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)

MAR 6 2014

Dear Interested Public:

The attached *Environmental Assessment* (EA) for the Howard Forest Management Project is now available for a 30-day public review. The EA is also available electronically on the Medford District BLM website at http://www.blm.gov/or/districts/medford/plans/index.php.

The Bureau of Land Management (BLM), Ashland Resource Area, proposes to implement the Howard Forest Management Project, designed to implement specific Management Objectives consistent with the 1995 Medford District Resource Management Plan (RMP). The Howard Project involves harvesting trees in mixed conifer forest stands on BLM-administered lands in the Upper Jenny Creek subwatershed of the Jenny Creek Watershed.

Forest management would be accomplished using a combination of timber sale and service contracts. Silvicultural treatments, designed under the principles of sustained yield forestry, are tailored to forest and site conditions to meet the desired long term objectives for each forest stand type. Forest management would be designed to improve tree vigor and growth, reduce the impacts of forest disease, and promote stand diversity and the maintenance of fire resilient species such as pine and incense cedar.

The Proposed Action would include commercial timber harvest utilizing ground based systems. Alternative 2, the proposed Action Alternative, also includes unit-specific activity fuels treatments. Under Alternative 2, an estimated 17 miles of existing roads would be used as haul routes and improved as needed to meet BLM standards, construction of an estimated 0.5 mile of temporary roads would occur. The Project also includes a proposal to decommission an estimated total length of 1.9 miles of existing roads.

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 April 5, 2014.**

All comments should be made in writing and mailed or delivered to Chamise Kramer, 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 Chamise Kramer, Natural Resource Specialist, at 541-618-2450.

Sincerely,

John Gerritsma
Field Manager
Ashland Resource Area

Enclosure

ENVIRONMENTAL ASSESSMENT

for the

HOWARD FOREST MANAGEMENT PROJECT

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

(DOI-BLM-OR-M060-2013-0007-EA)

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

EA COVER SHEET

RESOURCE AREA: Ashland

ACTION/TITLE: Howard Forest Management Project

EA NUMBER: DOI-BLM-OR-M060-2013-0007-EA

LOCATION: T. 38 S., R. 03 E., in sections 11-13, 23, and 26; T. 38 S., R. 04 E. in sections 7, 17, 19, and 29; T. 39 S., R. 03 E., in section 1; and T. 39 S., R. 04 E., in sections 5; Willamette Meridian, Jackson County, Oregon.

LIST OF PREPARERS	RESPONSIBILITY
Kristi Mastrofini	Timber, Engineering & Roads
Craig Brown	Logging Systems
Nate Goodwine	Silviculture Prescriptions, Carbon Storage
Mike Derrig	Hydrology/Water Resources
John McNeel	Road Specifications
Greg Chandler	Fire and Fuels, Air Quality
Chris Volpe	Aquatic Resources and ACS
Amy Meredith	Soils
Steve Slavik	Range
Ginelle O'Connor	T & E Animals, Wildlife
Armand Rebischke	Botany, Noxious Weeds
Zach Million	Recreation and Visual Resources Management
Chamise Kramer	NEPA Compliance & Writer/Editor

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 Howard Project 1-3
D. DECISION FRAMEWORK 1-4
E. LAND USE CONFORMANCE AND LEGAL REQUIREMENTS 1-5
F. RELEVANT ASSESSMENTS AND PLANS 1-6
G. SCOPING AND ISSUES 1-8
1. Relevant Issues 1-9
2. Issues Considered but not Further Analyzed 1-10

CHAPTER 2 – ALTERNATIVES

A. INTRODUCTION 2-1
B. COMPONENTS OF THE ACTION ALTERNATIVE 2-1
1. Silvicultural Objectives and Prescriptions 2-1
2. Commercial Harvest Methods 2-4
3. Post-Harvest Fuels (Activity Fuels) Reduction Treatments 2-4
C. ALTERNATIVES DESCRIBED IN DETAIL 2-4
1. Alternative 1—No Action Alternative 2-4
2. Alternative 2—Proposed Action 2-5
3. Project Design Features 2-15
   a. Riparian Reserves 2-15
   b. Harvest and Yarding 2-16
   c. Prescribed Fire 2-17
   d. Roads and Landings 2-17
   e. Hauling 2-18
   f. Quarries 2-19
   g Oil and Hazardous Materials and Emergency Response 2-19
   h. Silviculture 2-19
   i. Terrestrial Wildlife 2-20
   j. Botanical Resources 2-21
   k. Recreation 2-22
   l. Rangeland Resources/Grazing 2-22
   m. Cultural Resources 2-23
5. Implementation Monitoring 2-23
D. ACTIONS AND ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS 2-23

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 3-4
1. Affected Environment 3-4
   a. Landscape Pattern 3-4
   b. Plant Series and Associations 3-5
   c. Tree Growth and Vigor 3-6
   d. Forest Pathogens 3-9
   e. Coarse Woody Material 3-9
2. Environmental Consequences 3-11
   a. Alternative 1—No Action Alternative 3-11
   b. Alternative 2—Proposed Action 3-13

C. FIRE AND FUELS 3-16
1. Affected Environment 3-16
   a. Fire Regimes 3-17
   b. Predicted Climate Changes 3-17
   c. Condition Class 3-18
   d. Fire Hazard 3-18
   e. Fire Risk 3-18
   f. Surface Fuels and Fire Behavior 3-18
   g. Effects of Past Management 3-19
2. Environmental Effects 3-23
   a. Alternative 1—No Action Alternative 3-23
   b. Alternative 2—Proposed Action 3-23

D. SOIL RESOURCES 3-27
1. Affected Environment 3-27
   a. Description of Soils Series 3-28
   b. Roads 3-31
   c. Soil Productivity 3-32
   d. Past Actions 3-33
2. Environmental Consequences 3-34
   a. Alternative 1—No Action Alternative 3-34
   b. Alternative 2—Proposed Action 3-34

E. WATER RESOURCES 3-41
1. Affected Environment 3-41
   a. Analysis Area Description 3-41
2. Environmental Consequences 3-51
   a. Alternative 1—No Action Alternative 3-51
   b. Alternative 2—Proposed Action 3-54

F. AQUATIC HABITAT & FISH 3-58
1. Key Fisheries and Aquatic Resources Issues 3-59
2. Past, Ongoing, and Reasonably Foreseeable Future Actions 3-61
3. Affected Environment—Fish and Designated Habitat 3-62
   a. Fish Distribution 3-62
4. Environmental Consequences—Fish and Designated Habitat 3-63
5. Affected Environment—Aquatic Habitat 3-63
6. Environmental Consequences—Aquatic Habitat 3-65
   a. Alternative 1—No Action Alternative 3-65
   b. Alternative 2—Proposed Action 3-65
7. Affected Environment—Riparian Reserves 3-71
8. Environmental Consequences—Riparian Reserves 3-73
   a. Alternative 1—No Action Alternative 3-73
   b. Alternative 2—Proposed Action 3-73

G. CONSISTENCY WITH AQUATIC CONSERVATION STRATEGY 3-73
1. Introduction 3-73
2. Consistency Review 3-74
H. TERRESTRIAL WILDLIFE 3-76
1. Introduction 3-76
2. Affected Environment—General 3-77
a. Vegetation Conditions and Terrestrial Wildlife Habitats (General) 3-77
b. Special Status Wildlife Species 3-79
c. Federally Listed Species 3-80
d. Survey and Manage Species 3-85
e. BLM Bureau Sensitive Species 3-86
f. Other Wildlife Species of Concern 3-87
2. Environmental Effects 3-88
a. Alternative 1—No Action Alternative 3-88
b. Alternative 2—Proposed Action 3-89
I. BOTANY 3-97
1. Introduction 3-97
2. Affected Environment 3-97
a. Vascular and Non-Vascular Plants 3-98
b. Fungi 3-98
3. Environmental Effects 3-99
a. Alternative 1—No Action Alternative 3-100
b. Alternative 2—Proposed Action 3-100
J. NOXIOUS WEEDS AND INTRODUCED PLANTS 3-101
1. Affected Environment 3-101
a. Noxious Weeds 3-101
b. Introduced Plants 3-102
2. Environmental Effects 3-102
a. Alternative 1—No Action Alternative 3-102
b. Alternative 2—Proposed Action 3-103
3. Weed Risk Assessment (Including Field Review and Field Reconnaissance Results) 3-104
K. RECREATION 3-105
1. Affected Environment 3-105
2. Environmental Consequences 3-106
a. Alternative 1—No Action Alternative 3-106
b. Alternative 2—Proposed Action 3-106
L. VISUAL RESOURCES MANAGEMENT 3-107
1. Affected Environment 3-107
2. Environmental Consequences 3-107
a. Alternative 1—No Action Alternative 3-107
b. Alternative 2—Proposed Action 3-107
M. RANGELAND RESOURCES/GRAZING 3-111
1. Affected Environment 3-111
2. Environmental Consequences 3-112
a. Alternative 1—No Action Alternative 3-112
b. Alternative 2—Proposed Action 3-112
N. CARBON STORAGE 3-112
1. Background 3-112
2. Affected Environment 3-113
3. Environmental Consequences 3-113
a. Alternative 1—No Action Alternative 3-113
b. Alternative 2—Proposed Action 3-113
O. OTHER EFFECTS 3-114
1. Cultural Resources 3-114
2. Air Quality 3-114
2. Environmental Justice 3-116

CHAPTER 4 – PUBLIC PARTICIPATION 4-1

LITERATURE CITED

APPENDIX A – SURVEY AND MANAGE COMPLIANCE..... A-1

APPENDIX B – ACRONYMS AND GLOSSARY B-1

CHAPTER 1 - PURPOSE AND NEED

A. INTRODUCTION

The Bureau of Land Management (BLM), Ashland Resource Area, proposes to implement the Howard Project, a forest management project. The Howard Forest Management Project is designed to implement specific Management Objectives for lands allocated to the production of Timber Resources described in the Bureau of Land Management's 1995 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 Howard Forest Management Project on BLM-administered lands. The analysis documented in this EA will provide the BLM 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 & WHERE IS THE PROJECT LOCATED?

