffer Zones. Sept. 19-22: Hertfordshire, U.K. Quest Environmental, Inc.: Clinton, NJ.

Dolloff, C., M. Warren. 2003. Fish Relationships with Large Wood in Small Streams. American Fisheries Society Symposium 37:179-193.

Donato, D., Campbell, J., & Franklin, J. 2011. Multiple successional pathways and precocity in forest development: can some forests be born complex?

Elliot, W.J. 2010. Effects of forest biomass use on watershed processes in the western United States. *Western Journal of Applied Forestry* 25:12-17

Endicott, D. 2008. *National Level Assessment of Water Quality Impairments Related to Forest Roads and Their Prevention by Best Management Practices*. Final report to U.S. Environmental Protection Agency, Contract No. EP-C-05-066, Task Order 002. Great Lakes Environmental Ctr.: Traverse City, MI. December. 259 pp.

Environmental Services City of Portland. 2010. Avoiding Impacts on Nesting Birds During Construction and Revegetation Projects Version 2.

Franklin, J. 2004. Testimony for the Record on Oversight Hearing on “Restoring Forests After Catastrophic Events.” House Committee on Resources, Subcommittee on Forest and Forest Health.

Franklin, J. 2010. Early seral forest: a diminishing resource?

Franklin, J. F., T. A. Spies, R. Van Pelt, A. B. Carey, D. A. Thornburgh, D. R. Berg, D. B. Lindenmayer, M. E. Harmon, W. S. Keeton, D. S. Shaw, K. Bible, and J. Chen. 2002. Disturbances and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir as an example. Forest Ecology and Management 155:399-423.

Franklin, J., Perry, D., Noss, R., Montgomery, D., Frissell, C. Simplified Forest Management To Achieve Watershed And Forest Health: A Critique. National Wildlife Federation.

Gucinski, H., M.J. Furniss, R.R. Ziemer and M.H. Brookes (eds.). 2001. *Forest Roads: A Synthesis of Scientific Information*. USDA For. Serv. Gen. Tech. Rep. PNW-GTR-509. Portland, OR. 120 pp.

Furniss, M., Roelofs, T., Yee, C. 1991. Road Construction and Maintenance. *Influences of Forest and Rangelend Management on Salmonid Fishes and Their Habitats.* 297-323.

Heiken, D. 2008. Myths & Facts on Forest, Carbon and Global Warming slide show clarifying many misconceptions about forests, logging, and carbon. Slideshow.

Heiken, D. 2010. Dead Wood Response to Thinning: Some Examples from Modeling Work.

Hobson, K. A., A. G. Wilson, S. L. Van Wilgenburg, and E. M. Bayne. 2013. An estimate of nest loss in Canada due to industrial forestry operations. *Avian Conservation and Ecology* 8(2): 5. http://dx.doi.org/10.5751/ACE-00583-080205.

Johnson, N., Johnson, D. 2007. Policies to Encourage Diverse, Early Seral Forest in Oregon: What Might We Do?

Keim, R., Skaugset, A., Bateman, D. 2002. Physical Aquatic Habitat II. Pools and Cover Affected by Large Woody Debris in Three Western Oregon Streams. North American Journal of Fisheries Management 22:151–164.

Klaus J. Puettmann, Adrian Ares, and Erich Dodson. 2011. Over- and understory vegetation responses to thinning treatments: Can we accelerate late successional stand structures? Symposium: Density Management In The 21st Century: West Side Story.

Lemieux, C., Daniel, S., Davis, R., Gray, P. 2008. Changing Climate, Challenging Choices: Ontario Parks and Climate Change Adaptation. University of Waterloo, Department of Geography: Waterloo, Ontario.

Lutz & Halpern. 2006. Tree Mortality During Early Forest Development: A Long-Term Study Of Rates, Causes, And Consequences. Ecological Monographs, 76(2), 2006, pp. 257–275.

Lutz. J.A. 2005. The Contribution of Mortality to Early Coniferous Forest Development. MS Thesis. University of Washington.

Lutz, J., Larson A., Freund J., Swanson M., Bible K. 2013. The Importance of Large-Diameter Trees to Forest Structural Heterogeneity. PLoS ONE 8(12): e82784. doi:10.1371/journal.pone.0082784.

McDade, M., Swanson, F., McKee, W., Franklin, J., Van Sickle, J. 1990. Source distances for coarse woody debris entering small streams in western Oregon and Washington. Can. J. For. Res. 20: 326-330.

Minor, K. 1997. Estimating Large Woody Debris Recruitment from Adjacent Riparian Areas. Master's thesis, Oregon State University, 1997.

Naiman, R., Balian, E., Bartz, K., Bilby, R., Latterell, J. 2002. Dead Wood Dynamics in Stream Ecosystems. USDA Forest Service Gen. Tech. Rep. PSW-GTR-181.

NCASI. 2006. Similarities and differences between harvesting- and wildfire-induced disturbances in fire-mediated Canadian landscapes. Technical Bulletin No. 924. Research Triangle Park, N.C.: National Council for Air and Stream Improvement, IncNMFS (National Marine Fisheries Service) 2012. Public Draft recovery Plan for Southern Oregon/Northern California Coast Coho Salmon (Oncohynchus kisutch).

Newcombe, C., Jensen, J. 1996. Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact. *North American Journal of Fisheries Management.* 16(4): 693-727.

Nitschke C.R. 2005. Does forest harvesting emulate fire disturbance? A comparison of effects on selected attributes in coniferous-dominated headwater systems. Forest Ecology and Management 214 (2005) 305–319.

NRDC. 1999. Report: End of the Road: The Adverse Ecological Impacts of Roads and Logging: A Compilation of Independently Reviewed Research.

Odion DC, Hanson CT, Arsenault A, Baker WL, DellaSala DA, et al. 2014. Examining Historical and Current Mixed-Severity Fire Regimes in Ponderosa Pine and Mixed-Conifer Forests of Western North America. PLoS ONE 9(2): e87852. doi:10.1371/journal.pone.0087852.

Odion, D., Frost, E., Strittholt, J., Jiang, H., Dellasala, D., Moritz, M. 2004. Patterns of Fire Severity and Forest Conditions in the Western Klamath Mountains, California. *Conservation Biology*. 18(4): 927-936.

Office of Inspector General, US Department of Agriculture. 1999. Evaluation Report No. 08801-10-AT: Forest Service Timber Sale Environmental Analysis Requirements.

Ohmann. 2010. Trends in Early Seral Forest at the Stand and Landscape Scale.

Ohmann, J. 2003. Seeing the trees for the forest: mapping vegetation biodiversity in coastal Oregon forests. Science Findings, Issue 56. (September 2003).Oregon Wild 2011. Scoping Comments on the Wagon Road and Roseburg BLM Secretarial Pilots.

Oregon Department of Fish and Wildlife. (2006). The Oregon Conservation Plan.

Power, T.M. 2006. Public timber supply, market adjustments, and local economies: economic assumptions of the Northwest Forest Plan. *Conservation Biology* 20:341-50.

Rafal, Z. 2009. A meta-analysis of the effects of wildfire, clearcutting, and partial harvest on the abundance of North American small mammals. Forest Ecology and Management 258 (2009) 539–545.

Rose, C.L., Marcot, B.G., Mellen, T.K., Ohmann, J.L., Waddell, K.L., Lindely, D.L., and B. Schrieber. 2001. Decaying Wood in Pacific Northwest Forests: Concepts and Tools for

Habitat Management, Chapter 24 in Wildlife-Habitat Relationships in Oregon and Washington Johnson, D. H. and T. A. O'Neil. OSU Press. 2001.

Russell, R.E., Saab, V.A., Dudley, J.G., and J.J. Rotella. 2006. Snag longevity in relation to wildfire and postfire salvage logging. Forest Ecology and Management 232 (2006) 179-187.

Schilling, J.W. 2009. Demography, Home Range, and Habitat Selection of Northern Spotted Owls in the Ashland Watershed. M.S. Thesis. Oregon State Univ.: Corvallis. 149 pp.

Smith P., M. Bustamante, H. Ahammad, H. Clark, H. Dong, E. A. Elsiddig, H. Haberl, R. Harper, J. House, M. Jafari, O. Masera, C. Mbow, N. H. Ravindranath, C. W. Rice, C. Robledo Abad, A. Romanovskaya, F. Sperling, and F. Tubiello, 2014: Agriculture, Forestry and Other Land Use (AFOLU). In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Swanson, M.E., 2012. Early Seral Forest in the Pacific Northwest: A Literature Review and Synthesis of Current Science.

USDI, BLM. 2011. Camas Valley 2011 Harvest Plan Environmental Assessment. U.S. Dept. of the Interior - Bureau of land Management, Roseburg, OR.

Welty, J. W., T. Beechie, K. Sullivan, D. M. Hyink, R. E. Bilby, C. Andrus, and G. Pess. 2002. Riparian Aquatic Interaction Simulator (RAIS): a model of riparian forest dynamics for the generation of large woody debris and shade. Forest Ecology and Management 162:299-318.

APPENDIX A. SFLB PROPOSED PROJECT UNITS AND HAUL ROUTES TABLES

ALTERNATIVE 2 – PROPOSED ACTION

Table 2-2. Alternative 2: Proposed Non-Commercial Units

Unit	Non-Commercial Prescription	NSO Habitat Type[1]	Acres
01-9	Understory Reduction	Capable	62
01-10	Understory Reduction	Dispersal	100
03-10	Understory Reduction	Dispersal, Roosting/Foraging	17
03-11	Understory Reduction	Roosting/Foraging	3
03-12	Understory Reduction	Capable	17
03-13	Understory Reduction	Dispersal	15
06-8	Understory Reduction	Capable	34
06-9	Understory Reduction	Dispersal	79
21-2	Understory Reduction	Capable	69
21-3	Understory Reduction	Dispersal	14
21-8	Understory Reduction	Dispersal	110
21-9	Understory Reduction	Dispersal	24
22-15	Understory Reduction	Dispersal	10
23-13	Understory Reduction	Capable	10
23-14	Understory Reduction	Capable	22
25-7	Understory Reduction	Capable	3
25-8	Understory Reduction	Roosting/Foraging	2
30-5	Understory Reduction	Dispersal	9
30-6	Understory Reduction	Capable	9
30-7	Understory Reduction	Capable	4
30-8	Understory Reduction	Capable	2
33-1	Understory Reduction	Roosting/Foraging	49
33-10	Understory Reduction	Roosting/Foraging	3
33-13	Understory Reduction	Capable, Roosting/Foraging	2
33-14	Understory Reduction	Dispersal	9
33-15	Understory Reduction	Capable	8
33-16	Understory Reduction	Dispersal	72
33-17	Understory Reduction	Capable	35
33-5	Understory Reduction	Dispersal, Roosting/Foraging	11
33-6	Understory Reduction	Roosting/Foraging	8
Total			812

[1] NSO habitat types are defined in the Terrestrial Wildlife section of the EA (Chapter 3, Section G.4.b)

Table 2-3. Alternative 2: Proposed Commercial Harvest Units by Silvicultural Prescription, Harvest Method, and NSO Habitat

Unit	Harvest Method	Silvicultural Prescription[2]	Associated Non-Commercial Prescription	NSO Habitat Type[3]	Acres
1-1	Tractor	ST/MC	Activity Fuels, Understory Reduction	Dispersal	3
1-2	Tractor	Salvage	Activity Fuels	Capable	1
1-3	Tractor	IDM	Activity Fuels, Understory Reduction	Capable	20
1-4a	Cable	Salvage	Activity Fuels	Nesting	3
1-4b	Tractor	Salvage	Activity Fuels	Capable	1
1-5	Helicopter	SR	Activity Fuels, Understory Reduction	Dispersal	4
1-6	Bull-line	Salvage	Activity Fuels, Understory Reduction	Capable	5
1-7	Bull-line	Salvage	Activity Fuels, Understory Reduction	Capable	3
1-8	Bull-line	Salvage	Activity Fuels, Understory Reduction	Capable	2
3-1	Tractor	Salvage	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	5
3-2	Tractor	Salvage	Activity Fuels, Understory Reduction	Capable, Dispersal	19
3-5a	Cable	Salvage	Activity Fuels, Understory Reduction	Dispersal	19
3-5b	Tractor	Salvage	Activity Fuels, Understory Reduction	Capable	14
3-6	Bull-line	Salvage	Activity Fuels	Capable	8
3-7	Tractor	Salvage	Activity Fuels, Understory Reduction	Capable	8
3-8	Tractor	Salvage	Activity Fuels, Understory Reduction	Dispersal	6
5-1	Tractor	Salvage	Activity Fuels, Understory Reduction	Roosting/Foraging	17
5-2	Tractor	Salvage	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	12
5-3	Cable	Salvage	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	5
5-4	Tractor	ST/DF	Activity Fuels, Understory Reduction	Capable	28
6-1	Tractor	ST/MC	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	18
6-3	Tractor	Salvage	Activity Fuels, Understory Reduction	Capable	4
6-4	Bull-line	Salvage	Activity Fuels, Understory Reduction	Capable	1
6-5	Tractor	Salvage	Activity Fuels, Understory Reduction	Capable	7
6-6	Bull-line	Salvage	Activity Fuels, Understory Reduction	Capable	2
6-7	Tractor	Salvage	Activity Fuels, Understory Reduction	Roosting/Foraging	5
11-1	Tractor	ST/MC	Activity Fuels	Dispersal, Roosting/Foraging	79
11-2	Helicopter	ST/DF	Activity Fuels	Dispersal	7
11-3	Tractor	ST/DF	Activity Fuels	Dispersal	2
11-4	Tractor	Salvage	Activity Fuels	Capable	4
13-1a	Cable	ST/DF	Activity Fuels, Understory Reduction	Dispersal	23
13-1b	Helicopter	ST/DF	Activity Fuels	Dispersal	6

[2] Silvicultural prescriptions are defined on pages 2-26 to 2-29 of the EA.
[3] NSO habitat types are defined in the Terrestrial Wildlife section of the EA (Chapter 3, Section G.4.b).