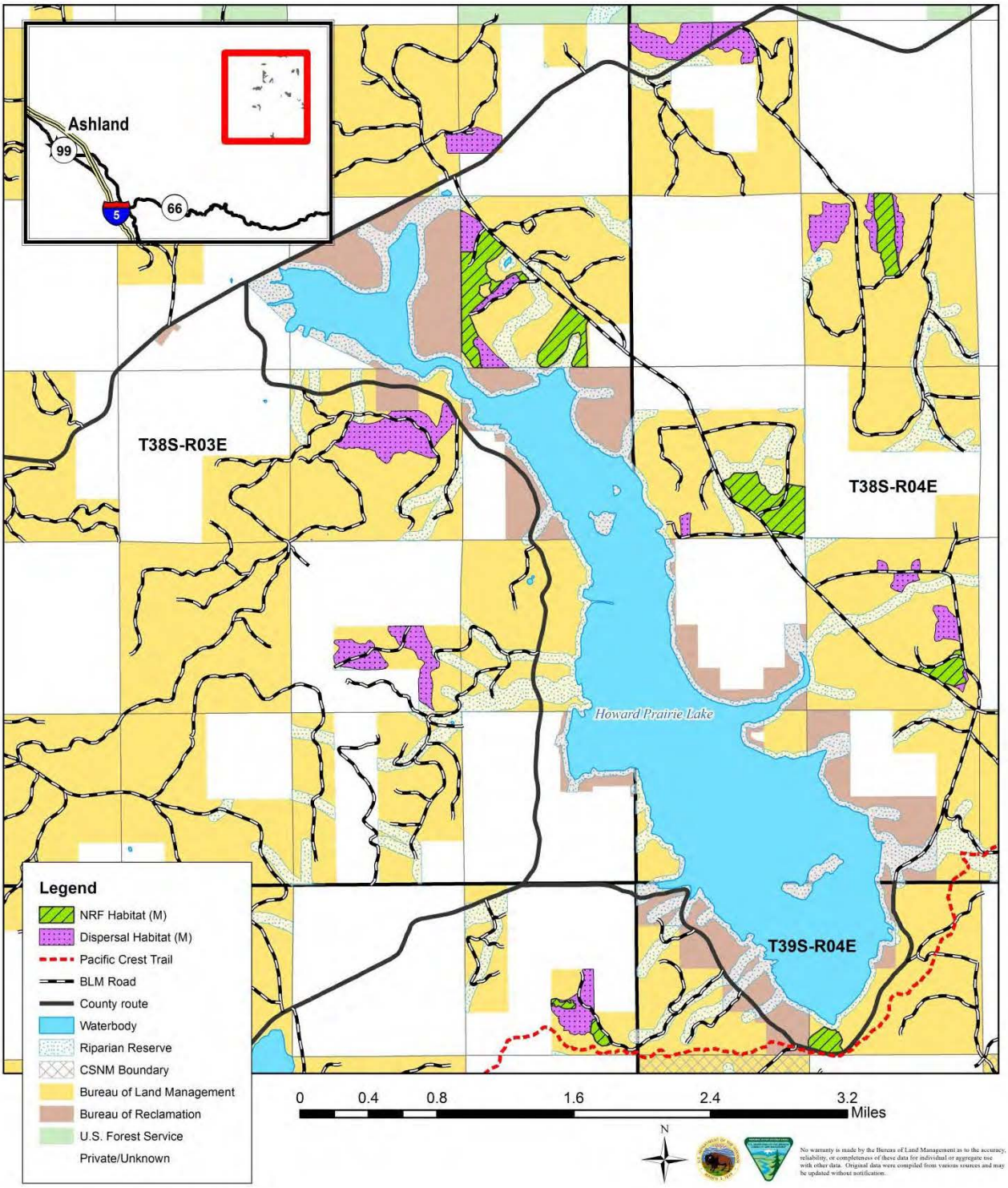
This section provides a brief summary of BLM's proposal for forest management. A more detailed description of BLM's Proposed Action is included in Chapter 2, Alternatives. The proposed 638 acre Howard Project would harvest trees in mixed conifer forest stands on BLM-administered land in the Upper Jenny Creek subwatershed of the Jenny Creek Watershed.

Forest management would be accomplished using a combination of timber sale and service contracts. Silvicultural treatments, designed under the principles of sustained yield forestry, are tailored to forest and site conditions to meet the desired long term objectives for each forest stand type. Forest management would be designed to improve tree vigor and growth, reduce the impacts of forest disease, and promote stand diversity and the maintenance of fire resilient species such as pine and incense cedar.

The Proposed Action would include commercial timber harvest utilizing ground based systems. Alternative 2, the proposed Action Alternative, also includes unit-specific activity fuels treatments. Under Alternative 2, an estimated 17 miles of existing roads would be used as haul routes and improved as needed to meet BLM standards, and construction of an estimated 0.5 mile of temporary roads would occur. The analysis also includes the proposal to decommission an estimated total length of 1.9 miles of existing roads.

The Howard Project Area is defined as the area where action is proposed, including connected actions. The Public Land Survey System description for the Howard Project Area is: T. 38 S., R. 03 E., in sections 11-13, 23, and 26; T. 38 S., R. 04 E. in sections 7, 17, 19, and 29; T. 39 S., R. 03 E., in section 1; and T. 39 S., R. 04 E., in section 5; Willamette Meridian, Jackson County, Oregon (Map 1-1).

Map 1-1. Howard Project Vicinity Map



C. WHY IS THE BLM PROPOSING THIS FOREST MANAGEMENT PROJECT?

The Howard Forest Management Project is designed to provide for long-term forest (timber) production in the Howard Project Area while minimizing the effects to existing northern spotted owl habitat within the provincial home ranges of spotted owl sites.

The design and development of the Howard Forest Management Project is consistent with the goals and timber-resource management objectives in the 1995 Medford District ROD/RMP for managing Matrix lands designated for timber management and production. The 1995 Record of Decision (ROD) and Resource Management Plan (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* (Northwest Forest Plan) (USDA and USDI 1994).

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);
- 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); 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 Proposed Howard 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:

Based on the stated objective in the 1995 RMP for Timber Resources, there is a need to provide a sustainable supply of timber. Per the stated objectives for Matrix lands, there is a 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 Howard Project Area (USDI 1995, pp. 38-39, 72).

One of the applicable laws governing the major portion of BLM-administered lands in the Howard Project 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 Howard Project Area 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). 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).

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 Howard Forest Management Project proposes commercial forest thinning and selection 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, while minimizing the effects to northern spotted owl habitat within the provincial home range(s).

Within the Howard Project 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 Medford District RMP provides direction for road management: to "[d]evelop and maintain a transportation system that serves the needs of users in an environmentally sound manner" (USDI 1995, p. 84). Roads throughout the Project Area were reviewed for the need for maintenance to restore and/or improve road surfaces, cross drains, and roadside drainage ditches in order to reduce road-related erosion and sedimentation to stream courses. The Project Area was also reviewed to determine existing and needed access to facilitate timber harvest in proposed units. Temporary road construction is proposed to facilitate access to areas proposed for treatment in order to meet Matrix land objectives and the Howard Project purpose and need. Road improvements are designed for the Howard Forest Management Project to facilitate access to harvest units, as well as to reduce road-related erosion and sedimentation to stream courses; per the RMP, "[s]tandards will be the minimum necessary to meet resource and allocation objectives while having minimal impacts on the environment" (USDI 1995, p. 88).

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 Howard Forest Management Project. The Ashland Resource Area Field Manager must decide whether to implement the Proposed Action Alternative as designed or whether to select the No-Action Alternative.

The decision will also include a determination whether or not the impacts of the Proposed Action are significant to the human environment. If the impacts are determined to be within the range analyzed in the 1995 RMP Environmental Impact Statement (EIS) (USDI 1995), 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/EIS, then a project-specific EIS must be prepared.

The forthcoming decision record will document the authorized officer's rationale for selecting a course of action based on the needs/objectives described above, the effects documented in the EA, and the extent to which the decision:

Contributes toward the Districts Allowable Sale Quantity (ASQ)

> The Howard 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).

Meets the BLM's obligation to protect resources consistent with existing laws, policy, and the direction of the 1995 Record of Decision and Resource Management Plan

> The relevant issues listed below (Section G: *Scoping and Issues*) provide the necessary framework for assessing the merits and the consequences to the physical, biological, and human environment of implementing the Howard Forest Management Project. Section E: *Land Use Conformance and Legal Requirements* provides the context for determining the Project's consistency and conformance with land use plans, agency policy and regulations, and existing laws.

E. LAND USE CONFORMANCE AND LEGAL REQUIREMENTS

Conformance with Land Use Plans

The Medford District designed this project to be in conformance with the 1995 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 Howard Project is consistent with the Medford District Resource Management Plan 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).

Survey and Manage

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in *Conservation Northwest, et al. v. Rye, et al., No. 08-1067 (W.D. Wash.) (Coughenour, J.)*, granting Plaintiffs' motion for partial summary judgment and finding a variety of NEPA violations in the BLM and USFS 2007 Record of Decision eliminating the Survey and Manage mitigation measure.

Judge Coughenour deferred issuing a remedy in his December 17, 2009 order until further proceedings, and did not enjoin the BLM from proceeding with projects. Plaintiffs and Defendents entered into settlement negotiations that resulted in the 2011 Survey and Manage Settlement Agreement, adopted by the District Court on July 6, 2011.

The Ninth Circuit Court of Appeals issued an opinion on April 25, 2013, reversing the District Court for the Western District of Washington's approval of the 2011 Survey and Manage Settlement Agreement and remanded the case back to the District Court for further proceedings.

On February 18, 2014, the U.S. District Court for the Western District of Washington issued an order vacating the 2007 Record of Decision. The project may proceed because the Howard Forest Management Project meets the provisions of the last valid Record of Decision, specifically 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* (not including subsequent Annual Species Reviews).

Consultation

Consultation with the US Fish and Wildlife Service was initiated April 4, 2013 Medford BLM Grave Howard Mining Biological Assessment (BA). The USFWS released a Biological Opinion (BO) (Reference Number 01EOFW00-2013-F-0137) on June 21, 2013.

The BA and BO used the Owl Estimation Methodology that was found to be invalid by the District Court for the District of Columbia on June 26, 2013 because it did not go through the rulemaking procedures of 5 U.S.C. § 553 (*Swanson, et al. v. Salazar, et al.,* No. 10-1843-RJL). However, the Amended Order, dated July 25, 2013, stated that consultation completed prior to 70 days after the date of the Amended Order was permissible. As consultation for the Howard Forest Management Project was completed June 21, 2013, this consultation is still valid.

Special Status Species

The Howard 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).

Statutes and Regulations

The Proposed Action Alternative 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.

- **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.

- **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.

- **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

Jenny Creek Watershed Analysis (WA) (USDI 1995)

Watershed Analysis 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.

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).

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 (See Federal Guide for Watershed Analysis 1995, p. 1).

The Howard Project Area falls within Jenny 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 Howard Forest Management Project, has been collected and is considered, along with existing information provided by the 1995 *Jenny Creek Watershed Analysis.* Management Objectives and Recommendations provided by the Watershed Analysis were considered and addressed as they applied to the Howard proposal.

The Jenny Creek Watershed Analysis describe the condition of the lands affected in the Howard Project Area resulting from a multitude of natural processes and human actions that have taken place over many decades. The current conditions of the lands affected by the proposed Action Alternative are described in Chapter 3 under the Affected Environment sections specific to each resource. The current conditions described in the Affected Environment reflect the natural processes and human actions that have taken place over many decades within the Watersheds. This EA will address the effects of the Howard Forest Management Project, which includes proposed road construction and timber harvesting, by analyzing the potential for cumulative impacts that may result when adding the incremental effects of the Howard proposed actions together with the effects of past, current and reasonably foreseeable future actions.

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 multilayered conifer forests" (U.S. Fish and Wildlife Service 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. The Howard Project defers proposed treatment in RA 32 stands identified by interagency survey guidance (USDA and USDI 2010) (see Chapter 2 Section D: *Actions and Alternative Considered But Eliminated from Detailed Analysis*) and is consistent with consultation completed with the U.S. Fish and Wildlife Service (USFWS), (USFWS 2011 and USFWS 2012b); therefore, the project is consistent with the *Revised Recovery Plan for the Northern Spotted Owl*.

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

This transportation management plan is not a decision document; rather, it provides guidance for implementing applicable decisions of the 1995 Medford District Resource Management Plan (which incorporated the Northwest Forest Plan).

Southwest Oregon Fire Management Plan (ODF 2010)

The Southwest Oregon Fire Management Plan (FMP) provides Southwest Oregon with an integrated concept in coordinated wildland fire planning and protection among Federal, State, local government entities and citizen initiatives.

The FMP introduces fire management concepts addressing fire management activities in relation to resource objectives stated in the current Land and Resource Plans (parent documents) of the Federal agencies, the laws and statutes that guide the state agencies and private protective associations, and serve 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.

A letter briefly describing the Proposed Action and inviting comments was mailed to adjacent landowners, interested individuals, organizations, and other agencies on February 12, 2013. Comments were requested to be received by March 15, 2013.

The following articles were submitted for BLM-review during the scoping process. The BLM reviewed these documents, and considered the information in developing the proposed Action Alternative:

Submitted:

- Odion, D.C., E.J. Frost, J.R. Strittholt, H. Jiang, D.A. 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.
- Naiman, R.J., E.V. Balian, K.K. Bartz, R. E. Bilby, and J. J. Latterell. 2002 Dead wood dynamics in stream ecosystems. USDA/Forest service PSW – General Technical Report-181
- McDade, M. H. Swanson, F. J.: McKee, W. A.: Franklin, J. F.; Van Sickle, J. 1990. Source distances for coarse woody debris entering small streams in western Oregon and Washington. Canadian Journal of Forest Research 20: 326-330
- Dolloff, C. A., and M. L. Warren, Jr. 2003 Fish Relationships with Wood in Small Streams. Pages 1790194 in S.V. Gregory, K. L. Boyer, and A. M. Gurnell, editors. The Ecology and Management of Wood in World Rivers. Americans Fisheries Society, Symposium 37, Bethesda, Maryland.
- Minor, K. P. 1997. Estimating large woody debris recruitment from adjacent riparian areas. Master's thesis, Oregon State University
- 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 rparian forest dynamics for the generation of large woody debris and shade. Forest Ecology and Management 162: 299-318
- Keim, R. F. , A.E. Skaugset, and D.S. bateman. 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
- Odion et al. Patterns of Fire Severity and Forest Conditions in the Western Klamth Mountains, California. Conservation Biology. 2004. We have discussed in the body of these comments how this paper calls into question many of the assumptions of BLM planners regarding the efficacy of logging and canopy reduction to increase fire resiliency.
- Colombaroli, Daniele and Gavin, Daniel. Highly Episodic Fire and Erosion Regime Over the Past 2,000 y in the Siskiyou Mountains, Oregon. PNAS. 2010. This article illuminates the relative impacts of logging and road construction compared to wildfire on sediment production in the Ashland Resource Area. It also establishes that mistletoe levels are not outside their historic range of variability. Both of these findings call into question the BLM's assumptions regarding the No Action Alternative.
- Trombulack, Stephen and Frissell, Christopher. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. Conservation Biology. 2000. This article calls into question the BLM's assumption that additional road construction in this highly roaded Key Watershed will not result in significant environmental impacts to resources of concern.
- MacDonald, Lee and Drew B. R. Coe. Road Sediment Production and Delivery: Processes and Management. This article discusses how use of unpaved roads can increase sediment production by more than an order of magnitude. These findings are relevant to analysis of BLM timber haul plans.
- Marsh, David and Beckman, Noelle. Effects of Roads on the Abundance and Activity of Terrestrial Salamanders. Ecological Applications. 2004. This article discusses the significant impacts of the "edge effect" from (even temporary) road construction on wildlife and wildlife habitat that is often ignored or downplayed by BLM timber planners.

- Ortega, Yvette, and Capen, David. Effects of Forest Roads on Habitat Quality For Ovenbirds in a Forested Landscape. The Auk. 1999. This article discusses the effects of roads on bird reproductive success and is relevant to BLM road construction plans.
- Holderegger, Rolf and Di Guilo Manuela. The Genetic Effects of Roads: A Review of Empirical Evidence. Basic and Applied Ecology. 2010. This article discusses the impacts of forest road habitat fragmentation on wildlife genetic diversity, a subject which is generally ignored in Ashland Resource Area logging road construction proposals.
- Agee, James and Skinner, Carl. Basic Principles of Forest Fuel Reduction Treatments. Forest Ecology and Management. 2005. This article indicates that fuel reduction treatments will be most effective if they retain large trees and focus on low thinning rather than canopy thinning. This is relevant to Ashland Resource Area proposals to log large diameter trees in the overstory.
- Greenwald et al. A Review of Northern Goshawk Habitat Selection… Wildlife Society Bulletin. 2005. This article indicates that timber activities that protect large trees and retain canopy closure have the fewest adverse impacts to Goshawk populations.

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. Some issues identified as relevant to this project proposal were analyzed in association with broader level environmental analyses. Where appropriate, this EA will incorporate by reference the analysis from broader level NEPA documents (40 CFR § 1508.28), to be considered along with project specific analysis. The following issues related to the Proposed Action Alternatives were identified by the interdisciplinary team based on internal and external scoping.

- Timber harvest activities, including road construction, timber yarding and hauling, could increase soil compaction and displacement, increase sediment, reduce site productivity, and alter hydrologic flow, including peak flow and low flow.
- There could be short-term increases in sediment from roadbed and drainage ditch disturbance associated with road maintenance activities.
- Concerns have been expressed that timber harvest activities could lead to increased access for off-highway vehicles (OHVs) potentially increasing impacts to soils, water quality, and aquatic and terrestrial habitat.
- 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 soils, water quality, hydrologic function, and aquatic and terrestrial habitats.
- Proposed Project activities need to incorporate the findings disclosed in the Jenny Creek Watershed Analysis.
- Increased sedimentation to streams from the implementation of the project proposal could potentially impact aquatic habitat and fish.
- Timber harvest and road construction has the potential to affect northern spotted owl nesting, roosting, foraging, and dispersal habitat.
- Timber harvest, including the removal of Douglas-fir dwarf mistletoe infected trees, could reduce the complexity of forest structure including vertical and horizontal diversity, snags, and downed wood that provides habitat for variety of wildlife species.
- Thinning in forest stands with latent infections of Douglas-fir dwarf mistletoe can stimulate the growth of mistletoe and its adverse effects on growth and vigor forest stands.
- Some commenters expressed concern for maintenance of old-growth forest or individual trees.
- Appropriate harvesting systems, operations costs, road maintenance and the potential for winter

hauling should be considered to achieve an economically viable sale.

- Timber harvest and road construction activities have the potential to affect Bureau Special Status vascular plants, bryophytes, lichens, and fungi.
- Forest management and logging can increase the risk of introduction and spread of noxious weeds.
- Course woody material densities need to be consistent with the project RMPs and RODs and should support the natural range of biota within the Project Area.
- The Project is entirely located in the Wildland-Urban Interface (WUI), and as such, should be designed to include appropriate hazard fuels reduction throughout project implementation.

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.

Current condition of nearby Late Successional Reserves (LSRs): Commenters raised the question: "What is the current condition of the nearby LSRs? Are they functioning?"

> ***Rationale for eliminating from detailed analysis:*** While there is a LSR on neighboring Forest Service-administered lands, there are no mapped BLM-administered LSRs in the Jenny Creek Watershed. Because the Howard Forest Management Project does not affect any LSRs, NEPA does not require an analysis or discussion of the specific conditions of these LSRs as part of the Project EA. The role of LSRs, as identified under the Northwest Forest Plan, is to provide for the maintenance and enhancement of a well-distributed network of late-successional forests to provide habitat for populations of species associated with late-successional and old-growth forests (USDI 1994, p. B-5; USDI 1995, pp. 32 and Appendix A). The Northwest Forest Plan EIS (FSEIS) recognized that LSRs are composed of a variety of vegetation classes; under Alternative 9 of the FSEIS (adopted and incorporated by the Medford District 1995 RMP), 42 percent of LSRs were covered by late-successional forests (USDI 1994, pp. 3- and 4-39). The ability of these reserves to meet the objectives of the Northwest Forest Plan was analyzed and disclosed in the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl*.