13-1c	Tractor	ST/DF	Activity Fuels	Dispersal	1
13-2	Tractor	ST/DF	Activity Fuels	Dispersal	7
13-3	Bull-line	Salvage	Activity Fuels	Capable	1
14-1	Helicopter	ST/DF	Activity Fuels	Dispersal	40
14-2a	Helicopter	ST/DF	Activity Fuels, Understory Reduction	Dispersal	24
14-2b	Cable	ST/DF	Activity Fuels, Understory Reduction	Dispersal	3
14-2c	Tractor	ST/DF	Activity Fuels, Understory Reduction	Dispersal	1
15-1a	Tractor	ST/DF	Activity Fuels	Dispersal, Roosting/Foraging	48
15-1b	Tractor	DM	Activity Fuels	Roosting/Foraging	12
15-3	Tractor	ST/DF	Activity Fuels, Understory Reduction	Dispersal	13
15-4	Helicopter	ST/DF	Activity Fuels	Dispersal	9
15-5	Tractor	ST/DF	Activity Fuels	Dispersal	4
17-1a	Helicopter	ST/DF	Activity Fuels	Dispersal	16
17-1b	Tractor	ST/DF	Activity Fuels	Dispersal	2
17-1c	Helicopter	GS-60	Activity Fuels	Roosting/Foraging	4
17-1d	Helicopter	GS-60	Activity Fuels	Roosting/Foraging	6
17-2a	Helicopter	ST/DF	Activity Fuels	Dispersal	24
17-2b	Helicopter	GS-60	Activity Fuels	Roosting/Foraging	1
17-2c	Helicopter	GS-60	Activity Fuels	Roosting/Foraging	4
17-3	Tractor	ST/PP	Activity Fuels, Understory Reduction	Capable	3
17-4	Tractor	ST/PP	Activity Fuels, Understory Reduction	Capable	16
17-5	Tractor	ST/PP	Activity Fuels, Understory Reduction	Dispersal	16
17-6	Helicopter	ST/PP	Activity Fuels, Understory Reduction	Dispersal	10
17-7	Bull-line	Salvage	Activity Fuels	Capable	4
17-8	Bull-line	Salvage	Activity Fuels	Capable	4
18-1	Bull-line	Salvage	Activity Fuels	Capable	3
18-2	Bull-line	Salvage	Activity Fuels	Dispersal	3
18-3	Helicopter	ST/DF	Activity Fuels	Dispersal	5
18-4a	Cable	ST/DF	Activity Fuels	Dispersal	31
18-4b	Tractor	ST/DF	Activity Fuels	Dispersal	29
18-4c	Cable	ST/DF	Activity Fuels	Dispersal	4
19-1a	Tractor	ST/DF	Activity Fuels, Understory Reduction	Capable, Dispersal	10
19-1b	Cable	ST/DF	Activity Fuels	Capable, Dispersal	34
19-1c	Tractor	ST/DF	Activity Fuels	Capable, Dispersal	15
19-3	Tractor	ST/PP	Activity Fuels, Understory Reduction	Dispersal	4
19-4a	Tractor	ST/PP	Activity Fuels, Understory Reduction	Capable	3
19-4b	Tractor	Salvage	Activity Fuels	Capable	3
19-5	Tractor	Salvage	Activity Fuels	Capable	3
19-6	Tractor	Salvage	Activity Fuels	Capable, Dispersal	6

20-1	Tractor	ST/WF	Activity Fuels	Dispersal	47
20-3	Tractor	ST/PP	Activity Fuels, Understory Reduction	Dispersal	6
20-4	Tractor	ST/PP	Activity Fuels, Understory Reduction	Roosting/Foraging	5
21-1	Tractor	ST/MC	Activity Fuels, Understory Reduction	Roosting/Foraging	43
21-4	Helicopter	ST/PP	Activity Fuels, Understory Reduction	Dispersal	23
21-6	Helicopter	ST/DF	Activity Fuels	Dispersal	1
21-7	Helicopter	ST/DF	Activity Fuels	Dispersal	7
22-1	Tractor	ST/MC	Activity Fuels	Dispersal	70
22-2	Tractor	ST/MC	Activity Fuels, Understory Reduction	Dispersal	19
22-3a	Helicopter	ST/DF	Activity Fuels	Dispersal	13
22-3b	Helicopter	ST/DF	Activity Fuels	Capable, Dispersal	5
22-3c	Helicopter	GS-60	Activity Fuels	Roosting/Foraging	3
22-4	Cable	ST/DF	Activity Fuels	Dispersal	7
23-10a	Tractor	ST/DF	Activity Fuels, Understory Reduction	Dispersal	2
23-10b	Helicopter	ST/DF	Activity Fuels, Understory Reduction	Dispersal	12
23-11	Bull-line	Salvage	Activity Fuels, Understory Reduction	Dispersal	3
23-12	Bull-line	Salvage	Activity Fuels, Understory Reduction	Roosting/Foraging	3
23-2a	Cable	ST/DF	Activity Fuels, Understory Reduction	Dispersal	10
23-2b	Cable	ST/DF	Activity Fuels, Understory Reduction	Dispersal	10
23-2c	Tractor	ST/DF	Activity Fuels, Understory Reduction	Dispersal	2
23-2d	Tractor	ST/DF	Activity Fuels, Understory Reduction	Dispersal	9
23-3a	Tractor	ST/PP	Activity Fuels, Understory Reduction	Dispersal	10
23-3b	Bull-line	ST/PP	Activity Fuels, Understory Reduction	Capable	3
23-4a	Cable	ST/DF	Activity Fuels, Understory Reduction	Dispersal	16
23-4b	Bull-line	ST/DF	Activity Fuels, Understory Reduction	Dispersal	1
23-4c	Helicopter	ST/DF	Activity Fuels, Understory Reduction	Dispersal	1
23-9	Helicopter	ST/DF	Activity Fuels	Dispersal	6
25-1a	Cable	DM	Activity Fuels	Roosting/Foraging	8
25-1b	Cable	ST/DF	Activity Fuels	Capable	7
25-3a	Tractor	IDM	Activity Fuels, Understory Reduction	Capable	12
25-3b	Cable	IDM	Activity Fuels, Understory Reduction	Capable	15
25-3c	Helicopter	IDM	Activity Fuels, Understory Reduction	Capable	6
25-4	Cable	Salvage	Activity Fuels, Understory Reduction	Capable, Roosting/Foraging	9
25-5	Cable	ST/DF	Activity Fuels	Capable, Dispersal	6
25-6	Bull-line	ST/DF	Activity Fuels	Dispersal	2
27-1	Tractor	SR	Activity Fuels, Understory Reduction	Dispersal	14
27-2	Tractor	SR	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging, Nesting	46
27-3	Tractor	ST/MC	Activity Fuels	Dispersal	11

27-4	Tractor	ST/MC	Activity Fuels	Roosting/Foraging	14
27-5a	Helicopter	ST/DF	Activity Fuels	Dispersal	28
27-5b	Helicopter	GS-60	Activity Fuels	Roosting/Foraging	36
27-6	Helicopter	ST/DF	Activity Fuels	Dispersal	17
27-8	Tractor	Salvage	Activity Fuels, Understory Reduction	Dispersal	12
29-1	Tractor	ST/WF	Activity Fuels	Dispersal	8
29-2	Tractor	GS-40	Activity Fuels	Dispersal	14
29-3	Cable	Salvage	Activity Fuels	Capable	6
29-4	Bull-line	Salvage	Activity Fuels	Capable	7
29-5	Bull-line	Salvage	Activity Fuels	Capable	3
29-6	Cable	Salvage	Activity Fuels, Understory Reduction	Roosting/Foraging	5
29-7	Tractor	Salvage	Activity Fuels	Capable	16
29-8	Tractor	Salvage	Activity Fuels	Dispersal	3
30-1a	Tractor	DM	Activity Fuels	Roosting/Foraging	12
30-1b	Tractor	ST/MC	Activity Fuels	Dispersal	14
30-1c	Helicopter	ST/MC	Activity Fuels	Dispersal	6
30-2a	Tractor	ST/MC	Activity Fuels, Understory Reduction	Dispersal	5
30-2b	Cable	ST/MC	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	18
30-2c	Tractor	ST/MC	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	5
30-3a	Tractor	ST/MC	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	11
30-3b	Cable	ST/MC	Activity Fuels, Understory Reduction	Roosting/Foraging	4
30-4	Tractor	Salvage	Activity Fuels	Dispersal	6
31-1	Tractor	Salvage	Activity Fuels	Roosting/Foraging	14
31-10	Tractor	Salvage	Activity Fuels	Dispersal	2
31-2a	Cable	ST/MC	Activity Fuels	Roosting/Foraging	7
31-2b	Tractor	ST/MC	Activity Fuels	Roosting/Foraging	4
31-3	Tractor	SR	Activity Fuels, Understory Reduction	Dispersal	9
31-4	Tractor	GS-40	Activity Fuels	Capable, Roosting/Foraging	31
31-5	Tractor	Salvage	Activity Fuels	Capable, Dispersal	8
31-6	Tractor	Salvage	Activity Fuels	Capable, Roosting/Foraging	2
31-7	Tractor	Salvage	Activity Fuels	Capable	7
31-8	Bull-line	Salvage	Activity Fuels	Capable	9
31-9	Bull-line	Salvage	Activity Fuels	Dispersal	4
33-11	Tractor	Salvage	Activity Fuels, Understory Reduction	Roosting/Foraging	7
33-12	Tractor	Salvage	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	7
33-2	Tractor	ST/MC	Activity Fuels, Understory Reduction	Dispersal	2
33-4	Tractor	ST/MC	Activity Fuels, Understory Reduction	Dispersal	1

33-8	Tractor	IDM	Activity Fuels, Understory Reduction	Capable	2
33-9	Tractor	Salvage	Activity Fuels, Understory Reduction	Roosting/Foraging	3
35-1a	Cable	ST/MC	Activity Fuels	Dispersal, Roosting/Foraging	17
35-1b	Tractor	ST/MC	Activity Fuels	Dispersal, Roosting/Foraging	4
35-4	Tractor	GS-40	Activity Fuels	Roosting/Foraging	11
35-5a	Tractor	Salvage	Activity Fuels, Understory Reduction	Dispersal	2
35-5b	Cable	Salvage	Activity Fuels, Understory Reduction	Dispersal	2
35-5c	Helicopter	Salvage	Activity Fuels, Understory Reduction	Dispersal	10
35-7	Tractor	IDM	Activity Fuels, Understory Reduction	Capable	5
35-8	Tractor	Salvage	Activity Fuels, Understory Reduction	Capable	18
DM = Density Management IDM = Insect and Disease Management SR = Structural Retention ST/MC = Selective Thinning-Mixed Conifer ST/PP = Selective Thinning-Ponderosa Pine			GS-40 = Group Selection > 40% GS-60 = Group Selection >60% ST/DF = Selective Thinning-Douglas Fir ST/WF = Selective Thinning-White Fir	Total Acres	1,676

Table 2-4. Alternative 2: Proposed Haul Routes on Existing Roads in the Project Area

Road Number	Approximate Length (miles)	Existing Surface	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)	Comments
37-2E-3.00 A	0.90	NAT	PVT	B	1	Install Temporary Bridge
37-2E-3.00 B	0.52	NAT	BLM	B	1	
37-2E-3.00 C	0.68	NAT	PVT	B	1	
37-2E-7.02 A1-H	8.41	ASC	BLM	A	2	
37-2E-7.04 A-B	0.55	NAT	BLM	B	1	Construct Rock Ford
37-2E-7.04 C1	1.12	NAT	PVT	B	1	Construct Rock Ford
37-2E-7.04 C2	0.69	NAT	PVT	A	1	
37-2E-7.04 D	0.05	NAT	BLM	A	1	
37-2E-11.00 A	0.46	NAT	BLM	B	1	
37-2E-11.00 B	0.10	NAT	PVT	B	1	
37-2E-11.00 C	0.41	NAT	BLM	B	1	
37-2E-11.00D	0.25	NAT	PVT	B	1	
37-2E-11.00E	0.06	NAT	BLM	C	1	Road is overgrown
37-2E-13.00 A2	0.32	ASC	PVT	A	2	
37-2E-13.00 B1	0.17	ASC	PVT	A	2	
37-2E-13.00 B2	0.20	ASC	PVT	A	2	
37-2E-13.00 C	0.85	ASC	PVT	A	2	
37-2E-13.00 D1	0.85	ASC	PVT	A	2	
37-2E-13.00 D2	0.67	ASC	PVT	A	2	
37-2E-13.00 E	0.61	ASC	BLM	A	2	
37-2E-13.00 F1	0.39	ASC	PVT	A	2	
37-2E-13.00 F3	0.31	NAT	PVT	C	1	Reshape Road/Spot Rock
37-2E-13.00 G	0.56	ASC	PVT	A	2	
37-2E-13.00 H	0.58	ASC	BLM	A	2	