Analysis of LSRs has taken place at broader scales, and is beyond the scope of analysis contained in this EA.

CHAPTER 2 - ALTERNATIVES

A. INTRODUCTION

This Chapter describes the proposed Action Alternative developed by the ID Team to achieve the objectives identified in the Need statements in Chapter 1. In addition, a "No Action" Alternative is presented to form a baseline for analysis. Project Design Features (PDFs), which apply the Best Management Practices (BMPs) as described in Appendix D of the 1995 RMP (and modified by Resource Management Plan Maintenance dated July 12, 2012), are integral to the design of the Proposed Action. The PDFs are included as features of the Proposed Action in the analysis of anticipated environmental effects.

B. COMPONENTS OF THE ACTION ALTERNATIVE

The Howard Forest Management Project is designed to implement timber-resource management objectives in the 1995 Medford District ROD/RMP for managing lands designated for timber management and production.

1. Silvicultural Objectives and Prescriptions

The silvicultural objectives for harvest are as follows: 1) to increase resistance/resilience of forests stands to wildfire, drought, insects, disease, etc.; 2) to restore more characteristic stand structure and species composition for mixed conifer forest types (encourage regeneration and survival of pine species); 3) to maintain and promote structural complexity (e.g., increase growing space and decrease competition for large and/or legacy pine ,cedar and Douglas-fir trees); 4) to maintain critical components of nesting, roosting, and foraging (NRF) spotted owl habitat; and 5) to maintain components of dispersal owl habitat.

While meeting the above-stated silvicultural objectives, and with regard to the northern spotted owl, the goal is to minimize effects on suitable habitat, particularly in the provincial home range. The BLM will strive to meet this goal through the design of the Proposed Action and the implementation of PDFs which were incorporated into the design of the Proposed Action for the Howard Forest Management Project.

Trees would be marked for harvest within proposed treatment units by BLM personnel, with oversight from the Ashland Resource Area's Silviculturist and Wildlife Biologist, to ensure that treatment units are marked according to the silvicultural prescriptions. Treatment units would be marked to retain specific percent canopy cover by prescription. Using a fish-eye photographic lens, the difference between forested stands with 40% and 60% canopy cover is illustrated in Figure 2-1.

Figure 2-1. Photographs illustrating >60% canopy cover (left), and 40% canopy cover (right).

Silvicultural Prescriptions within Northern Spotted Owl Nesting, Roosting, and Foraging (NRF) Habitat

NRF habitat is characterized by forested stands with older forest structure with characteristics such as canopy cover of 60% or greater, trees with large crowns, multiple canopy layers, snags, and down wood. However, southwest Oregon NRF habitat varies greatly, and one or more of these habitat components might be lacking or even absent prior to silvicultural treatments. Forest stands that are currently providing northern spotted owl NRF habitat would be thinned to maintain and, in some cases, promote NRF habitat function. Vegetative features of NRF habitat in southwest Oregon are typified by mixed-conifer habitat, recurrent fire history, and patchy habitat components. The silvicultural strategy here includes the use of Selective Thinning to maintain NRF characteristics.

Selective Thinning—Maintain NRF Habitat

Forest stands that are currently providing northern spotted owl NRF habitat would be thinned to maintain and, in some cases, promote NRF habitat function. The complex forest structure that forms NRF habitat consists of dead down wood, snags, dense canopy, multi-storied stands, or mid-canopy habitat. Selective thinning of NRF habitat is designed to reduce density of white fir trees and low-vigor trees in mixed conifer stands, while maintaining a minimum of 60% canopy cover at the stand level and other important structural components. Canopy cover is the proportion of the forest floor covered by the vertical projection of tree crowns (Figure 2-1). Canopy cover is usually estimated with devices like the moosehorn, aerial photography, or remote imagery. 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[1]. Trees targeted for removal would include those with crown ratios less than 30%, 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%. Additionally, NRF units would be marked so that no less than an average of 180 square feet of basal area[2] remains, post-harvest.

When encountered, thin around large (greater than 18-inches in DBH) ponderosa and sugar pine to approximately 100-120 sq. ft. of basal area[2], not to exceed 1/5 acre in size. Mark all competing white fir trees first, and then thin the residual species if appropriate. Such pine thinning would be limited to no more than about one per acre in NRF units to avoid compromising the canopy cover and basal area targets. The same guidelines apply when encountering root disease pockets. Where root disease pockets are encountered, select resistant species for leave, where possible, and remove symptomatic trees**.** Target white fir trees for removal first; secondly, focus on leaving resistant species, followed by uninfected or the least infected trees. Incense cedar, sugar pine, and ponderosa pine are the most resistant to the diseases and would be favored for leave in and around the disease pockets. Disease-infected trees may be marked for removal if prescribed canopy cover retention for the stand is not compromised.

Silvicultural Prescriptions within Northern Spotted Owl Dispersal Habitat

Dispersal habitat is described as forested habitat greater than 40-years old with an average tree diameter of 11 inches, a canopy cover of approximately 40% or more, is open enough for flight and predator avoidance, but does not meet the habitat criteria of NRF habitat.

Density Management—Maintain Dispersal Habitat

Forest stands that currently provide northern spotted owl dispersal habitat would have trees removed to lower the overall stand density, while still retaining a minimum of 40% canopy cover and important structural components. Per the stated Project need to maintain and promote vigorously growing conifer forests, reduce tree mortality, and provide timber resources utilizing sustained-yield principles, the

1 Stand Level: the level of forest management at which an easily defined area of the forest that is relatively uniform in species composition or age can be managed under a single prescription, or set of treatments, to meet well-defined objectives.
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 trees in a stand, measured at breast height, expressed in square feet per acre. Measurement of how much of a site occupied by tree; directly related to stand volume and density.

primary objective of tree removal is to reduce stand densities and enhance stand level diversity while maintaining a minimum 40% canopy cover. Density management of dispersal habitat is designed to thin low-vigor and white fir trees across all diameter classes to accelerate the growth of the retained trees, while maintaining a minimum of 40% canopy cover at the stand level. Trees targeted for removal would include those with crown ratios less than 30%, that exhibit crown decline and/or narrow crown widths, and contribute least to the canopy layer. Trees would be individually selected for removal that demonstrate these characteristics, unless removal compromises the required minimum average canopy cover of 40%. Additionally, dispersal units would be marked so as no less than an average of 100-140 square feet of basal area remains following harvest.

Thin around large (greater than18-inches DBH) ponderosa and sugar pine to approximately 100-120 square feet of basal area, not to exceed 1/5 acre in size. Mark all competing white fir trees first, and then thin the residual species if appropriate. Such pine thinning would be limited to no more than about two per acre in dispersal units to avoid compromising the canopy cover and basal area targets. The same guidelines apply to root disease pockets. Where root disease pockets are encountered, select resistant species for leave where possible and remove symptomatic trees**.** Target white fir trees for removal first; secondly, focus on leaving resistant species, followed by uninfected or the least infected trees.

General Guidance Applicable to all Silvicultural Prescriptions

Strive to maintain or create diverse vertical and horizontal stand structure by leaving trees of all crown classes with crown ratios of $\geq$ 30%. Strive for stand diversity in regard to diameter classes, species compostion, tree heights (crown classes), trees per acre, and the vigor of individual trees. Some diseased, forked-top trees, and dying and dead trees should remain.

The preference is to retain trees with the old-growth characteristics described below:

- Larger and older than the second-growth trees in the current stand, an indication that the tree may be one of the seed trees of the present-day stand. These trees have a bottle-brush shape (non-symmetrical crown). (These characteristics apply to all conifer species.)
- Large-diameter limbs indicating that the tree was once open-grown and had a large crown. Limbs (live or dead) are usually heavy and gnarled, are covered with mosses and lichens, and are close to the ground. (These characteristics apply to all conifer species.)
- Douglas-fir with thick bark, deep fissures and a chocolate brown color. (Second-growth trees have more gray color in the bark.) Ponderosa pines with thick bark, plate-like and yellow orange in color.

The intent of retaining trees with the aforementioned characterisitics is to retain and/or promote structural complexity within stands treated. Situations where trees with the above-mentioned characteristics may be harvested include where the tree compromises operational safety and/or to meet stated management guidelines in root disease pockets.

Favor leaving sugar pine, ponderosa pine, incense cedar, Douglas-fir, and white fir, respectively.

Within harvest units, retain all snags (standing dead) and coarse woody material (CWM) of various size and decay classes, unless determined by OSHA health and safety guidelines to present a risk to people. Snags fallen for safety reasons within these units will be left as CWM to further contribute towards key habitat elements. Hardwood species and Pacific yew would also be reserved for stand diversity, structure, and wildlife habitat, unless determined to be a safety hazard by OSHA health and safety guidelines.

Trees with bird nests, wildlife cavities, wide forks with flat nesting spots, or loose bark (which function as bat roosts) would generally not be removed. Additionally, clumps of trees adjacent to snags or wildlife trees may be retained for stand diversity. When available, leave some broken, forked top, and deformed trees that are greater than 20 inches DBH. Trees of this size with mistletoe infections on the tree bole, specifically

those that currently provide a structure or platform for wildlife nests would count toward these guidelines. These trees would provide additional structural features for habitat and serve as future CWM recruitment.

Do not mark seed trees. Do not mark any tree, that if felled, would endanger a seed tree.

2. Commercial Harvest Methods

Trees designated for removal per the forest stand prescriptions described above would be moved from forest stands to landing areas using tractor yarding methods. Within all tractor units, the potential for the use of mechanized ground-based yarding methods also exists.

Tractor Yarding: utilizes tractors to drag trees to landing locations. Tractor yarding occurs on lands with less than 35% slope. This method requires narrow skid trails (approximately 9 to 12 feet wide). Skid trail locations are approximately 150 feet apart, but vary depending on the site-specific terrain, and the locations are pre-determined and approved by the BLM Contract Administrator. Pre-determined locations of skid trails minimize the area of ground a tractor operates on, thus minimizing soil disturbance. Trees posing safety hazards would be removed, and trees in skid trails and landing areas may be removed when operationally required.

Mechanized Ground-Based Yarding: utilizes 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 (aka 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 1-2, and mechanical trails would be limited to operating an average of 50 feet off of designated skid trails.

3. Post-Harvest Fuels (Activity Fuels) Reduction Treatments

Fuels reduction is an important component of stand treatments and Project Design Features are incorporated into the Proposed Action to address these actions. Small diameter slash (generally 3 inches in diameter and less) created from harvest activities (activity slash) would be cut, handpiled, and covered with plastic following completion of timber harvest operations. Pile burning is usually completed within 6 months to 2 years 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.

C. ALTERNATIVES DESCRIBED IN DETAIL

1. Alternative 1—No Action Alternative

The No Action Alternative describes a baseline against which the effects of the Proposed Action can be compared. This alternative describes the existing conditions and the continuing trends, given the effects of other present actions and reasonably foreseeable actions identified. Under the No Action Alternative, no vegetation or transportation management would be implemented; no commercial cutting of trees or associated activity fuels treatments, and no road construction, road decommissioning, or project specific road maintenance would occur. 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?

Only normal programmed road maintenance would be performed. 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 decision process aborted. Future harvesting, other connected actions, and road management in this area would not be precluded and could be analyzed under subsequent NEPA documents.

Not implementing portions of the Proposed Action (Alternative 2) would be consistent with the No Action Alternative (Alternative 1). In this instance, an explanation of why portions of the Proposed Action would not be implemented would be included in the Project Decision Record (DR).

2. Alternative 2—Proposed Action

Alternative 2 was developed to achieve the objectives of the Purpose and Need described in Chapter 1 for the Howard Forest Management Project. Alternative 2 would treat 638 acres of vegetation using the various silvicultural prescriptions as described. Post-harvest fuels reduction (activity fuels) would occur in commercial treatment units as described in section B.3. Harvesting would primarily occur along existing roads. Additionally, an estimated 0.50 mile of temporary road would be constructed.

Table 2-1 summarizes the Howard Forest Management Project by silvicultural treatment prescriptions and timber harvest methods. Unit-specific information, including fuels reduction treatments, are displayed in Table 2-2 and Maps 2-1, 2-2, 2-3, 2-4, and 2-5.

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

NSO Habitat Type	Estimated Acres
Maintain NSO Nesting, Roosting, and Foraging Habitat (NRF)	244
Maintain NSO Dispersal Habitat	394
Total	**638**
Silvicultural Prescription	**Estimated Acres**
Mixed Conifer Density Management	394
Mixed Conifer Selective Thinning	244
Total	**638**
Associated Treatments	**Estimated Acres**
Activity Fuels	638
Timber Harvest Method in Commercial Units	**Estimated Acres**
Tractor Yarding	638
Total	**638**

Table 2-2. Alternative 2 Units by Silvicultural Prescription, NSO Habitat, and Harvest Method

Unit No.	Acres	Harvest Method	Silvicultural Prescription		Associated Treatments
			Harvest Prescription	NSO Habitat Type	
1-1	15	Tractor	Mixed Conifer selective thinning	NRF (M)	Activity Fuels
1-2	33	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
1-3	4	Tractor	Mixed Conifer selective thinning	NRF (M)	Activity Fuels
1-4	7	Tractor	Mixed Conifer selective thinning	NRF (M)	Activity Fuels
7-1	44	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
7-2	28	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
11-1	26	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
13-1	15	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
13-2	10	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
13-3	11	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
13-4	59	Tractor	Mixed Conifer selective thinning	NRF (M)	Activity Fuels
13-4	2	Tractor	Mixed Conifer selective thinning	NRF (M)	Activity Fuels
13-5	37	Tractor	Mixed Conifer selective thinning	NRF (M)	Activity Fuels

Unit No.	Acres	Harvest Method	Silvicultural Prescription		Associated Treatments
			Harvest Prescription	NSO Habitat Type	
17-1	29	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
17-2	9	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
17-3	9	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
17-4	32	Tractor	Mixed Conifer selective thinning	NRF (M)	Activity Fuels
19-1	5	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
19-2	68	Tractor	Mixed Conifer selective thinning	NRF (M)	Activity Fuels
23-1	84	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
26-1	27	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
26-2	34	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
29-1	2	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
29-2	10	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
29-3	16	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
29-4	2	Tractor	Mixed Conifer density management	Dispersal (M)	Activity Fuels
29-5	20	Tractor	Mixed Conifer selective thinning	NRF (M)	Activity Fuels
TOTAL	**638**				

Abbreviations: M=Maintain
NRF=Nesting, Roosting, Foraging

Proposed Haul Routes (Existing Roads)

An estimated 17.21 miles of existing roads would be used as haul routes and maintained as needed to meet BLM road maintenance standards identified in the BLM's 2010 Western Oregon Transportation Management Plan. In addition, the following road work is proposed for the Howard Forest Management Project:

- At the road approach for Road 38-3E-13.05, a temporary culvert would be installed where the road crosses the roadside ditch. The road approach would be rocked, and the earthen berm will be removed for the timber harvest activities. At the completion of Project activity, the earth berm will be replaced, and the culvert removed.
- Road 38-4E-7.7 (an existing non-system road that continues through to US Forest Service lands) would be re-opened, rocked, and closed at the completion of Project activities.

Additional road stabilization and/or drainage improvements are noted in Table 2-3.

Table 2-3. 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)
38-3E-11.00	0.28	PRR	BLM	3	2
38-3E-11.01	0.27	NAT	BLM	3	1
38-3E-11.02	0.15	NAT	BLM	3	1
38-3E-13.05	0.22	NAT	BLM	Rock road approach with crushed rock. Installation of temporary culvert, to be removed when road is closed with project completion	1
38-3E-13.06	0.49	ASC	BLM	Rock road approach with crushed rock. Barricade after	2

Road Number	Approximate Length (miles)	Existing Surface	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)
				completion of work	
38-3E-19.00 D	0.30	ASC	BLM	3	2
38-3E-23.01	0.78	NAT	BLM	Spot Rock	1
38-3E-23.03	0.26	NAT	BLM	Spot Rock	1
38-3E-25.00 A	0.18	ASC	BLM	3	2
38-3E-25.02	0.45	NAT	BLM	Spot Rock	1
38-3E-27.01 A	0.07	NAT w/spot rock	BLM	Spot Rock	1
38-3E-27.01 B	0.53	NAT w/spot rock	PVT	Spot Rock	1
38-3E-27.01 C	1.15	NAT	BLM	Spot Rock	1
38-4E-07.00 A	0.80	NAT	BLM	3	1
38-4E-07.00 B	0.40	NAT	BLM	3	1
38-4E-07.00 C	0.59	NAT	BLM	Spot Rock	1
38-4E-7.07	0.13	NAT	BLM	Open barricade, then close after harvest	1
38-4E-17.00	0.27	NAT	BLM	Spot Rock	1
38-4E-19.00	1.20	PRR	BLM	3	2
38-4E-19.03	0.70	NAT	BLM	Rock road approach with crushed rock. Spot rock	1
38-4E-19.04	0.20	ASC	BLM	Spot rock with crushed rock	2
38-4E-29.00	1.71	ASC	BLM	3	2
39-4E-06.03 A	0.66	ASC	BLM	3	2
39-4E-06.03 B	0.67	NAT	BLM	Spot Rock	1
39-7E-31.00 A1	1.99	BST	BLM	3	0
39-7E-31.00 A2	2.49	BST	BLM	3	0
Non-system Spur A	0.12	NAT	BLM	Open barricade, grade surface	1
Non-system Spur B	0.15	NAT	BLM	Open barricade, grade surface	1
Total mileage	**17.21**				

Abbreviations:
Existing Surface: NAT=natural; 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:
3 = no road stabilization/drainage improvements. Road would be maintained to meet BLM standards.
Seasonal Restrictions (for log hauling):
0 = no restrictions
1 = hauling restricted between 10/15 and 6/1
2 = hauling restricted between 11/15 and 5/15
Note:. Seasonal restrictions could be modified as approved by the Authorized Officer if conditions warrant. In addition, purchaser may be allowed to extend timber haul by placing rock on roads if approved by the Authorized Officer.

Proposed Temporary Road Construction

Under Alternative 2, construction of approximately 0.50 miles of temporary road would provide access to proposed Units 1-1, 7-1, 13-4, 17-1, and 17-2. Following harvest activities, these roads would be fully decommissioned according to the terminology adopted in the 2010 Western Oregon Transportation Plan (USDI 2010, p. 34). Associated landings are incorporated into the temporary road design, and analyzed as such.

Temporary roads would be dry weather-use only, and would be decommissioned after use, resulting in no net increase in road density in the Jenny Creek Key Watershed.

Of the five proposed temporary roads, two of them would be road approaches that would be constructed off of County roads, located in T. 38 S., R. 4 E., Section 7 and T. 39 S., R. 4 E., Section 5, with lengths of

0.16 and 0.03 miles, respectively. Approaches would be rocked, used, and decommissioned as per County requirements.

Table 2-4. Alternative 2—Proposed New Temporary Road Construction

Location	Approximate Length (miles)	Surface	Control	Comments
T38S R3E Section 13 Spur	0.13	NAT	BLM	Temporary Road. Decommission after use. Dry season use only.
T38S R4E Section 7 Spur A	0.16	NAT	BLM	Temporary Road. Decommission after use. Dry season use only.
T38S R4E S17 Spur West	0.06	NAT	BLM	Temporary Road. Decommission after use. Dry season use only.
T38S R4E S17 Spur East	0.08	NAT	BLM	Temporary Road. Decommission after use. Dry season use only.
T39S R4E S05 Spur	0.03	NAT	BLM	Temporary Road. Decommission after use. Dry season use only
Total Mileage	**0.46 miles**			

Proposed Road Decommissioning and Long-Term Closures

Five roads are proposed for decommissioning under Alternative 2 (Table 2-5). Decommissioning and road closures would use methods that may include scarifying the surface, installing waterbars, scattering slash and other debris along the length, and camouflaging and blocking the entrance using an earthen berm, logs, boulders or a combination of these. The intent is to prevent use of these roads by off-highway vehicles (OHV) following full decommissioning or long-term closure.