Road Number	Approximate Length (miles)	Existing Surface	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)	Comments
37-2E-14.00A	0.41	NAT	BLM	B	1	
37-2E-14.00B	1.17	NAT	PVT	B	1	
37-2E-15.00 A	0.18	NAT	BLM	B	1	
37-2E-15.00 D	0.40	NAT	PVT	B	1	
37-2E-15.00 E	0.09	NAT	BLM	B	1	
37-2E-15.00 F	0.50	NAT	PVT	B	1	
37-2E-15.01	0.39	NAT	PVT	C	1	Road is overgrown
37-2E-16.00 A	0.66	ASC	PVT	B	1	
37-2E-16.00 B	0.48	ASC	BLM	B	1	
37-2E-16.00 C	0.26	NAT	PVT	B	1	
37-2E-17.00 B3	0.11	NAT	PVT	B	1	
37-2E-17.00 C	0.30	NAT	BLM	B	1	
37-2E-17.00 D	0.04	NAT	BLM	B	1	
37-2E-21.01	0.15	NAT	BLM	B	1	
37-2E-23.00 A	1.34	ASC	BLM	A	2	
37-2E-23.02	0.72	ASC	BLM	A	2	
37-2E-23.04 A	0.37	ASC	BLM	A	1	
37-2E-23.04 B	0.12	ASC	PVT	A	1	
37-2E-24.01 A	0.80	ASC	BLM	A	1	
37-2E-24.01 B-D2	2.21	ASC	BLM	A	1	
37-2E-24.04 A	0.12	ASC	PVT	A	2	
37-2E-24.04 B	0.65	NAT	PVT	B	1	Close After Use
37-2E-24.04 C	0.06	NAT	BLM	B	1	Close After Use
37-2E-24.05 A	0.11	ASC	PVT	A	2	
37-2E-24.05 B	0.84	ASC	BLM	A	2	
37-2E-25.03	0.25	NAT	BLM	C	1	Open Existing Closed/ Reclose After Use
37-2E-25.05 A	0.09	PRR	BLM	A	1	
37-2E-25.05 B	0.37	PRR	BLM	A	1	
37-2E-25.06	0.10	NAT	BLM	C	1	Open Existing Closed/ Reclose After Use
37-2E-33.00	1.36	ASC	BLM	A	2	
37-2E-33.01 A	0.57	NAT	BLM	A	1	
37-2E-33.01 B	0.23	NAT	PVT	A	1	
37-2E-33.05	0.30	NAT	BLM	C	1	Open Existing Closed/ Reclose After Use
37-2E-36.00A	0.13	PRR	BLM	A	1	
37-2E-36.00B	0.47	PRR	BLM	A	1	Remove Gate Barricade
37-2E-36.01	0.78	NAT	BLM	A	1	
37-2E-36.02	0.25	NAT	BLM	A	1	
37-2E-36.04	0.63	NAT	PVT	B	1	
37-3E-18.01 A1-B	2.13	ASC	BLM	A	2	
37-3E-18.03	0.60	ASC	BLM	A	2	
37-3E-18.04 A	0.58	ASC	BLM	A	2	
37-3E-18.04 B	0.02	NAT	PVT	A	1	
37-3E-18.05	0.10	NAT	BLM	C	1	Open Existing Closed/ Reclose After Use

Road Number	Approximate Length (miles)	Existing Surface	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)	Comments
37-3E-18.06	0.26	ASC	BLM	A	2	
37-3E-18.07	0.17	ASC	BLM	A	2	
37-3E-19.00	3.60	ASC	BLM	B	2	
37-3E-19.01 A1	0.59	ASC	BLM	A	2	
37-3E-19.01 A2	0.19	ASC	PVT	A	2	
37-3E-19.01 A3-B	1.30	ASC	BLM	A	2	
37-3E-19.04	0.20	ASC	BLM	A	2	
37-3E-21.01	0.58	NAT	PVT	B	1	
37-3E-21.02	0.44	NAT	PVT	B	1	
37-3E-29.00	0.50	ASC	BLM	A	2	
37-3E-29.01 A	0.43	ASC	BLM	A	2	
37-3E-29.01 B	0.28	PRR	PVT	A	2	
37-3E-29.02	0.40	ASC	BLM	C	1	Road is overgrown
37-3E-30.00	0.50	ASC	BLM	A	2	
37-3E-30.04	0.50	ASC	BLM	B	2	
37-3E-30.06	0.56	ASC	BLM	A	2	
37-3E-31.00 A-B	2.09	ASC	BLM	A	2	
37-3E-31.01	1.28	PRR	BLM	A	2	
37-3E-31.03	0.60	PRR	BLM	A	2	
37-3E-32.00 A1	0.29	ASC	BLM	A	2	
37-3E-32.00 B	0.93	PRR	BLM	A	2	
37-3E-32.02	0.25	ASC	BLM	A	2	
37-3E-32.05	0.93	NAT	BLM	C	1	Open Existing Closed/ Reclose After Use
38-2E-1.00 A	0.20	NAT	BLM	B	1	
38-2E-1.04 A	0.32	NAT	BLM	B	1	
38-2E-1.05	0.32	NAT	BLM	A	1	
38-2E-1.07	0.54	NAT	UKN	B	1	Install Temporary Bridge / Close After Use
38-2E-3.00	0.16	GRR	BLM	A	1	
38-2E-3.01	1.15	ASC	BLM	B	2	
38-2E-3.02 A	0.58	ASC	BLM	A	2	
38-2E-3.02 B	0.15	ASC	BLM	B	1	Open Existing Closed/ Reclose After Use
38-2E-3.03	0.22	ASC	BLM	A	2	
38-2E-3.08 A	0.11	PRR	BLM	A	2	
38-2E-3.08 B	0.20	PRR	PVT	A	2	
38-2E-3.08 C	0.71	PRR	BLM	A	2	
38-2E-3.10	0.23	NAT	BLM	B	1	
38-2E-9.1 C	0.40	ASC	BLM	A	2	
38-2E-11 A	0.25	ASC	BLM	A	2	
38-2E-11 B	0.37	ASC	PVT	A	2	
38-2E-11 C	0.28	ASC	BLM	A	2	
38-2E-11 D	0.14	ASC	BLM	A	2	
38-2E-11 E	0.15	ASC	BLM	A	2	
38-2E-11 F	0.03	ASC	BLM	A	2	
38-2E-11 G-K	4.92	ASC	BLM	A	2	
38-2E-27 A1-A2	2.30	BST	BLM	A	0	

Road Number	Approximate Length (miles)	Existing Surface	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)	Comments
38-2E-27 A3	0.37	BST	PVT	A	0	
38-2E-27 B1-B2	1.07	BST	BLM	A	0	
38-2E-27 C1	0.85	BST	BLM	A	0	
38-2E-27 C2	1.14	BST	BLM	A	0	
38-2E-27 C3	1.15	BST	BLM	A	0	
38-2E-27 D1	1.50	BST	BLM	A	0	
38-2E-27 D2	1.28	BST	BLM	A	0	
38-2E-27 D3	0.47	BST	BLM	A	0	
38-3E-5.00	1.46	ASC	BLM	A	2	
38-3E-6.00	0.50	NAT	BLM	B	1	
38-3E-6.01	0.40	NAT	BLM	B	1	
38-3E-6.02	0.70	NAT	BLM	B	1	
38-3E-9.00	1.29	ASC	BLM	A	2	
38-3E-11.00	1.62	PRR	BLM	A	2	
38-3E-11.06	0.44	GRR	BLM	A	1	
38-3E-11.07	0.14	NAT	BLM	C	1	Open Existing Closed/ Reclose After Use
38-3E-11.08	0.16	NAT	BLM	B	2	
38-3E-17.00 A-B	3.74	BST	BLM	A	0	
38-3E-17.00 C1-	1.60	BST	BLM	A	0	
38-3E-17.00 D-F	6.00	BST	BLM	A	0	
38-3E-19.00 A-C	4.99	BST	BLM	A	0	
38-3E-19.00 C	0.44	ASC	BLM	A	2	
38-3E-19.00 D	1.52	ASC	BLM	A	2	
38-3E-20.00	0.80	NAT	BLM	C	1	Reshape Road/Spot Rock Repair
38-3E-20.01	0.29	NAT	BLM	C	1	Open Existing Closed/ Reclose After Use
38 3E-21.00 A1-B	0.66	ASC	BLM	A	1	
38-3E-21.02	0.60	ASC	BLM	A	1	
38-3E-22.00	0.40	NAT	BLM	B	1	
38-3E-23.01	0.14	NAT	BLM	A	1	
38-3E-23.03	0.32	NAT	BLM	A	1	
38-3E-23.04	0.36	NAT	BLM	A	1	
38-3E-27.00	1.50	NAT	BLM	B	1	
38-3E-27.02	0.35	NAT	BLM	B	1	Close After Use
38-3E-27.03	0.60	NAT	BLM	B	1	Close After Use
38-3E-27.05	0.32	NAT	BLM	A	1	
38-3E-29.00 A-B	0.72	PRR	BLM	A	2	
38-3E-29.03	0.77	PRR	BLM	A	2	
38-3E-33.00	2.90	ASC	BLM	A	2	
38-3E-33.01	0.55	ASC	BLM	A	2	
38-3E-34.02	0.91	NAT	BLM	A	1	
USFS 800	4.51	ASC	USFS	A	2	
USFS 830	0.22	NAT	USFS	A	1	
T37 R2E Spur 23-2	0.09	NAT	BLM	C	1	Existing Non System Road to be Opened and Re-Barricaded After Use

Road Number	Approximate Length (miles)	Existing Surface	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)	Comments
T37 R2E Spur 25-3	0.10	NAT	BLM	C	1	Existing Non System Road to be Fully Decommissioned After Use
T37 R2E Spur 35-8	0.15	NAT	BLM	B	1	Existing Non System Road
T37 R3E Spur 30-3	0.10	NAT	BLM	B	1	Existing Non System Road to be Fully Decommissioned After Use
T38 R3E Spur 21-1	0.10	NAT	BLM	C	1	Existing overgrown Non System Road, Rock Road Approach
T38 R3E Spur 22-1	0.09	NAT	BLM	C	1	Existing Non System Road to be Fully Decommissioned After Use
T38 R3E Spur 22-2	0.04	NAT	BLM	B	1	Existing Non System Road to be rocked / dispersed Rec Site
T38 R3E Spur 27-1	0.11	NAT	BLM	C	1	Existing Non System Road to be Fully Decommissioned After Use
Total mileage	122.28					

Abbreviations:
Existing Surface: NAT = natural, GRR = Grid Rolled Rock, PRR = Pit Run Rock, ASC = Aggregate Surface Course, BST = Bituminous Surface Treatment
Control: BLM = Bureau of Land Management, PVT = Private
Possible Stabilizations or Drainage Improvements:

A = no road stabilization/drainage improvements. Road would be maintained to meet BLM standards.
B = spot rocking and/or drainage improvements. Road would be maintained to meet BLM standards.
C = Reshaping road and reestablishing drainage. Road would be maintained to meet BLM standards.

Seasonal Restrictions (for log hauling):

0 = no restrictions
1 = Hauling is restricted during the wet season, October 15th - May 15th; restrictions may be waived from October 15th - December 1st and April 1st to May 15th as approved by the Authorized Officer and in accordance with Medford BMPs. No hauling would be allowed during the core wet season, December 2nd - March 31st
2 = Hauling during the wet season, October 15th – May15th, may occur in accordance with Medford BMP's: R094, , R097, and R099

Note: Prior to the wet season, October 15th – May 15th, if purchaser elects to furnish and place additional rock as per BLM specifications, road specific seasonal haul restrictions may be modified as approved by the Authorized Officer.

Medford BMP's:

R 094 - On active haul roads, during the wet season, use durable rock surfacing and sufficient surface depth to resist rutting or development of sediment on road surfaces that drain directly to wetlands, floodplains and waters of the state.

R 097 - Remove snow on haul roads in a manner that will protect roads and adjacent resources. Retain a minimum layer (2-4 inches) of compacted snow on the road surface. Provide drainage through the snow bank at periodic intervals to allow for snow melt to drain off the road surface.

R 099 - Maintain road surface by applying appropriate gradation of aggregate and suitable particle hardness to protect road surfaces from rutting and erosion under active haul where runoff drains to wetlands, riparian management areas, floodplains and waters of the state.

ALTERNATIVE 3

Table 2-10. Alternative 3: Proposed Non-Commercial Units

Unit	Non-Commercial Prescription	NSO Habitat Type[4]	Acres
1-9	Understory Reduction	Capable	62
1-10	Understory Reduction	Dispersal	100
3-10	Understory Reduction	Dispersal, Roosting/Foraging	17
3-11	Understory Reduction	Roosting/Foraging	3
3-12	Understory Reduction	Capable	17
3-13	Understory Reduction	Dispersal	15
6-8	Understory Reduction	Capable	34
6-9	Understory Reduction	Dispersal	79
21-2	Understory Reduction	Capable	69
21-3	Understory Reduction	Dispersal	14
21-8	Understory Reduction	Dispersal	110
21-9	Understory Reduction	Dispersal	25
22-15	Understory Reduction	Dispersal	10
23-13	Understory Reduction	Capable	10
23-14	Understory Reduction	Capable	22
25-7	Understory Reduction	Capable	3
25-8	Understory Reduction	Roosting/Foraging	2
29-6	Understory Reduction	Roosting/Foraging	5
30-5	Understory Reduction	Dispersal	9
30-6	Understory Reduction	Capable	9
30-7	Understory Reduction	Capable	4
30-8	Understory Reduction	Capable	2
		Total Acres	619

[4] NSO habitat types are defined in the Terrestrial Wildlife section of the EA (Chapter 3, Section G.4.b).