Road 38-3E-13.6 (0.5 miles) would be placed in a long-term closure status to restrict unauthorized access that has resulted in OHV damage to the associated meadow. The road entry at the junction of the Keno Access Road would be blocked using a tank trap and debris.

To facilitate completion of proposed Project activities, 0.27 miles of existing non-GTRN roads (Non-system Spur A and Spur B, accessing Units 13-4 and 13-5, respectively) would be opened and bladed for use. Spur B (Figure 2-2), located in Unit 13-5, will be used specifically to access an existing landing. At the completion of Project activities, both Spurs would be decommissioned by loosening compacted soil, placing debris, barricading, and allowing natural re-vegetation to occur. These temporary roads would be dry-season use only.

Figure 2-2. Existing Non-System Roadbeds

Road 38-3E-23.2 (0.65 miles) would be fully decommissioned via seeding with native grass species, removing culverts, scattering slash and other debris, and effectively blocking access using trench barricades, earthen berms, logs, boulders, or a combination of these.

Road 38-4E-29.02 (0.45 miles) is currently overgrown with trees from an adjacent plantation and is considered nonexistent and naturally decommissioned, with regard to use and future planning. Full decommissioning of this road would remove it from the BLM transportation database, and the natural re-vegetation of the roadbed would continue. This road is not proposed for use during Project activity.

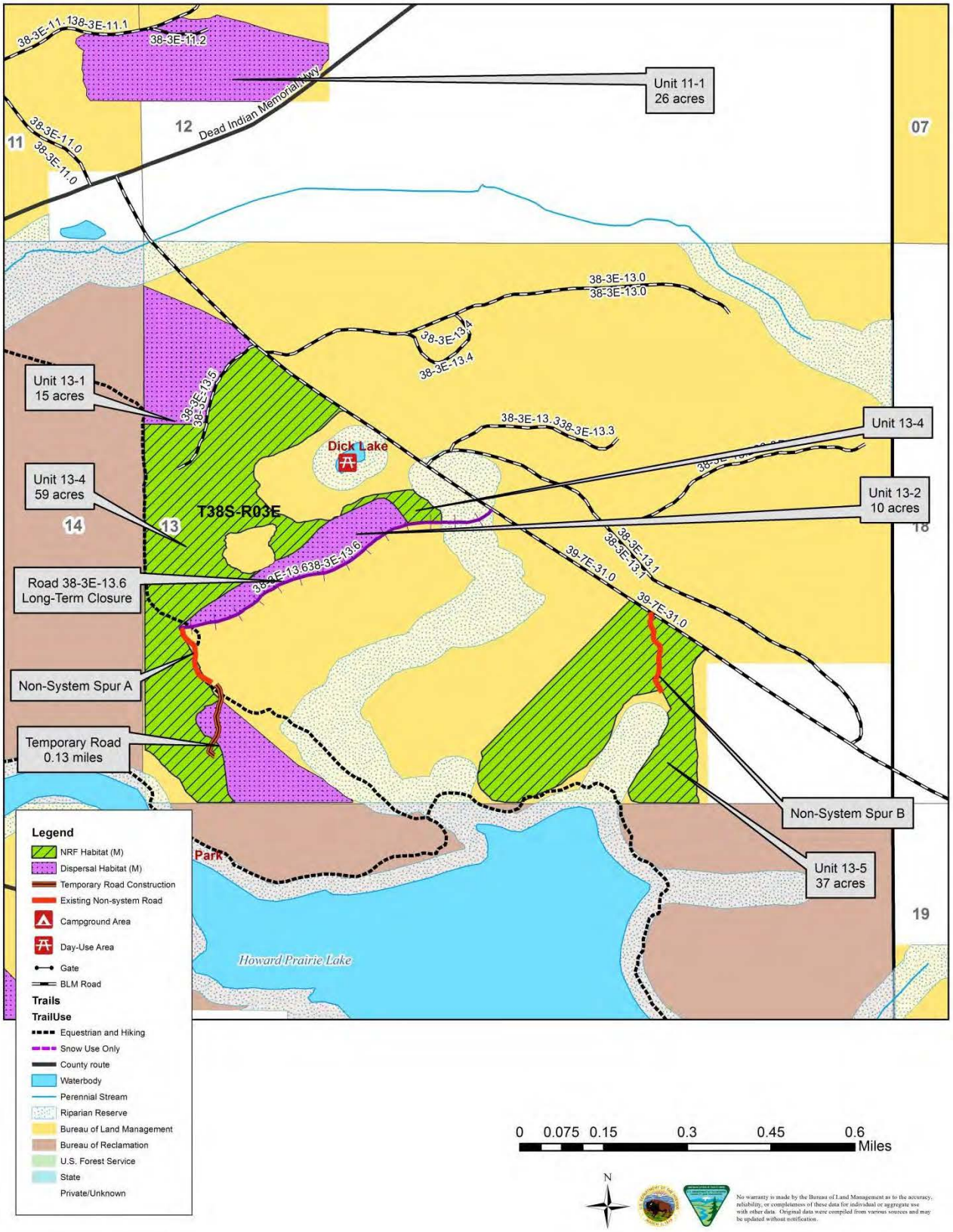
Table 2-5. Proposed Decommissioning and Long-Term Road Closures

Road Number	Approximate Length (miles)	Surface	Control	Decommission/Closure Type[3]
38-3E-13.6	0.50	ABC	BLM	Decommission (Long-Term Closure): Place woody debris across road surface
Non-system Spur A T38 R03E Sec 13	0.12	NAT	BLM	Loosen compacted surface, place debris, and barricade, seed and mulch
Non-system Spur B T38 R03E Sec 13	0.15	NAT	BLM	Loosen compacted surface, place debris, and barricade, seed and mulch
39-3E-23.2	0.65	NAT	BLM	Fully Decommission: Mechanical
38-4E-29.02	0.45	NAT	BLM	Fully Decommission: Natural
Total Mileage	**1.87 miles**			

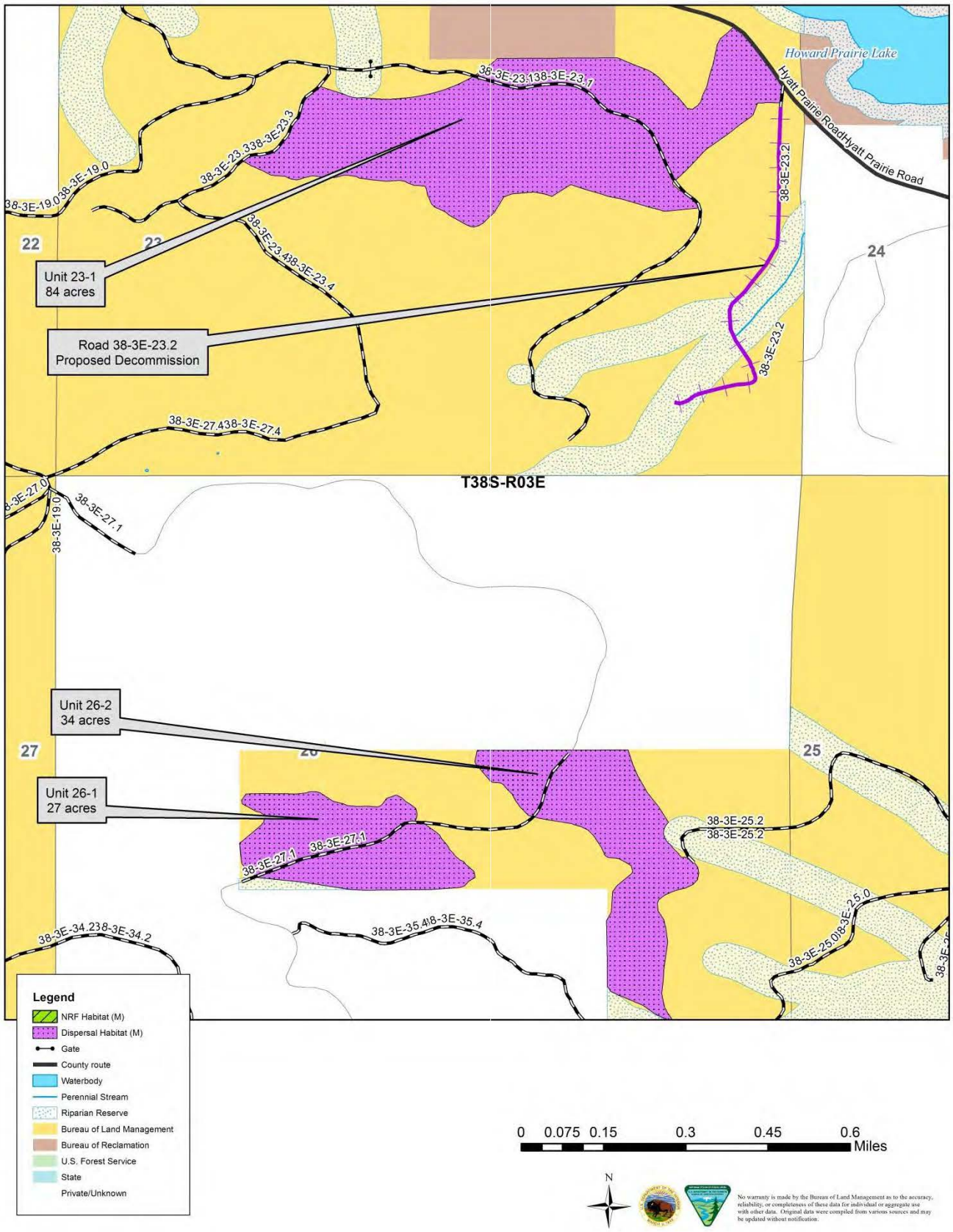
[3] Decommission (long-term closure): Closures based on resource protection needs and RMP directives. The road segment will be closed to vehicles on a long-term basis, but may be used again in the future. Prior to closure, the road will be left in an erosion-resistant condition by establishing cross drains, eliminating diversion potential at stream channels, and stabilizing or removing fills on unstable areas. Exposed soils will be treated to reduce sedimentation. The road will be closed with an earthen barrier or its equivalent. This category can include roads that have been or will be closed due to natural processes (abandonment) and may be opened and maintained for future use. Road segments placed in long-term closure will be moved from FAMS operating status to FAMS storage status.