Table 2-11. Alternative 3: Proposed Commercial Harvest Units by Silvicultural Prescription, Harvest Method, and NSO Habitat

Unit	Harvest Method	Silvicultural Prescription[5]	Associated Non-Commercial Prescription	NSO Habitat Type[6]	Acres
1-1	Tractor	ST/MC	Activity Fuels	Dispersal	3
1-2	Tractor	Salvage	Activity Fuels	Capable	1
1-3	Tractor	IDM	Activity Fuels, Understory Reduction	Capable	20
1-4a	Cable	Salvage	Activity Fuels	Nesting	3
1-4b	Tractor	Salvage	Activity Fuels	Capable	1
1-5	Helicopter	SR	Activity Fuels, Understory Reduction	Dispersal	4
1-6	Bull-line	Salvage	Activity Fuels, Understory Reduction	Capable	5
1-7	Bull-line	Salvage	Activity Fuels, Understory Reduction	Capable	3
1-8	Bull-line	Salvage	Activity Fuels, Understory Reduction	Capable	2
3-1	Tractor	Salvage	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	5
3-2	Tractor	Salvage	Activity Fuels, Understory Reduction	Capable, Dispersal	19
3-5a	Cable	Salvage	Activity Fuels, Understory Reduction	Dispersal	19
3-5b	Tractor	Salvage	Activity Fuels, Understory Reduction	Capable	14
3-6	Bull-line	Salvage	Activity Fuels	Capable	8
3-7	Tractor	Salvage	Activity Fuels, Understory Reduction	Capable	8
3-8	Tractor	Salvage	Activity Fuels, Understory Reduction	Dispersal	6
5-1	Tractor	Salvage	Activity Fuels, Understory Reduction	Roosting/Foraging	17
5-2	Tractor	Salvage	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	12
5-3	Cable	Salvage	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	6
6-1	Tractor	ST/MC	Activity Fuels, Understory Reduction	Dispersal	14
6-3	Tractor	Salvage	Activity Fuels, Understory Reduction	Capable	4
6-4	Bull-line	Salvage	Activity Fuels, Understory Reduction	Capable	1
6-5	Tractor	Salvage	Activity Fuels, Understory Reduction	Capable	7
6-6	Bull-line	Salvage	Activity Fuels, Understory Reduction	Capable	2
6-7	Tractor	Salvage	Activity Fuels, Understory	Roosting/Foraging	5

[5] Silvicultural prescriptions are defined on pages 2-26 to 2-29 of the EA.
[6] NSO habitat types are defined in the Terrestrial Wildlife section of the EA (Chapter 3, Section G.4.b).

Unit	Harvest Method	Silvicultural Prescription[5]	Associated Non-Commercial Prescription	NSO Habitat Type[6]	Acres
			Reduction		
11-1	Tractor	ST/MC	Activity Fuels	Dispersal	32
11-4	Tractor	Salvage	Activity Fuels	Capable	4
13-1	Helicopter	ST/DF	Activity Fuels, Understory Reduction	Dispersal	5
13-3	Bull-line	Salvage	Activity Fuels	Capable	1
14-2a	Helicopter	ST/DF	Activity Fuels, Understory Reduction	Dispersal	9
14-2b	Cable	ST/DF	Activity Fuels, Understory Reduction	Dispersal	3
15-4	Helicopter	ST/DF	Activity Fuels	Dispersal	9
17-1a	Helicopter	ST/DF	Activity Fuels	Dispersal	16
17-1b	Tractor	ST/DF	Activity Fuels	Dispersal	2
17-2a	Helicopter	ST/DF	Activity Fuels	Dispersal	21
17-3	Tractor	ST/PP	Activity Fuels, Understory Reduction	Capable	2
17-4	Tractor	ST/PP	Activity Fuels, Understory Reduction	Capable	16
17-6	Helicopter	ST/PP	Activity Fuels, Understory Reduction	Dispersal	10
17-7	Bull-line	Salvage	Activity Fuels	Capable	4
17-8	Bull-line	Salvage	Activity Fuels	Capable	4
18-1	Bull-line	Salvage	Activity Fuels	Capable	3
18-2	Bull-line	Salvage	Activity Fuels	Dispersal	1
18-4a	Cable	ST/DF	Activity Fuels	Dispersal	31
18-4b	Tractor	ST/DF	Activity Fuels	Dispersal	17
19-4a	Tractor	ST/PP	Activity Fuels, Understory Reduction	Capable	3
19-4b	Tractor	Salvage	Activity Fuels	Capable	3
19-5	Tractor	Salvage	Activity Fuels	Capable	3
19-6	Tractor	Salvage	Activity Fuels	Capable, Dispersal	6
20-1a	Tractor	ST/WF	Activity Fuels	Dispersal	41
20-1b	Cable	ST/WF	Activity Fuels	Dispersal	7
21-1	Tractor	ST/MC	Activity Fuels, Understory Reduction	Roosting/Foraging	44
21-6	Helicopter	ST/DF	Activity Fuels	Dispersal	1
21-7	Helicopter	ST/DF	Activity Fuels	Dispersal	7
22-1	Tractor	ST/MC	Activity Fuels	Dispersal	45
22-2	Tractor	ST/MC	Activity Fuels, Understory Reduction	Dispersal	19
22-3a	Helicopter	ST/DF	Activity Fuels	Dispersal	5
22-3b	Helicopter	ST/DF	Activity Fuels	Capable	3
23-10a	Tractor	ST/DF	Activity Fuels, Understory	Dispersal	2

Unit	Harvest Method	Silvicultural Prescription[5]	Associated Non-Commercial Prescription	NSO Habitat Type[6]	Acres
			Reduction		
23-10b	Helicopter	ST/DF	Activity Fuels, Understory Reduction	Dispersal	12
23-3a	Tractor	ST/PP	Activity Fuels, Understory Reduction	Dispersal	10
23-3b	Tractor	ST/PP	Activity Fuels, Understory Reduction	Capable	3
23-4a	Cable	ST/DF	Activity Fuels, Understory Reduction	Dispersal	13
23-4b	Bull-line	ST/DF	Activity Fuels, Understory Reduction	Dispersal	1
23-4c	Helicopter	ST/DF	Activity Fuels, Understory Reduction	Dispersal	1
25-3a	Tractor	IDM	Activity Fuels, Understory Reduction	Capable	12
25-3b	Helicopter	IDM	Activity Fuels, Understory Reduction	Capable	15
25-3c	Helicopter	IDM	Activity Fuels, Understory Reduction	Capable	6
25-4	Cable	Salvage	Activity Fuels, Understory Reduction	Capable, Roosing/Foraging	9
27-1	Tractor	SR	Activity Fuels, Understory Reduction	Dispersal	14
27-2	Tractor	SR	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	43
27-3	Tractor	ST/MC	Activity Fuels	Dispersal	11
27-4	Tractor	ST/MC	Activity Fuels	Roosting/Foraging	14
27-8	Tractor	Salvage	Activity Fuels, Understory Reduction	Dispersal	12
29-1	Tractor	ST/WF	Activity Fuels	Dispersal	8
29-2	Tractor	GS-40	Activity Fuels	Dispersal	14
29-3	Cable	Salvage	Activity Fuels	Capable	6
29-4	Bull-line	Salvage	Activity Fuels	Capable	7
29-5	Bull-line	Salvage	Activity Fuels	Capable	3
29-7	Tractor	Salvage	Activity Fuels	Capable	16
30-1a	Tractor	DM	Activity Fuels	Roosting/Foraging	12
30-1b	Tractor	ST/MC	Activity Fuels	Dispersal	14
30-1c	Helicopter	ST/MC	Activity Fuels	Dispersal	6
30-2a	Tractor	ST/MC	Activity Fuels, Understory Reduction	Dispersal	5
30-2b	Cable	ST/MC	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	16
30-2c	Tractor	ST/MC	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	5
30-2d	Helicopter	ST/MC	Activity Fuels, Understory Reduction	Dispersal, Roosting/Foraging	2
30-3a	Tractor	ST/MC	Activity Fuels, Understory	Dispersal,	11

Unit	Harvest Method	Silvicultural Prescription[5]	Associated Non-Commercial Prescription	NSO Habitat Type[6]	Acres
			Reduction	Roosting/Foraging	
30-3b	Helicopter	ST/MC	Activity Fuels, Understory Reduction	Roosting/Foraging	4
30-4	Tractor	Salvage	Activity Fuels	Dispersal	6
31-1	Tractor	Salvage	Activity Fuels	Roosting/Foraging	14
31-10	Tractor	Salvage	Activity Fuels	Dispersal	2
31-5	Tractor	Salvage	Activity Fuels	Capable, Dispersal	8
31-6	Tractor	Salvage	Activity Fuels	Capable, Roosing/Foraging	2
31-7	Tractor	Salvage	Activity Fuels	Capable	7
31-8	Bull-line	Salvage	Activity Fuels	Capable	9
31-9	Bull-line	Salvage	Activity Fuels	Dispersal	4
33-8	Tractor	IDM/UR	Activity Fuels, Understory Reduction	Capable	2
35-5a	Tractor	Salvage	Activity Fuels, Understory Reduction	Dispersal	2
35-5b	Cable	Salvage	Activity Fuels, Understory Reduction	Dispersal	2
35-5c	Helicopter	Salvage	Activity Fuels, Understory Reduction	Dispersal	10
35-7	Tractor	IDM	Activity Fuels, Understory Reduction	Capable	5
35-8	Tractor	Salvage	Activity Fuels, Understory Reduction	Capable	15
DM = Density Management IDM = Insect and Disease Management ST/DF = Selective Thinning-Douglas Fir ST/MC = Selective Thinning-Mixed Conifer ST/PP = Selective Thinning-Ponderosa Pine			GS-40 = Group Selection > 40% SR = Structural Retention ST/WF = Selective Thinning-White Fir	Total Acres	960

Table 2-12. Alternative 3: Proposed Haul Routes on Existing Roads in the Project Area

Road Number	Approximate Length (miles)	Existing Surface	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)	Comments
37-2E-3.00 A	0.90	NAT	PVT	B	1	Install Temporary Bridge
37-2E-3.00 B	0.52	NAT	BLM	B	1	
37-2E-3.00 C	0.68	NAT	PVT	B	1	
37-2E-7.02 A1-H	8.41	ASC	BLM	A	2	
37-2E-11.00 A	0.46	NAT	BLM	B	1	
37-2E-11.00 B	0.10	NAT	PVT	B	1	
37-2E-11.00 C	0.41	NAT	BLM	B	1	
37-2E-11.00D	0.25	NAT	PVT	B	1	
37-2E-11.00E	0.06	NAT	BLM	C	1	Road is overgrown
37-2E-13.00 A2	0.32	ASC	PVT	A	2	
37-2E-13.00 B1	0.17	ASC	PVT	A	2	
37-2E-13.00 B2	0.20	ASC	PVT	A	2	
37-2E-13.00 C	0.85	ASC	PVT	A	2	
37-2E-13.00 D1	0.85	ASC	PVT	A	2	
37-2E-13.00 D2	0.67	ASC	PVT	A	2	
37-2E-13.00 E	0.61	ASC	BLM	A	2	
37-2E-13.00 F1	0.39	ASC	PVT	A	2	
37-2E-13.00 F3	0.31	NAT	PVT	C	1	Reshape Road/Spot Rock
37-2E-13.00 G	0.56	ASC	PVT	A	2	
37-2E-13.00 H	0.58	ASC	BLM	A	2	
37-2E-14.00A	0.41	NAT	BLM	B	1	
37-2E-15.00 E	0.09	NAT	BLM	B	1	
37-2E-15.00 F	0.50	NAT	PVT	B	1	
37-2E-16.00 A	0.66	ASC	PVT	B	1	
37-2E-16.00 B	0.48	ASC	BLM	B	1	
37-2E-16.00 C	0.26	NAT	PVT	B	1	
37-2E-23.02	0.72	ASC	BLM	A	2	
37-2E-23.04 A	0.37	ASC	BLM	A	1	
37-2E-23.04 B	0.12	ASC	PVT	A	1	
37-2E-24.01 A	0.80	ASC	BLM	A	1	
37-2E-24.01 B-D1	1.88	ASC	BLM	A	1	
37-2E-25.03	0.25	NAT	BLM	C	1	Open Existing Closed/ Reclose After Use
37-2E-25.05 A	0.09	PRR	BLM	A	1	
37-2E-25.05 B	0.37	PRR	BLM	A	1	
37-2E-25.06	0.10	NAT	BLM	C	1	Open Existing Closed/ Reclose After Use
37-2E-33.00	1.36	ASC	BLM	A	2	
37-2E-36.00A	0.13	PRR	BLM	A	1	
37-2E-36.00B	0.47	PRR	BLM	A	1	Remove Gate Barricade After Use
37-2E-36.01	0.78	NAT	BLM	A	1	
37-2E-36.02	0.25	NAT	BLM	A	1	
37-2E-36.04	0.63	NAT	PVT	B	1	
37-3E-18.01 A1-B	2.13	ASC	BLM	A	2	

Road Number	Approximate Length (miles)	Existing Surface	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)	Comments
37-3E-18.04 A	0.58	ASC	BLM	A	2	
37-3E-18.04 B	0.02	NAT	PVT	A	1	
37-3E-18.05	0.10	NAT	BLM	C	1	Open Existing Closed/ Reclose After Use
37-3E-18.06	0.26	ASC	BLM	A	2	
37-3E-18.07	0.17	ASC	BLM	A	2	
37-3E-19.00	3.60	ASC	BLM	B	2	
37-3E-19.01 A1	0.59	ASC	BLM	A	2	
37-3E-19.01 A2	0.19	ASC	PVT	A	2	
37-3E-19.01 A3-B	1.30	ASC	BLM	A	2	
37-3E-19.04	0.20	ASC	BLM	A	2	
37-3E-21.02	0.44	NAT	PVT	B	1	
37-3E-29.00	0.50	ASC	BLM	A	2	
37-3E-29.01 A	0.43	ASC	BLM	A	2	
37-3E-29.01 B	0.28	PRR	PVT	A	2	
37-3E-29.02	0.40	ASC	BLM	C	1	Road is overgrown
37-3E-30.00	0.50	ASC	BLM	A	2	
37-3E-30.04	0.50	ASC	BLM	B	2	
37-3E-30.06	0.56	ASC	BLM	A	2	
37-3E-31.00 A-B	2.09	ASC	BLM	A	2	
37-3E-31.01	1.28	PRR	BLM	A	2	
37-3E-31.03	0.60	PRR	BLM	A	2	
37-3E-32.00 A1	0.29	ASC	BLM	A	2	
37-3E-32.00 B	0.93	PRR	BLM	A	2	
37-3E-32.02	0.25	ASC	BLM	A	2	
37-3E-32.05	0.17	NAT	BLM	C	1	Open Existing Closed/ Reclose After Use
38-2E-1.00 A	0.20	NAT	BLM	B	1	
38-2E-1.04 A	0.32	NAT	BLM	B	1	
38-2E-1.05	0.32	NAT	BLM	A	1	
38-2E-1.07	0.54	NAT	UKN	B	1	Install Temporary Bridge / Close After Use
38-2E-3.00	0.16	GRR	BLM	A	1	
38-2E-3.01	1.15	ASC	BLM	B	2	
38-2E-3.02 A	0.58	ASC	BLM	A	2	
38-2E-3.02 B	0.15	ASC	BLM	B	1	Open Existing Closed/ Reclose After Use
38-2E-3.03	0.22	ASC	BLM	A	2	
38-2E-3.08 A	0.11	PRR	BLM	A	2	
38-2E-3.08 B	0.20	PRR	PVT	A	2	
38-2E-3.08 C	0.71	PRR	BLM	A	2	
38-2E-3.10	0.23	NAT	BLM	B	1	
38-2E-9.1 C	0.40	ASC	BLM	A	2	
38-2E-11 A	0.25	ASC	BLM	A	2	
38-2E-11 B	0.37	ASC	PVT	A	2	
38-2E-11 C	0.28	ASC	BLM	A	2	
38-2E-11 D	0.14	ASC	BLM	A	2	
38-2E-11 E	0.15	ASC	BLM	A	2	
38-2E-11 F	0.03	ASC	BLM	A	2	

Road Number	Approximate Length (miles)	Existing Surface	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)	Comments
38-2E-11 G-K	4.92	ASC	BLM	A	2	
38-2E-27 A1-A2	2.30	BST	BLM	A	0	
38-2E-27 A3	0.37	BST	PVT	A	0	
38-2E-27 B1-B2	1.07	BST	BLM	A	0	
38-2E-27 C1	0.85	BST	BLM	A	0	
38-2E-27 C2	1.14	BST	BLM	A	0	
38-2E-27 C3	1.15	BST	BLM	A	0	
38-2E-27 D1	1.50	BST	BLM	A	0	
38-2E-27 D2	1.28	BST	BLM	A	0	
38-2E-27 D3	0.47	BST	BLM	A	0	
38-3E-5.00	1.46	ASC	BLM	A	2	
38-3E-6.00	0.50	NAT	BLM	B	1	
38-3E-6.01	0.40	NAT	BLM	B	1	
38-3E-6.02	0.70	NAT	BLM	B	1	
38-3E-9.00	1.29	ASC	BLM	A	2	
38-3E-11.00	1.62	PRR	BLM	A	2	
38-3E-11.06	0.29	GRR	BLM	A	1	
38-3E-17.00 A-B	3.74	BST	BLM	A	0	
38-3E-17.00 C1-	1.60	BST	BLM	A	0	
38-3E-17.00 D-F	6.00	BST	BLM	A	0	
38-3E-19.00 A-C	4.99	BST	BLM	A	0	
38-3E-19.00 C	0.44	ASC	BLM	A	2	
38-3E-19.00 D	1.52	ASC	BLM	A	2	
38-3E-20.00	0.80	NAT	BLM	C	1	Reshape Road/Spot Rock Repair
38-3E-20.01	0.29	NAT	BLM	C	1	Open Existing Closed/ Reclose After Use
38 3E-21.00 A1-B	0.66	ASC	BLM	A	1	
38-3E-21.02	0.60	ASC	BLM	A	1	
38-3E-22.00	0.40	NAT	BLM	B	1	
38-3E-27.00	1.50	NAT	BLM	B	1	
38-3E-27.02	0.35	NAT	BLM	B	1	Close After Use
38-3E-27.03	0.60	NAT	BLM	B	1	Close After Use
38-3E-27.05	0.32	NAT	BLM	A	1	
38-3E-29.00 A-B	0.72	PRR	BLM	A	2	
38-3E-29.03	0.77	PRR	BLM	A	2	
38-3E-33.00	2.90	ASC	BLM	A	2	
38-3E-33.01	0.55	ASC	BLM	A	2	
38-3E-34.02	0.91	NAT	BLM	A	1	
USFS 800	4.51	ASC	USFS	A	2	
USFS 830	0.22	NAT	USFS	A	1	
T37 R2E Spur 25-3	0.10	NAT	BLM	C	1	Existing Non System Road to be Fully Decommissioned After Use
T37 R2E Spur 35-8	0.15	NAT	BLM	B	1	Existing Non System Road to be Fully Decommissioned After Use

Road Number	Approximate Length (miles)	Existing Surface	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)	Comments
T37 R3E Spur 30-3	0.10	NAT	BLM	B	1	Existing Non System Road to be Fully Decommissioned After Use
T38 R3E Spur 21-1	0.10	NAT	BLM	C	1	Existing overgrown Non System Road, Rock Road Approach
T38 R3E Spur 22-1	0.09	NAT	BLM	C	1	Existing Non System Road to be Fully Decommissioned After Use
T38 R3E Spur 22-2	0.04	NAT	BLM	B	1	Existing Non System Road to be rocked / dispersed Rec Site
T38 R3E Spur 27-1	0.11	NAT	BLM	C	1	Existing Non System Road to be Fully Decommissioned After Use
Total mileage	109.28					

Abbreviations:
Existing Surface: NAT = natural, GRR = Grid Rolled Rock, PRR = Pit Run Rock, ASC = Aggregate Surface Course, BST = Bituminous Surface Treatment
Control: BLM = Bureau of Land Management, PVT = Private
Possible Stabilizations or Drainage Improvements:

A = no road stabilization/drainage improvements. Road would be maintained to meet BLM standards.
B = spot rocking and/or drainage improvements. Road would be maintained to meet BLM standards.
C = Reshaping road and reestablishing drainage. Road would be maintained to meet BLM standards.

Seasonal Restrictions (for log hauling):

0 = no restrictions
1 = Hauling is restricted during the wet season, October 15th - May 15th; restrictions may be waived from October 15th - December 1st and April 1st to May 15th as approved by the Authorized Officer and in accordance with Medford BMPs. No hauling would be allowed during the core wet season, December 2nd - March 31st
2 = Hauling during the wet season, October 15th – May15th, may occur in accordance with Medford BMP's: R094, , R097, and R099

Note: Prior to the wet season, October 15th – May 15th, if purchaser elects to furnish and place additional rock as per BLM specifications, road specific seasonal haul restrictions may be modified as approved by the Authorized Officer.

Medford BMP's:

R 094 - On active haul roads, during the wet season, use durable rock surfacing and sufficient surface depth to resist rutting or development of sediment on road surfaces that drain directly to wetlands, floodplains and waters of the state.

R 097 - Remove snow on haul roads in a manner that will protect roads and adjacent resources. Retain a minimum layer (2-4 inches) of compacted snow on the road surface. Provide drainage through the snow bank at periodic intervals to allow for snow melt to drain off the road surface.

R 099 - Maintain road surface by applying appropriate gradation of aggregate and suitable particle hardness to protect road surfaces from rutting and erosion under active haul where runoff drains to wetlands, riparian management areas, floodplains and waters of the state.

APPENDIX B. SOUTH FORK LITTLE BUTTE AQUATIC CONSERVATION STRATEGY

The Northwest Forest Plan's (NWFP) Aquatic Conservation Strategy (ACS) has four components: Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration. It is guided by nine objectives which are meant to focus agency actions to protect ecological processes at the 5th field hydrologic scale, or watershed, at the 6th and or 7th fields (subwatershed and or drainage), and at the site level. In this case, the South Fork Little Butte Project Analysis Area includes 20 7th field drainages, which collectively form portions of two 6th field subwatersheds, the Middle and Lower South Fork Little Butte Creek subwatersheds. All of the drainages and catchments are within the larger Little Butte Creek 5th field watershed. How the four components of ACS relate to the South Fork Little Butte (SFLB) Forest Management Project is explained below:

1. Riparian Reserves: Riparian Reserve widths for streams, springs, wetlands, and unstable soils have been determined according to the protocol outlined in the NWFPs Aquatic Conservation Strategy and are listed in the PDFs for the SFLB Forest Management Project.

2. Key Watersheds: Tier 1 Key Watersheds contribute directly to conservation of at-risk anadromous salmonids, bull trout, and resident fish species. They also have a high potential of being restored as part of a watershed restoration program. The portion of the Little Butte Creek Watershed from the North and South Fork confluence upstream is a Key Watershed, which includes all areas in the Analysis Area except for Lake Creek.

3. Watershed Analysis: BLM completed the Little Butte Creek Watershed Analysis in 1997. The Watershed Analysis covers the project and Analysis Areas. Outdated information in the Watershed Analysis was updated in 2014 to better reflect present-day road densities and aquatic habitat conditions and to incorporate recent restoration activities which have occurred in the watershed.

4. Watershed Restoration: Most of the restoration activities in the watershed have focused on restoring fish passage to provide better access to habitat on upstream private and federal lands. Projects by the local watershed council, ODFW and/or BLM include culvert removal and replacement, dam removal, road decommissioning, and irrigation ditch fish screens and siphoning.

Evaluation of This Action's Consistency with Northwest Forest Plan Aquatic Conservation Strategy Objectives

1. Maintain and restore the distribution, diversity, and complexity of watershed and **landscape-scale features** to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

> Topography, slope, forest fire regime, climate, and the distribution of soil types and plant communities are some of the landscape-scale features affecting aquatic systems in the Little Butte Creek Watershed. One of the treatment objectives of the SFLB Forest Management Project is to compensate for an altered fire regime and restore certain plant communities. The intent of this objective is to restore the function of landscape-scale processes like wildfire in order to protect the complexity and distribution of plant communities (including riparian areas) across the landscape. This would be noticeable at the site level, but would have only a minor benefit at the watershed scale, as less than 1.0% of the watershed would be treated.

2. Maintain and restore **spatial and temporal connectivity** within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

> In the Little Butte Creek Watershed, BLM-managed land is concentrated in the steeper slopes of the tributary streams of the catchments. Here, longitudinal connectivity and road densities are the primary

issues for aquatic species. No activities planned under the South Fork Little Butte Project would affect spatial and/or temporal connectivity, as no culverts are proposed for addition, replacement, or removal on perennial channels under the timber sale. Temporary bridges planned to facilitate haul would allow for unhindered passage of all aquatic organisms during the time they are in use.

3. Maintain and restore the **physical integrity** of the aquatic system, including shorelines, banks, and bottom configurations.

No actions are proposed in the South Fork Little Butte Project that would negatively affect the physical integrity of the aquatic system. Addition of river rock to fords proposed to be used during a period when the streams would be dry would help to protect the banks and stream bottoms, and river rock itself is a natural substrate that would not be detrimental to the channels. Funded decommissioning activities do not include any stream crossings, but proposed decommissioning which is currently unfunded would include 12 stream channels crossings. If/when these roads are decommissioned the physical integrity of stream bottoms would be improved at each of the 12 crossings through the removal of culverts. This would allow stream bottoms to recover to a natural state.

4. Maintain and restore **water quality** necessary to support healthy riparian, aquatic and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

There would be no effect on water temperature, because shade would not be reduced along any perennial stream channels. Short-term (one to three years) there would likely be a small amount of fine sediment entering stream channels in the Analysis Area catchments from hauling. Sediment inputs would be minor relative to existing sediment levels, and detectable behind background levels only at the site level. Upland work would have no effect on fine sediment levels, due to the filtering action of Riparian Reserve buffers, extensive PDFs designed to prevent overland sediment movement, and the incorporation of BMPs. Roads proposed for future decommissioning but lacking current funding include 12 stream crossings. If/when these roads are decommissioned there would be short-term sight level negative effects, as up to a cubic yard of sediment may be contributed at each crossing as a result of removing culverts and fill. This would be coupled with long-term site level improvements as chronic sources of sediment input would be removed.

5. Maintain and restore the **sediment regime** under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

The only elements of this project which could affect the sediment regime are log hauling and road decommissioning. Hauling would likely input a very small amount of fine sediment directly to aquatic habitats adjacent to or crossing haul routes. This sediment would affect site level habitats during an uncharacteristic time of year (i.e. during haul, much of which would occur during the summer). Winter hauling would also contribute sediment to Analysis Area streams during high flow events. However, given the small magnitude of sediment anticipated to be input from hauling, it would be undetectable in downstream habitats plagued by high sediment and turbidity from a myriad of other sources. Unfunded road decommissioning would, if it occurred, also be likely to input sediment at each of the 12 crossings (see ACS Objective #4). In general, high road densities, past and ongoing intense harvest of industrial and federal timber lands, extensive agricultural and urban development, and cattle grazing in the Analysis Area catchments will continue to impact the sediment regime.

6. Maintain and restore **instream flows** sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Peak flows and summer low flows are unlikely to be affected by the South Fork Little Butte Project. Please see the Water Resources section in the Environmental Assessment for details. Any effects on ground water availability from the project would be too small to be noticeable at the site, much less the drainage or watershed scale. Storage dams, water transfers and withdrawals for agriculture and residential use, and the high amount of non-porous surfaces (roads, buildings, etc.) have the most substantial impacts to instream flows in the watershed.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in **meadows and wetlands**.

Only harvest would have any mechanism to affect the timing, variability, and duration of floodplain inundation and water table elevation. However, harvest would not occur in Riparian Reserves and across the Project Area would leave canopy cover within the range of natural variability. Because of this, any extra water input intercepted by the ground as a result of harvest would likely be utilized by remaining vegetation before it reached the floodplain. Therefore, this objective would not be measurably affected at any spatial scale.