Full Decommissioning (permanent): Roads determined through an interdisciplinary process to have no future need may be subsoiled (or tilled), seeded, mulched, and planted to re-establish vegetation. Cross drains, fills in stream channels, and unstable areas will be removed, if necessary, to restore natural hydrologic flow. The road will be closed with an earthen barrier or its equivalent. The road will not require future maintenance. This category includes roads that have been closed due to a natural process (abandonment) and where hydrologic flow has been naturally restored. Road segments placed in permanent closure will be moved from FAMS operating status to FAMS decommission status. (USDI 2010)

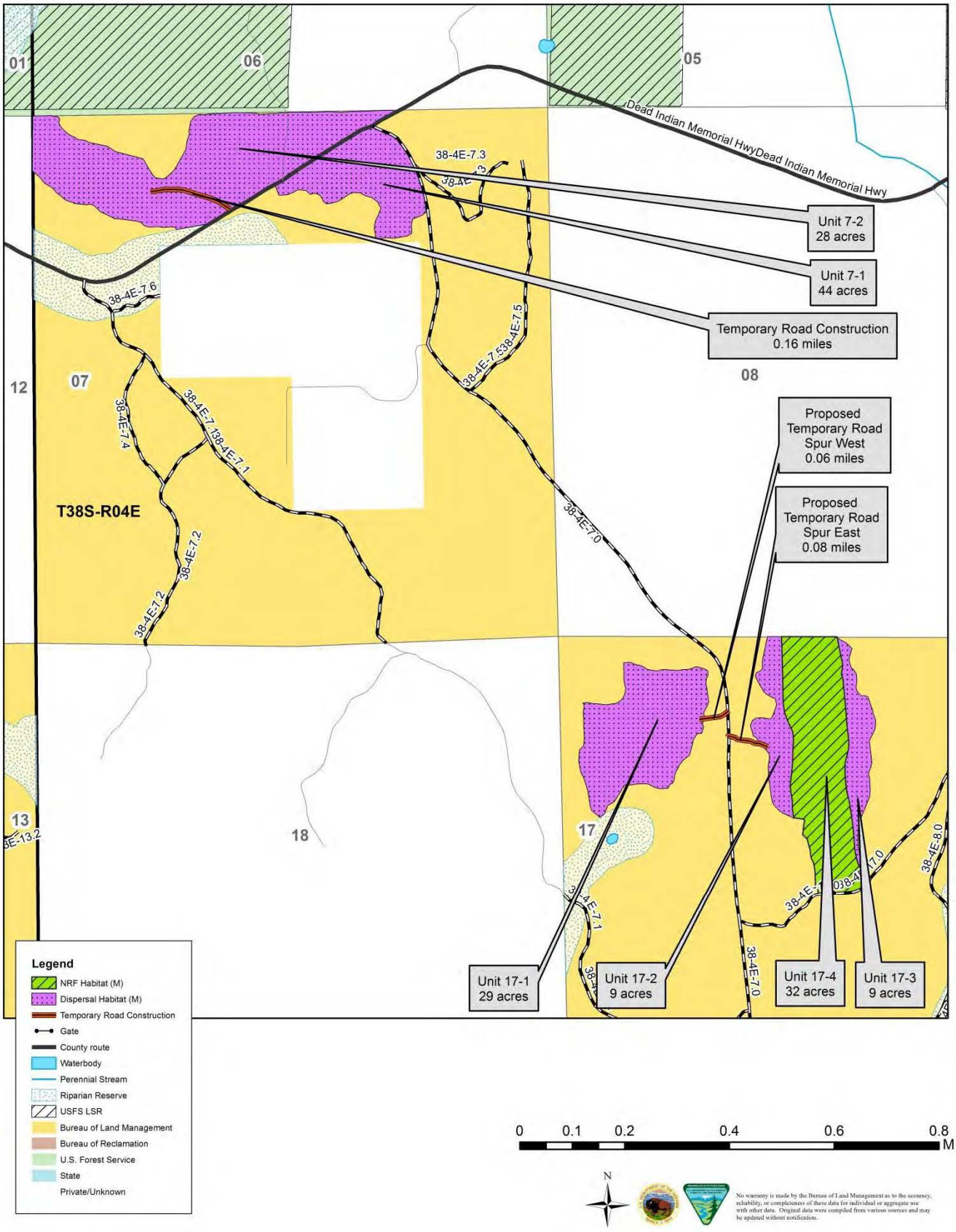
Map 2-1. Howard Forest Management Project Alternative 2



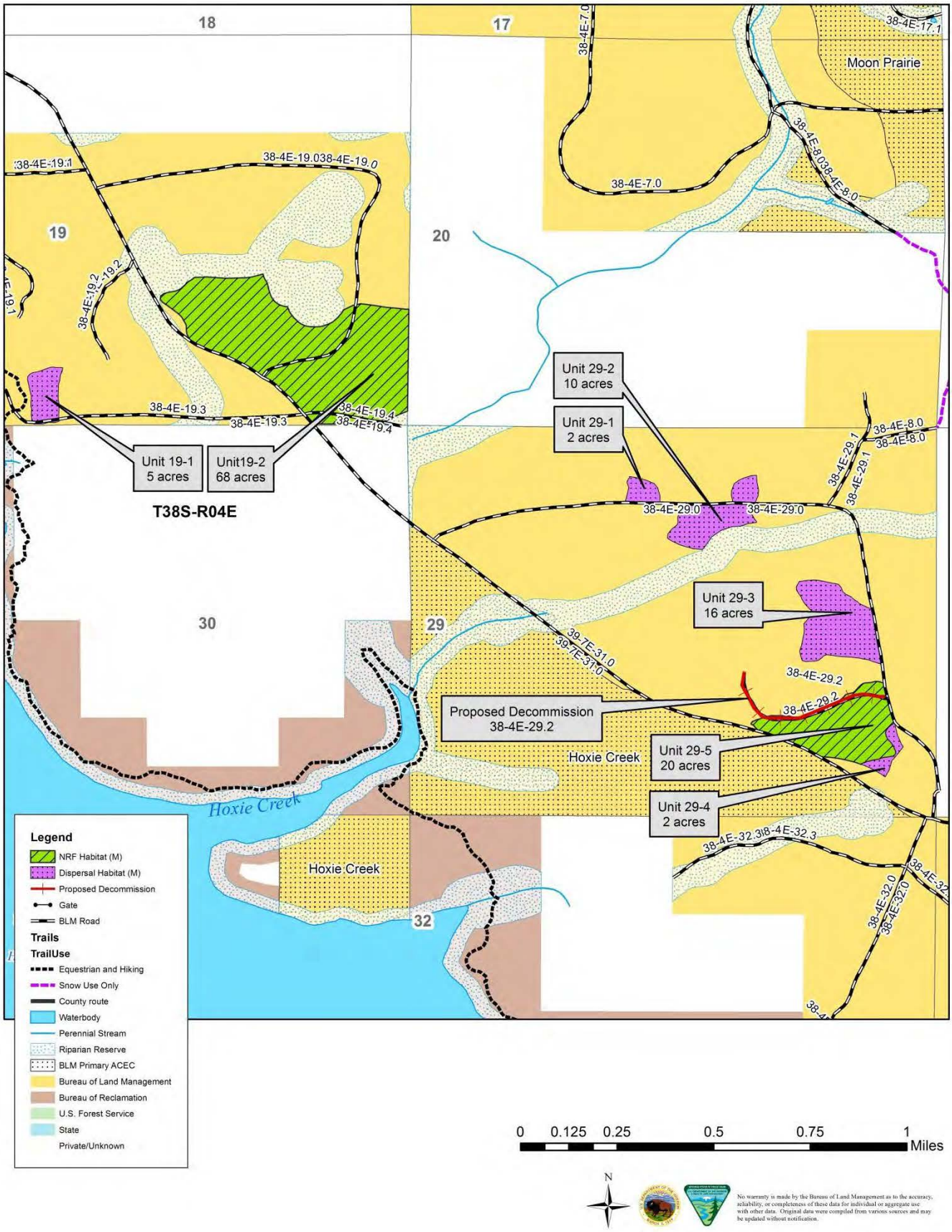
Map 2-2. Howard Forest Management Project Alternative 2