8. Maintain and restore the species composition and structural diversity of **plant communities in riparian areas** and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of **coarse woody debris** sufficient to sustain physical complexity and stability.

Road decommissioning and construction of one tractor landing in riparian areas are the only project elements which would affect this indicator. One landing proposed upslope of the paved Conde Creek road would include the outer 15 feet of the Riparian Reserve of upper Soda Creek and would disturb approximately 1/3 of an acre of riparian vegetation, but would not remove any channel shading trees, or reduce the potential for future large wood inputs. Road segments proposed to be fully decommissioned that are currently funded include 0.5 miles of riparian roads that would allow for the eventual recovery of these riparian areas. This would allow for the recovery of about 1.2 acres of riparian vegetation, which, when coupled with the proposed disturbance associated with the riparian landing, would net an increase of 0.9 acres of recovered Riparian Reserves. Additional roads identified for full decommissioning but currently lacking funding include 1.5 miles within Riparian Reserves. If these roads were decommissioned in the future, it would result in future recovery of an additional 3.6 acres of Riparian Reserves within the South Fork Little Butte aquatic Analysis Area. Assuming that these un-funded roads are someday decommissioned, collectively, actions proposed in Riparian Reserves would net an increase (over time) of 4.5 acres of recovered riparian vegetation.

9. Maintain and restore **habitat** to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

See Objectives # 3, 4, 5, and 8. Site level effects to aquatic and riparian habitat would not be of sufficient magnitude to compromise this objective. The amount of habitat affected would be insignificant and immeasurable at the drainage, subwatershed, and watershed scales compared to the past and ongoing degradation that has impacted habitat in these catchments.

APPENDIX C. SURVEY & MANAGE COMPLIANCE

Survey & Manage Tracking Form: Botany Species Survey and Site Management Summary

Medford District BLM - Ashland Resource Area

Project Name: South Fork Little Butte **Prepared By:** Armand Rebischke

Project Type: Forest Management Project **Date:** April 14, 2015

Location: T.37S., R.02E. Sections 5, 11, 13, 14, 15, 17, 20, 21, 22, 23, 25, 27, 33, and 35; T.37S., R.03E. Sections 17, 18, 19, 20, 29, 30, 31, and 32; T.38S., R.02E. Sections 1, 3, and 11; and T. 38 S., R. 3 E. Sections 5, 6, 11, 19, 20, 21, 22, 23, 27, and 29.

S&M List Date: 2001 with 2003 Annual Species Review

Survey & Manage Botany Species

The Medford District BLM compiled the species list below (Table C-1) from the *2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines* with 2003 Annual Species Review (ASR) and includes those botanical species whose known or suspected range includes the BLM Medford District according to information in the Survey Protocols in IM-OR-99-26, IM-OR-98-103, IM-OR-98-038, IM-OR-2003-078 (including Change 1), IM-OR-2000-17 (including Change 1), Bryophyte Protection Buffer Species version 2.0, and IM-OR-98-103; and information in Management Recommendations in IM-OR-99-027, R6-NR-S&M-TP-03-03, IM-OR-97-027, IM-OR-2002-080, and IM-OR-98-003; and the Handbook to Strategy 1 Fungal Species in the Northwest Forest Plan PNW-GTR-476.

Species listed are Category A and C species, for which pre-disturbance surveys are required. Category A and C species are not included where their defined range is outside southern Oregon (e.g. *Ptilidium californicum*, in California).

This list also includes any Category B, D, E or F species with known sites located within the South Fork Little Butte Project Area. Management recommendations are based on professional judgment in accordance with site-specific conditions and proposed treatments.

Table C-1. Survey and Manage Botanical Species Known or Suspected in the Project Area

Species	S&M Category	Survey Triggers			Survey Results			Site Management
		Within Range of the Species?	Contains Suitable habitat?	Habitat Disturbing*?	Surveys Required?	Survey Date (month/year)	Sites Known or Found?	
Other S&M Sites (Not Category A or C)								
Chaenotheca ferruginea	B	Yes	Yes	Yes	No	5/2013 6/2014	12	Yes[1]
Chaenotheca subroscida	E	Yes	Yes	Yes	No	6/2014	2	Yes[1]
Leptogium teretiusculum	E	Yes	Yes	Yes	No	6/2014	2	Yes[1]
Albatrellis ellisii	B	Yes	Yes	Yes	No	10/2014	1	Yes[1]

Clavariadelphus sachalinensis	B	Yes	Yes	Yes	No	10/2014 11/2014	21	Yes[1]
Gomphus kaufmanii	B	Yes	Yes	Yes	No	10/2014	2	Yes[1]
Vascular Plants								
Cypripedium fasciculatum	C	Yes	Yes	Yes	Yes	7/1999	1	Yes[2]
Cypripedium montanum	C	Yes	Yes	Yes	Yes	7/1999	2	Yes[2]

[1] See plant protection table in Chapter 3 of the EA.
[2] If the sites or plants cannot be located, it is no longer considered an occupied site.

Statement of Compliance

The Medford District BLM applied the *2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines* with 2003 ASR species list to the South Fork Little Butte Project, completing the pre-disturbance surveys, and management of known sites required by Survey Protocols and Management Recommendations to comply with the 2001 Record of Decision.

Project and historical surveys discovered sites for eight Survey & Manage botany species:

- Category C Vascular Plant (*Cypripedium fasciculatum*): Historic surveys identified one site located within a proposed unit. Refer to Table 3-30 for protection measures explanation.
- Category C Vascular Plant (*Cypripedium montanum*): Historic surveys identified two sites located in proposed units. Refer to Table 3-30 for protection measures explanation.
- Category B Lichen (*Chaenotheca ferruginea*): Pre-disturbance surveys identified 12 sites located within proposed units. Refer to Table 3-30 for protection measures explanation.
- Category E Lichen (*Chaenotheca subroscida*): Pre-disturbance surveys identified 2 sites located within proposed units. Refer to Table 3-30 for protection measures explanation.
- Category E Lichen (*Leptogium teretiusculum*): Pre-disturbance surveys identified 2 sites located within proposed units. Refer to Table 3-30 for protection measures explanation.
- Category B Fungi (*Albatrellis ellisii*): Pre-disturbance surveys identified 1 site located within a proposed unit. Refer to Table 3-30 for protection measures explanation.
- Category B Fungi (*Clavariadelphus sachalinensis*): Pre-disturbance surveys identified 21 sites located within proposed units. Refer to Table 3-30 for protection measures explanation.
- Category B Fungi (*Gomphus kaufmanii*): Pre-disturbance surveys identified 2 sites located within proposed units. Refer to Table 3-30 for protection measures explanation.

s:\Armand Rebischke — 4/14/15

Armand Rebischke, Botanist — Date

Medford BLM District, Ashland Resource Area

Survey & Manage Tracking Form: Wildlife Species Survey and Site Management Summary

Medford District BLM –Ashland Resource Area

Project Name: South Fork Little Butte **Prepared By:** Steve Godwin

Project Type: Forest Management Project **Date:** 6/26/2015

Location: T.37S., R.02E. Sections 5, 11, 13, 14, 15, 17, 20, 21, 22, 23, 25, 27, 33, and 35;
T.37S., R.03E. Sections 17, 18, 19, 20, 29, 30, 31, and 32;
T.38S., R.02E. Sections 1, 3, and 11; and
T.38S., R.3E. Sections 5, 6, 11, 19, 20, 21, 22, 23, 27, and 29.

S&M List Date: 2001 with 2003 Annual Species Review

Survey & Manage Wildlife Species

The Medford District BLM compiled the species list below (Table C-2) from the *2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines* with 2003 Annual Species Review and includes those wildlife species whose known or suspected range includes the BLM Medford District according to:

- *Survey protocol for the Great Grey Owl within the Range of the Northwest Forest Plan v3.0* (Jan. 2004)
- *Survey Protocols for Amphibians under the Survey & Manage Provision of the Northwest Forest Plan v3.0* (Oct. 1999)
- *Survey Protocol for the Red Tree Vole v2.1* (Oct. 2002)
- *Survey Protocol for S&M Terrestrial Mollusk Species v3.0* (Feb. 2003)

Species listed are Category A and C species, for which pre-disturbance surveys are required.

This list also includes any Category D, E, or F species with known sites located within the SFLB Forest Management Project Area (None).

Table C-2. Survey and Manage Wildlife Species Known or Suspected in the Project Area

Species	S&M Category	Survey Triggers			Survey Results			Site Management
		Within Range of the Species?	Contains Suitable habitat?	Habitat Disturbing*?	Surveys Required?	Survey Date (M/Y)	Sites Known or Found?	
Vertebrates								
Siskiyou Mountains salamander (*Plethodon stormi*, north range)	Off[1]	No	N/A	N/A	No	N/A	N/A	N/A
Great Gray Owl (*Strix nebulosa*)	A	Yes	Yes	Yes	Yes	2014/2015	TBD	TBD

Red Tree Vole (*Arborimus longicaudus*)	C	No	N/A	N/A	No	N/A	N/A	N/A
Mollusks								
Chase Sideband (*Monadenia chaceana*)	B[2]	Yes	Yes	Yes	Yes	11/2011 and 5/2012	TBD[5]	TBD[5]
Oregon Shoulderband (*Helminthoglypta hertleini*)	B[2]	Yes	Yes	Yes	Yes	11/2011 and 5/2012	TBD[5]	TBD[5]
Evening Fieldslug (Deroceras hesperium)	B[2]	Yes	Yes	No	No[3]	N/A	No	N/A
Crater Lake Tightcoil (*Pristiloma arcticum crateris*)	A	Yes	Yes	No	No[4]	N/A	N/A	N/A

*"Habitat disturbing" and thereby a trigger for surveys as defined in the 2001 ROD S&Gs (p. 22).

N/A = Not Applicable

[1]This species is covered by a Conservation Strategy in the northern part of the species range.

[2] Equivalent-effort pre-disturbance surveys are required for this species.

[3] Suitable habitat for the evening Fieldslug is "associated with wet meadows in forested habitats in a variety of low vegetation, litter and debris; rocks may also be used. Little is known about this species or its habitat. Surveys may be limited to moist surface vegetation and cover objects within 30 m. (98ft.) of perennial wetlands, springs, seeps and riparian areas..." (pg. 41, *Survey Protocol for S&M Terrestrial Mollusk Species v3.0*, 2003). Within the project, suitable habitat is confined to the stream-side areas that are contained within Riparian Reserves in the harvest units. Significant negative affects to the micro-climate of this habitat within the Riparian Reserve will not occur so there is no trigger for surveys. Although, pre-disturbance surveys were conducted in areas outside of the riparian buffers and if this species presence is confirmed, it will receive the appropriate management protection.

[4]Suitable habitat for the Crater Lake tightcoil is "perennially wet situations in mature conifer forests, among rushes, mosses and other surface vegetation or under rocks and woody debris within 10 meters of open water in wetlands, springs, seeps and riparian areas..." (pg. 43, *Survey Protocol for S&M Terrestrial Mollusk Species v3.0*, 2003). Within the project, suitable habitat is confined to the stream-side areas that are contained within Riparian Reserves in the regeneration harvest units. Significant negative affects to the micro-climate of this habitat within the Riparian Reserve will not occur so there is no trigger for surveys.

[5] Pre-disturbance surveys were conducted for terrestrial mollusks. Voucher specimens collected from surveys are currently being identified and sent to a regional malacologist for verification. If a Survey and Manage species is confirmed, the site will receive appropriate management protection and removed from the treatment areas.

Statement of Compliance

The Medford District BLM applied the *2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines* with 2003 ASR species list to the South Fork Little Butte Project, completing the pre-disturbance surveys, and management of known sites required by Survey Protocols and Management Recommendations to comply with the 2001 Record of Decision.

Summary of Survey Results

Project surveys discovered sites (final number pending completion of surveys in July 2015) for the following Survey and Manage wildlife species:

- Great Gray Owls

Project surveys were conducted for terrestrial mollusks. Voucher specimens collected from surveys are currently being identified and sent to a regional malacologist for verification. If a Survey and Manage species is confirmed, the site will receive appropriate management protection and removed from the treatment areas.

Steven A. Godwin, Wildlife Biologist
Medford BLM District, Ashland Resource Area

6/29/2015
Date

APPENDIX D. WEED RISK ASSESSMENT

BLM Manual 9015 - Integrated Weed Management (USDI 1992) directs BLM botanists to conduct a weed risk assessment to determine the risk of introducing weeds into an area and/or spreading then throughout a Project Area. Surveys for all species on the Medford Weed list were conducted over several years starting in 2006. Noxious weed and non-native plant populations in the Project Area and on adjacent BLM-administered lands vary by location and species (see Section H. Botany, Affected Environment, Noxious Weeds of the EA for information on weed infestation).

Class A Weeds are noxious weeds that are exotic (non-native) to the State or area, and are of limited distribution or are unrecorded in the State or area and pose a serious threat to agricultural crops and rangelands in the State. Class A weeds receive highest priority. Management emphasis is complete control. These weeds approximate the Oregon Department of Agriculture List A weeds. A records check and surveys of areas that may be affected by the South Fork Little Butte Project resulted in zero sites of Class A weeds.

Class B Weeds are noxious weeds that are exotic (non-native) plant species of limited distribution or unrecorded in a region of the State but are common in other regions of the State and have been identified by the BLM or State as potentially harmful. Class B-Weeds receive second highest priority. Management emphasis is to control the spread, decrease population size, and eventually eliminate the weed population when cost-effective technology is available. These weeds approximate the Oregon Department of Agriculture List B weeds. Note that percent cover of these species is less than the infestation area since most weeds, with the occasional exception of Blackberry, usually cover less than 100% of their infested area.

Table D-1. Class B Weeds Located within or Adjacent to the Project Area

Species	Count	Estimated size of infestation(s)
Armenian Blackberry	20+	Large ~10 acres
Yellow starthistle	7	Medium ~5 acres
Diffuse knapweed	2	Small < 25 m^2
Medusahead Rye	4	Medium ~3 acres
Rush skeletonweed	1	Small - <10m^2
Canada thistle	1	Small - < 1 acre
Bull thistle	12	Small - <100m^2
Perennial peavine	2	Small - <100m^2
Cutleaf teasel	1	Small - <30m^2
St. John's wort	11	Medium ~2 acres
Sulphur cinquefoil	3	Medium ~2 acres

Class C Weeds consist of any other noxious weeds (exotic or native) or undesirable plants. This classification receives the lowest priority. Management emphasis is to contain spread to present population size or decrease population to a manageable size. The following species listed in Table D-2 are exotic, have a moderate frequency from recent survey lists in nearby stands, and have the potential to cause ecological damage.

Table D-2. Class C Weeds Located within or Adjacent to the Project Area

Species	Count	Estimated size of infestation
Downy Brome (Cheatgrass)	15	Large 5+ acres
Hedgehog Dogtail grass	17	Large 25+ acres
Common Teasel	2	Small - <100m^2
Spreading hedge-parsley	3	Medium ~3 acres

Table D-3. Factor 1: Likelihood of Noxious Weed Species Spreading to the Project Area

Level	Value	Description
None	0	Noxious weed species not located within or adjacent to the Project Area. Project activity is not likely to result in the establishment of noxious weed species in the Project Area.
Low	1	Noxious weed species present in areas adjacent to but not within the Project Area. Project activities can be implemented and prevent the spread of noxious weeds into the Project Area.
Moderate	5	Noxious weed species located immediately adjacent to or within the Project Area. Project activities are likely to result in some areas becoming infested with noxious weed species even when preventative management actions are followed. Control measures are essential to prevent the spread of Noxious weeds within the Project Area.
High	10	Heavy infestations of Noxious weeds are located within or immediately adjacent to the Project Area. Project activities, even with preventative management actions are likely to result in the establishment and spread of noxious weeds on disturbed sites throughout much of the Project Area.

The likelihood of Class B and C weed species spreading into the Project Area is moderate (factor 5). There are Class B and C weed populations immediately adjacent to, at the edges of proposed treatment units, and occasionally in the units. Forest management activities would create patchy, moderately intensive ground disturbance. Some weed seeds and plant material may spread from the road prism into units without aggressive treatment. Project Design Features (PDFs) are included that would prevent the extensive spread of noxious weeds due to direct effects of the proposed project.

Yellow starthistle, Diffuse knapweed, Canada thistle, Bull thistle, Rush skeletonweed, Perennial peavine, Medusahead rye, Sulphur cinquefoil, St. John's wort, and Cutleaf Teasel occurring in small patches within or near the Project Area would be reduced, and perhaps locally eradicated, in 1 to 3 years with the implementation of PDFs and treatments. Armenian blackberry is difficult to treat and would require excessive resources to do so. It will likely spread whether proposed actions are implemented or not. No effective treatments for Medusahead Rye are available at this time. It will continue to spread. However, the infestations are relatively small, and the impacts from the proposed action are difficult to distinguish from natural spreading.

The budget to treat and monitor noxious weeds is not fixed for this project. There is no budget to treat Class C weeds; also, it is not permitted to use herbicides on Class C weeds at this time. It is expected that the BLM will be able to treat Class C weeds with new, more effective herbicides by 2016. If the weeds are not treated due to insufficient budget or workforce and PDFs are not implemented, the likelihood of noxious weed and non-native species spreading into and within the Project Area would be high.

Table D-4. Factor 2: Consequence of Noxious Weed Establishment in the Project Area

Level of Consequence	Value	Description of Possible Effects
Low to Non-existent	1	None. No cumulative effects expected.
Moderate	5	Possible adverse effects on site and possible expansion of infestation within Project Area. Cumulative effects on native plant community are likely but limited.
High	10	Obvious adverse effects within the Project Area and probable expansion of noxious weed infestations to areas outside the Project Area. Adverse cumulative effects on native plant community are probable.

The consequence of noxious weed establishment in the Project Area is moderate. The noxious weed and non-native populations in the affected areas vary by species and are primarily located along roads, except

Armenian blackberry (RUAR) which occurs along roadsides and in proposed treatment units. Except for RUAR, these species are primarily competitive when under an open canopy, (i.e. roadsides or disturbed open gaps in canopy). The herbaceaous weeds (except RUAR) could invade disturbed areas and displace native herbs, forbs and graminoids. Seeding with native plants, spreading mulch in highly disturbed areas, and continued treatment of weeds in the Project Area would mitigate the displacement of native vegetation. RUAR can form dense thickets where nothing grows underneath its canopy. Without treatment it will continue to expand into riparian areas and extend along roadsides crowding out native vegetation. Unrelated activities could transport weed seed (e.g. wind, water, wildlife, wildfire, hiking, OHV, etc.) into any newly disturbed areas.

Risk Rating

Step 1 - Identify level of likelihood and consequence of adverse effects and assign values according to the following:

None = 0

Low = 1

Moderate = 5

High = 10

Step 2 - Multiply the level of Likelihood value (Table D-3) by the Consequence value (Table D-4) to determine Value.

Step 3 - Use the value resulting from Step 2 to determine Risk Rating and Action in Table D-5 below.

Table D-5. Risk Rating and Action

Value	Risk Rating	Action
0	None	Proceed as planned.
1-10	Low	Proceed as planned. Initiate control treatment on noxious weed populations that get established in the area.
25	Moderate	Develop preventative management measures for the proposed project to reduce the risk of introduction or spread of noxious weeds into the area. Preventative management measures should include modifying the project to include seeding the area to occupy disturbed sites with desirable species. Monitor area for at least 3 consecutive years and provide for control of newly established populations of noxious weeds and follow-up treatment for previously treated infestations.
50-100	High	Project must be modified to reduce risk level through preventative management measures including seeding with desirable species to occupy disturbed sites and controlling existing infestations of noxious Weeds prior to project activity. Projects must also provide for control of newly established populations of Noxious weeds and follow-up treatment for previously treated infestations.

Example: 5x5=25. Moderate risk. Implement PDF's. Monitoring and control treatments shall occur.

The Medford District BLM Resource Management Plan directs the use of integrated pest management actions to contain and reduce noxious weed infestations (USDI 1995). The South Fork Little Butte Project incorporates PDFs as part of the proposed action to control noxious weeds and avoid new infestations. The PDFs include both preventive features and active control. The PDFs represent the most current and widely employed methodology for weed control and prevention. The EA analyzes effects to resources in the context of a project design that includes PDFs prescribed for the South Fork Little Butte Project; thus, the effects of PDFs have been incorporated into the analysis of the Proposed Action. While ground disturbance associated

with this project would create site conditions initially more favorable for noxious weeds and introduced plants, with the implementation of PDFs, including weed control treatments, weed spread would be minimized and roadside weed populations would be controlled and reduced in most areas.

PDFs included in the South Fork Little Butte Project to control noxious weeds are consistent with:

- Medford District BLM Resource Management Plan (USDI BLM, 1995, p. 92);
- Medford District BLM Integrated Weed Management Plan and Environmental Assessment (USDI BLM, 1998); and the
- Bureau's 2007 Final Programmatic Environmental Impact Statement, *Vegetation Treatments Using Herbicides*, Prevention of Weeds and Early Detection and Rapid Response strategy (USDI BLM, 2007, p. 2-23 to 2-25).

APPENDIX E – ACRONYMS & GLOSSARY

ACS – Aquatic Conservation Strategy
AMA – Adaptive Management Area
ARPA – Archaeological Resources Protection Act
ASQ – Allowable Sale Quantity
AUM – Animal Unit Month
BA – Biological Assessment
BAFH – Biological Assessment of Forest Habitat
BCC – Bird Species of Conservation Concern
BCR – Bird Conservation Region
BLM – Bureau of Land Management
BMP – best management practice
BOR – Bureau of Reclamation
CAA – Clean Air Act
CAP – capable habitat
CC – canopy cover
CCH – Coho Critical Habitat
CEQ – Council on Environmental Quality
CFR – Code of Federal Regulations
CHU – critical habitat unit
COE – US Army Corps of Engineers
CWA – Clean Water Act
CWD – coarse woody debris
DBH – diameter at breast height
DEQ – Department of Environmental Quality
DOT – Department of Transportation
DSP – dispersal habitat
EA – Environmental Assessment
EF – east fork
EFH – essential fish habitat
EIS – environmental impact statement
ENSO – El Nino Southern Oscillation
EP Act – Energy Policy Act
ESA – Endangered Species Act
ESU – evolutionarily significant unit
EO – Executive Order
FAA – Federal Aviation Administration
FCC – Federal Communications Commission
FEIS – Final Environmental Impact Statement
FERC – Federal Energy Regulatory Commission
FG – fragile for slope gradient
FLPMA – Federal Land Policy Management Act
FMP – Fire Management Plan
FOI – Forest Operations Inventory
FONSI – Finding of No Significant Impact
FP – fragile for mass movement
FW – fragile for ground water
GBBDC – Game Birds Below Desired Condition
GFMA – General Forest Management Area
GIS – Geographic Information System
GGO – great gray owl
GTRN – Ground Transportation Network
HUC – hydrologic unit code
IDT/ ID Team – interdisciplinary team
IM – instructional memorandum
JCEP – Jordan Cove Energy Project
KLE – Klamath East Critical Habitat Unit
KOP – known observation point
KSA – Klamath Study Area
KSOAC – Known Spotted Owl Activity Center
LAA – likely to adversely affect
LNG – liquefied natural gas
LSR – Late Successional Reserve
mbf – thousand board feet
MOA – memorandum of agreement
MOU – memorandum of understanding
NAAQS – National Ambient Air Quality Standards
NEPA – National Environmental Policy Act
NF – north fork
NGA – Natural Gas Act
NH – nesting habitat
NLAA – not likely to adversely affect
NMFS – National Marine Fisheries Service
NRCS – National Resource Conservation Service
NRF – nesting, roosting, and foraging habitat
NSO – northern spotted owl
NWFP – Northwest Forest Plan
O & C – Oregon and California Act, 1938
ODA – Oregon Department of Agriculture
ODEQ – Oregon Department of Environmental Quality
ODF – Oregon Department of Forestry
ODFW – Oregon Department of Fish and Wildlife
OHV – off-highway vehicle
OM – organic matter
ORS – Oregon Revised Statutes
OSHA – Occupational Safety and Health Administration
OSMP – Oregon Smoke Management Plan
PCE – primary constituent element
PCGP – Pacific Connector Gas Pipeline
PCT – pre-commercial thinning
PDF – Project Design Features
PDO – Pacific Decadal Oscillation
PE – polyethylene
PM – particulate matter
PM 2.5 – particulate matter smaller than 2.5 microns

PM 10 – particulate matter smaller than 10 microns
PNW – Pacific Northwest
QMD – quadratic mean diameter
RA-32 – Recovery Action 32
RAWS – Remote Automated Weather Station
RDI – relative density index
RMP – Resource Management Plan
ROD – Record of Decision
ROW – right-of-way
RR – Riparian Reserve
S & M – Survey and Manage
SDWA – Safe Water Drinking Act
SEIS – Supplemental Environmental Impact Statement
SF – south fork
SNEP – Sierra Nevada Ecosystem Project
SONCC – Southern Oregon/Northern California Coasts
SSP – Special Status Plants
SSRA – Smoke Sensitive Receptor Area
SSS – Special Status Species
SVS – Stand Visualization System
T&E – Threatened and Endangered
TMDL – total maximum daily load
TP – tree planting
TPA – trees per acre
TPCC – timber production capability class
TSZ – transient snow zone
USDA – United States Department of Agriculture
USDI – United States Department of the Interior
USFS – United States Forest Service
USFWS – United States Fish and Wildlife Service
VRM – visual resource management
WA – Watershed Analysis
WF – west fork
WOPR – Western Oregon Plan Revision
WQMP – Water Quality Management Plan
WUI – Wildland Urban Interface
WQRP – Water Quality Restoration Plan

Glossary of Terms

A

Abiotic: Non-living elements of an environment.

Activity Fuel: The combustible material resulting from or altered by forestry practices such as timber harvest or thinning, as opposed to naturally created fuels.

Affected Environment: The area impacted by the Proposed Action.

Alternative: Other options to the proposed action by which the BLM can meet its purpose and need.

Animal Unit Month (AUM): The amount of forage required to sustain the equivalent of one cow and a calf for one month.

Anthropogenic: Of human origin or influence.

Aquatic: Living or growing in or near the water.

Available Water Capacity: That portion of soil water which plants can extract.

B

Basal Area: The cross-sectional area of a single stem including the bark, measured at breast height (4.5 ft. above the ground); the cross-sectional area of all stems of a species or all stems in a stand measured at breast height and expressed per unit of land area.

Baseline: The starting point for analysis of environmental consequences.

Best Management Practices (BMPs): State-of-the-art mitigation measures, generally considered benchmark standards.

Biotic: Living elements of an environment.

Brush: To remove shrubby undergrowth.

Bryophyte: A type of nonvascular plant including mosses, liverworts, and hornworts.

C

Canopy Cover: The percent of a fixed area covered by the crown of an individual plant species or delimited by the vertical projection of its outermost perimeter; small openings in the crown are included.

Cultural Resources: Those resources of historical and archaeological significance.

Cumulative Effects: Those effects on the environment that result from the incremental effect of the action when added to past, present, and reasonably foreseeable future actions regardless of what agency or person(s) undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

D

Dispersal: The movement of an individual from their origin to a new site.

Dispersal Habitat: Northern spotted owl habitat which is not suitable for nesting, roosting, or foraging, but has sufficient patchy cover to be used for travel between suitable stands, a minimum of 40% canopy cover, and an average tree diameter greater than 11 inches with flying space for owls in the understory.

Diversity: The aggregate of species assemblages (communities), individual species, the genetic variation within species, and the processes by which these components interact within and among themselves. The elements of diversity are 1) community diversity (habitat, ecosystem), 2) species diversity, and 3) genetic diversity within a species. All three change over time.

Dripline: The line extending vertically from the exterior edge of a tree's live crown to the ground.

Duff: The partially decomposed organic material of the forest floor beneath the litter of freshly fallen twigs, needles, and leaves.

E

Ecosystem: A system made up of a community of animals, plants, and micro-organisms and its interrelated physical and chemical environment.

Edge Effect: The modified environmental conditions or habitat along the margins of forest stands or patches.

Effects Analysis: Predicts the degree to which the environment will be affected by an action.

Endangered Species: Any animal or plant species in danger of extinction throughout all of a significant portion of its range. These species are listed by the US Fish and Wildlife Service.

Endemic: A species that is unique to a specific locality.

Environmental Assessment (EA): A concise, public document containing a federal agency's analysis of the significance of potential environmental consequences of a proposed action. The EA need not contain the level of analysis contained in an Environmental Impact Statement (EIS). An EA is used to determine whether an EIS is needed or a "finding of no significant impact" (FONSI) is warranted.

Environmental Impact Statement (EIS): A detailed statement of a federal project's environmental consequences, including adverse environmental effects that cannot be avoided, alternatives to the proposed action, the relationship between local short-term uses and long-term productivity, and any irreversible or irretrievable commitment of resources.

Ephemeral Stream: A stream that flows only in direct response to precipitation, and whose channel is at all times above the water table.

Erosion: The detachment and movement of soil or rock fragments by water, wind, ice, or gravity.

F

Fauna: The animals of a specified region or time.

Finding of No Significant Impact (FONSI): A finding that explains that an action will not have a significant effect on the environment and, therefore, an EIS will not be required.

Fire Regime: The characteristic frequency, extent, intensity, severity, and seasonality of fires within an ecosystem.

Flora: The plants of a specified region or time.

Fuel load: the oven-dry weight of fuel per unit area.

Fully Decommission: The road surface would be decompacted so that the former compacted surface would be rendered loose and friable to a depth of 12 to18 inches or to a point where 10-inch diameter stones are the dominant substrate (whichever is shallower). Slash, boulders, and other debris would be placed along the roads "entire length" as determined by availability of materials to provide ground cover and discourage mechanized use. Blockage at the entrance would consist of placing logs, slash, boulders, berms, and other material so the entrance is camouflaged for a minimum distance of 100 feet and vehicle access is precluded. Seeding with approved native seed species and mulching with weed-free straw or approved native materials would occur within Riparian Reserves and within 100 feet of the roads entrance. All drainage structures would be removed.

G

Ground Water: Water in the ground that is in the zone of saturation; water in the ground that exists at or below the water table.

GTRN (Ground Transportation Road Network): Roads over which the BLM has jurisdiction and maintenance responsibilities.

H

Habitat: A specific set of physical conditions in a geographic area(s) that surrounds a single species, a group of species, or a large community. In wildlife management, the major components of habitat are food, water, cover, and living space.

Habitat Fragmentation: The breakup of extensive habitat into small, isolated patches which are too limited to maintain their species stocks into the indefinite future.

HUC5: Fifth field hydrologic unit code, or watershed.

HUC6: Sixth field hydrologic unit code, or subwatershed.

HUC7: Seventh field hydrologic unit code or tributary to a subwatershed.

Hydrology: The science dealing with the properties, distribution, and circulation of water.

I

Impact: Synonymous with "effects." Includes ecological, aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Impacts may also include those resulting from actions which may have both beneficial and detrimental (adverse) effects. Impacts may be considered as direct, indirect, or cumulative.

Implementation Action: An action that implements land use plan decisions.

Indicators: Parameters of ecosystem function that are observed, assessed, measured, or monitored directly or indirectly to determine attainment of a standard(s).

Infiltration: The downward entry of water into the soil.

Infiltration Rate: The rate at which water enters the soil.

Intermittent Stream: Seasonal stream; a stream that flows only at certain times of the year when it receives water from springs or from some surface source, such as melting snow in mountainous areas.

Invertebrate Species: Any animal without a backbone or spinal column.

K

Key Watershed: A watershed containing (1) habitat for potentially threatened species or stocks of anadromous salmonids or pother potentially threatened fish, or (2) greater than 6 square miles with high-quality water and fish habitat.

L

Landing: A cleared area in the forest to which logs are yarded or skidded for loading onto trucks for transport.

Late-successional Forest: Forest seral stages which include mature and old-growth age classes.

Lichen: A composite organism formed from the symbiotic association of a fungus and an alga.

Long-Term Closure: The road would be effectively blocked and winterized prior to the wet season. Blockage at the entrance would consist of placing logs, slash, boulders, earthen berms, and other material so the entrance is camouflaged for a minimum distance of 100 feet and vehicle use is precluded. Prior to closure the road will be left in an erosion-resistant condition.

M

Mass Movement: Soil and rock movement downslope (e.g. slumps, earth flows).

Matrix: BLM-managed lands designated by Congress under the Northwest Forest Plan where most timber harvest and other silvicultural activities would be conducted.

Mitigating Measures: Constraints, requirements, or conditions imposed to reduce the significance of or eliminate an anticipated impact to environmental, socioeconomic, or other resource value from a proposed land use.

Mixed-Conifer Forest: A mix of tree species that include Douglas-fir, ponderosa pine, sugar pine, incense cedar, and white fir.

Monitoring: A process of collecting information to evaluate if objective and anticipated or assumed results of a management activity or plan are being realized, or if implementation is proceeding as planned.

Morphology: The study of the form and structure of organisms and their specific structure features, internal and external.

N

Nonpoint Source Pollution: Pollution that arises from an ill-defined and diffuse source, such as runoff from cultivated fields, agricultural lands, urban areas, or forests and wildlands.

Nonvascular: Plants with specialized methods of transporting water and nutrients without xylem or phloem (e.g. mosses, hornworts, liverworts, algae).

Noxious Plants: Those plants which are injurious to public health, agriculture, recreation, wildlife, or any public or private property.

O

O&C Lands: Public lands managed by the BLM under the O&C Act of 1937 for permanent forest production, in accord with the principle of sustained yield. Lands administered under the O&C Act must also be managed in accordance with other environmental laws.

Off-Highway Vehicles (OHV): Any motorized vehicle designed for or capable of cross-country travel over land, water, sand, snow, ice, marsh, swampland, or other terrain.

Organic Matter: Plant and animal residues accumulated or deposited at the soil surface; the organic fraction of the soil that includes plant and animal residues at various stages of decomposition; cells and tissues of soil organisms, and the substances synthesized by the soil population.

P

Perennial Stream: A stream that flows continuously. Perennial streams are generally associated with the water table in the localities through which they flow.

Permeability: The ease with which gases, liquids, or plant roots penetrate or pass through bulk mass of soil or a layer of soil.

Planning Area: All of the lands within the BLM management boundary addressed in a BLM resource management plan; however, planning decisions only apply to BLM-administered lands and mineral estate.

Plant Community: An association of plants of various species found growing together in different areas with similar site characteristics.

Point Source Pollution: Pollution that arises from a well-defined origin, such as discharge from an industrial plant or runoff from a feedlot.

Preferred Alternative: The alternative BLM believes would reasonably accomplish the purpose and need for the proposed action while fulfilling its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors. This alternative may or may not be the same as the proposed action.

Prescribed Fire: Controlled application of fire to natural fuels under conditions of weather, fuel moisture, and soil moisture that will allow confinement of the fire to a predetermined area and, at the same time, will produce the intensity of heat and rate of spread required to accomplish certain planned benefits to one or more objectives for wildlife, livestock, and watershed values. The overall objectives are to employ fire scientifically to realize maximum net benefits at minimum environmental damage and acceptable cost.

Prey species: An animal taken by a predator as food.

Proposed Action: A proposal for BLM to authorize, recommend, or implement an action to address a clear purpose and need.

Public Lands: Any lands administered by a public entity, including (but not limited to) the Bureau of Land Management and the US Forest Service.

Pyroclastic: Composed chiefly of fragments of volcanic origin.

R

Ravel: Loose rock material on a hillslope, usually of gravel or cobble size.

Record of Decision (ROD): The decision document associated with an environmental impact statement.

Refugia: Locations and habitats that support populations of organisms that are limited to small fragments of their previous geographic range.

Resource Management Plan (RMP): A land use plan prepared by the BLM under current regulations in accordance with the Federal Land Policy and Management Act (FLPMA).

Right-Of-Way (ROW): Federal land authorized to be used or occupied for the construction, operation, maintenance, and termination of a project, pursuant to a ROW authorization.

Riparian Area: An area containing an aquatic ecosystem and adjacent upland areas that directly affect it.

Riparian Habitat: The living space for plants, animals, and insects provided by the unique character of a riparian area.

Riparian Reserve (RR): A federally designated buffer around streams, springs, ponds, lakes, reservoirs, fens, wetlands, and areas prone to slumping, on federal lands only. The Northwest Forest Plan's Aquatic Conservation Strategy defines riparian reserve widths for the above water bodies.

S

Scope: The extent of an analysis in a NEPA document.

Scoping: The process by which BLM solicits internal and external input on the issues and effects that will be addressed in planning, as well as the degree to which those issues and effects will be analyzed in the NEPA document.

Sediment Yield: The quantity of soil, rock particles, organic matter, or other dissolved or suspended debris which is transported through a cross-section of stream during a given period.

Sensitive Species: Those species that (1) have appeared in the Federal Register as proposed for classification and are under consideration for official listing as endangered or threatened species or (2) are on an official state list, or (3) are recognized by a land management agency as needing special management to prevent their being placed on Federal or state lists.

Seral Stage: A temporal or intermediate stage in the process of succession.

Shelterwood: The cutting of most trees, leaving those needed to produce a new age class in a moderated microenvironment.

Silviculture: The science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet diverse needs.

Silvicultural System: A planned sequence of treatments or prescriptions over the entire life of a forest stand needed to meet management objectives.

Skid: To drag a log from within a harvest unit to a collection point (landing).

Slash: The residual vegetation (e.g., treetops and branches) left on the ground after logging.

Soil Series: The lowest or most basic category of the U.S. system of soil classification.

Species: A group of related plants or animals that can interbreed to produce offspring.

Special Status Species (SSS) include:

Proposed species – species that have been officially proposed for listing as threatened or endangered by the Secretary of the Interior. A proposed rule has been published in the Federal Register.

Listed Species – species officially listed as threatened or endangered by the Secretary of the Interior under the provisions of the ESA. A final rule for the listing has been published in the Federal Register.

Endangered Species – any species which is in danger of extinction throughout all or a significant portion of its range.

Threatened Species – any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Candidate Species – species designated as candidates for listing as threatened or endangered by the FWS and/or NMFS. A list has been published in the Federal Register.

State Listed Species: Species listed by a state in a category implying but not limited to potential endangerment or extinction. Listing is either by legislation or regulation.

Subwatershed: The sixth level in the hydrologic unit hierarchy. A subwatershed is a subdivision within a fifth level watershed.

Succession: A series of dynamic changes by which one group of organisms succeeds another through stages leading to potential natural community or climax.

Sustained Yield Forestry: The yield that a forest can produce continuously at a given intensity of management; the achievement and maintenance in perpetuity of a high-level annual or regular periodic

output of the various renewable resources without impairment of the productivity of the land.

T

Tier 1 Key Watershed: areas that either provide, or are expected to provide, high-quality aquatic habitat. These watersheds are intended to serve as refugia for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species.

Tiering: Using the coverage of general matters in broader NEPA documents in subsequent, narrower NEPA documents, allowing the tiered NEPA document to narrow the range of alternatives and concentrate solely on the issues not already addressed.

Topography: The configuration of a surface area including its relief, or relative elevations, and position of its natural and anthropogenic features.

Total Maximum Daily Loads (TMDLs): Pollution load limits calculated by DEQ for each pollutant entering a water body. TMDLs describe the amount of each pollutant a waterway can receive and still not violate water quality standards. Both point and non-point source pollution are accounted for in TMDLs as well as a safety margin for uncertainty and growth that allows for future discharges to a water body without exceeding water quality standards.

Transient Snow Zone (TSZ): The area where a mixture of snow and rain occurs, sometimes referred to as the rain-on-snow zone. The snow level in this zone fluctuates throughout the winter in response to alternating warm and cold fronts. Rain-on-snow events originate in the transient snow zone.

Turbidity: The cloudy condition caused by suspended solids, dissolved solids, natural or human-developed chemicals, algae, etc. in a liquid; a measurement of suspended solids in a liquid.

U

Understory: That portion of trees or other woody vegetation which forms the lower layer in a forest stand which consists of more than one distinct layer.

V

Vascular: Plants having phloem- and xylem-conducting elements that facilitate the moving of water and nutrients.

Vertebrate Species: Any animal with a backbone or spinal column.

W

Watershed: All land and water within the confines of a drainage divide.

Watershed Analysis: A systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. Watershed analysis provides a basis for ecosystem management planning.

Wetlands: Lands including swamps, marshes, bogs, and similar areas, such as wet meadows, river overflows, mud flats, and natural ponds.

Wildland-Urban Interface (WUI): The area where structures and other human development meet or intermingle with undeveloped wildland.

Windthrow: A tree or trees uprooted or felled by the wind.

Y

Yarding: The act or process of conveying logs or whole trees to a landing, particularly by cable, tractor, or helicopter.