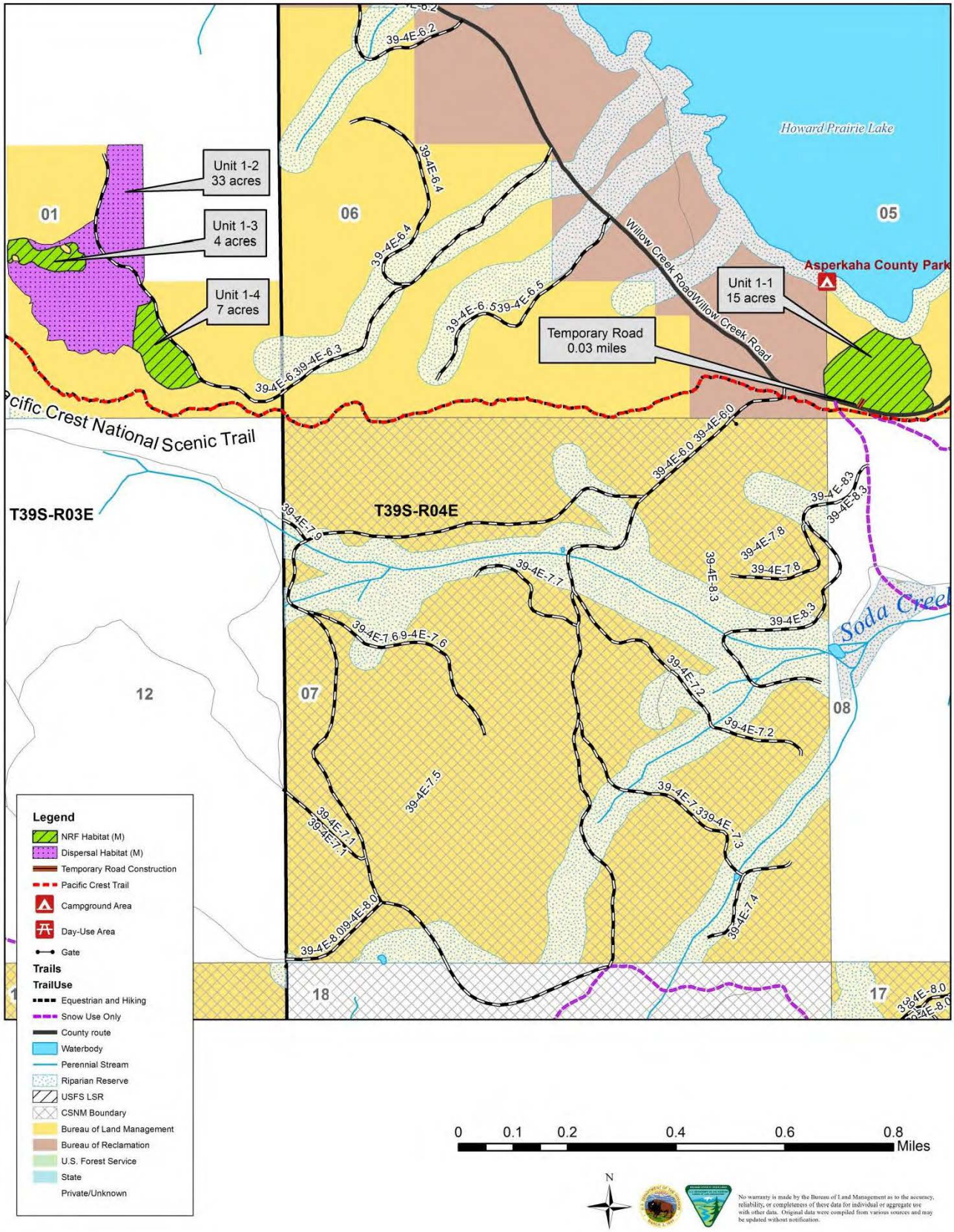
Map 2-3. Howard Forest Management Project Alternative 2



Map 2-4. Howard Forest Management Project Alternative 2



Map 2-5. Howard Forest Management Project Alternative 2



3. Project Design Features

Project Design Features (PDFs) are an integral part of the Proposed Action (Alternative 2). 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.

The PDFs with an asterisk (*) are Best Management Practices (BMPs) to reduce nonpoint source pollution to the maximum extent practicable. BMPs 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. 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 Howard 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 *Jenny Creek Watershed Analysis* (USDI 1995b, pp. 90-93), and are based on a site potential tree height of 170 feet. See Maps 1-1, 2-1, 2-2, 2-3, 2-4 and 2-5 for Riparian Reserve locations within the Howard Forest Management Project Area. Site-specific widths for each Riparian Reserve have been mapped in GIS and would be implemented under the Proposed Action Alternative. Riparian Reserve widths in the Howard Project Area are as follows:

(1) Fish streams: 340-foot slope distance on each side of the stream.

(2) Perennial non-fish-bearing streams: 170-foot slope distance on each side of the stream.

(3) Intermittent non-fish-bearing streams: 170-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. Harvest and Yarding

Objective 1: Protect Riparian Reserves

(1) No commercial harvest in Riparian Reserves. *

(2) No use of skid trails in Riparian Reserves. *

(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 irrigation ditches would be practiced. Trees would be felled to the lead in relation to skid trails. Irrigation ditches 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) Tractors would be equipped with integral arches to obtain one end log suspension during log skidding. Restrict tractor operations and skid trail locations to slopes less than 35%.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. *

(5) Tractor yarding on designated skid trails would occur between June 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. 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.

(6) To minimize soil disturbance, mechanized ground-based yarding systems used off designated skid trails must have an arm capable of reaching at least 20 feet and must minimize turning by avoiding return trips to the same skid trail whenever feasible. Walk mechanized harvest equipment over slash on skid trails to the extent possible.

(7) During dry soil conditions, mechanized ground-based harvesting (harvester/forwarder or feller/buncher) would be allowed off of designated skid trails for one-to-two passes. These 1-to-2 pass trails must be spaced a minimum of 50 feet apart. Trails will be limited to a minimum of 50-foot spacing off of designated skid trails. All other use of ground-based equipment must be restricted to designated skid trails. All operations off of designated skid trails would be limited to soil moisture conditions of 15% or less by weight, or snow-logging conditions listed below.

(8) 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. The intent is to reduce the potential for use of these features by

OHVs and the resulting resource damage, and to minimize erosion and routing of overland flow to streams by decreasing disturbance (e.g. unauthorized use by OHVs). *

(9) 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).* 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. *

(10) 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.

c. Prescribed Fire

Objective1: Prevent Offsite Soil Erosion and Soil Productivity Loss

(1) Slash piles would be dispersed across treatment areas. Piles would be burned when soil and duff moisture are high.

(2) Slash in Unit 13-2 will be lopped and scattered at a depth not to exceed 12 inches to prevent unauthorized OHV use. Slash shall be reduced to the extent that it is within 12 inches of the ground at all points to prevent excessive fuel loading.

d. Roads and Landings

Objective 1: Protect Riparian Reserves

(1) No construction of new landings or expansion of old landings would be allowed in Riparian Reserves.*

(2) Road 38-3E-13.6 would be closed upon completion of Project activity to prevent damage to soil and water resources resulting from unauthorized access by OHVs. The closure would consist of removing an existing culvert where the road intersects the Keno Access Road, removing 50-100 feet of road fill at the entrance, and constructing an earthen berm. In conjunction with the berm, boulders and/or large logs would be placed to effectively preclude vehicle use. In addition, large logs would be placed across the road at intervals along the length of the road.

(3) Road 38-3E-23.2 would be fully decommissioned upon completion of Project activity. Portions of this road are located within a Riparian Reserve, including two stream crossings. Decommissioning would begin where existing pavement ends (retaining the roadside ditch culvert), and would include scattering logs and other large debris along the subsequent 200 feet to camouflage the entrance and block vehicle access. Where available, logs, rocks, and other debris would be scattered along the road's length. As needed, the road bed would be scarified to a depth of six inches, the culverts would be removed, and the crossings restored. If necessary, dewatering would occur prior to culvert removal. No turbid water would be permitted below the construction site. All disturbed ground would be seeded with native seed, and mulched with certified weed-free organic material.

Objective 2: Prevent Offsite Soil Erosion

(1) Landing construction and road maintenance would not occur during the wet season (October 15th to June 1st) when the potential for soil erosion and water quality degradation exists. This restriction could be waived under dry conditions and with a specific erosion control plan specifying measures to protect water quality (e.g. rocking, waterbarring, seeding, mulching, barricading). 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 (RAWS) would be used. Construction

activities would not occur for at least 48 hours after rainfall has stopped and on approval by the Contract Administrator. *

(2) 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.*

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

(4) Slash would be windrowed at the base of newly-constructed fill slopes to catch sediment. *

(5) Temporary roads are identified and analyzed for use. If opened/constructed, these temporary roads would be scarified to a depth of six inches, seeded, mulched, and effectively blocked at the entrance and along their length using earthen berms, logs, and other material at the completion of harvest and log haul, and within the same season as constructed/opened.* Work would be done between June 1st to October 15th. *

(6) All natural surface roads would be closed during the wet season.*

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.

e. Hauling

Objective 1: Prevent Offsite Soil Erosion

(1) No hauling would occur on natural surfaced roads during the wet season (generally October 15th to June 1st). This would protect the road from damage and decrease the potential for off-site sediment movement. Variations in these dates would be permitted dependent upon weather and soil moisture conditions of the roads.

(2) Hauling would be allowed between May 15th and November 15th on roads surfaced with adequate surfacing (as determined by a Civil Engineer Technician and approved by the contracting officer). Some variations in these dates would be permitted dependent upon weather, soil moisture conditions of the roads, or frozen road conditions. The Contracting Officer may approve a conditional waiver for hauling if it is determined that hauling would not result in road damage or the transport of sediment to nearby stream channels (based on soil moisture conditions, frozen conditions, or rain events).

(3) Hauling on snow would be allowed on paved roads or exempted natural-surface roads (Table 2-6) when at least 2-4 inches of compacted snow is present on hauling roads. Snow plowing would maintain at least 2-4 inches of compacted snow on hauling roads.

Table 2-6. Natural Surface Roads Proposed for Winter Hauling Use

Road Number*	Approximate Length (miles)
38-3E-11.01	0.27
38-3E-11.02	0.15

Road Number*	Approximate Length (miles)
38-3E-13.05	0.22
Non-GTRN (Non-System) Roads	
Non-System Spur A (T. 38S. R 3E. S. 13)	0.12
Non-System Spur B (T. 38S. R 3E. S. 13)	0.15

*Roads have been determined to have an adequate base to withstand winter season-use conditions.

(4) No road maintenance would occur during the wet season, other than plowing of snow as described for emergency purposes. Maintenance activities may be considered (e.g. rocking, blading of aggregate roads, cutting brush) 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 Offsite 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 would be handpiled outside of the driplines of individual pine trees and burned.

(2) No more than 25% of the live crowns of pine species would be scorched for trees measuring 8 inches DBH and larger.

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

(1) 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 to reduce the probability of mechanical damage to white fir leave trees.

i. Terrestrial Wildlife

Objective 1: Protect Northern Spotted Owl Nest Reserves

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

(2) Seasonally restrict habitat modifying activities from March 1st to September 30th within 0.25 miles of known northern spotted owl nest sites. Affected units would be 29-3, 29-4 and 29-5. The seasonal restriction could be waived if the BLM determines the site is not occupied, or owls are not nesting.

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 2-7) 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 2-7 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.

(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 1 through June 30, or until two weeks after the fledging period, unless substantial smoke would not drift into the nest patch.

(4) Seasonally restrict treating in un-surveyed northern spotted owl nesting, roosting, and foraging habitat from March 1st to June 30th . The seasonal restriction could be waived if the BLM determines the site is not occupied or owls are not nesting. Units affected would be 1-1, 1-3, 1-4, 13-4, 13-5, 17-4, 19-2, and 29-5.

Table 2-7. 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.	

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

(1) Retain and protect where possible (if not jeopardizing public or worker safety) large, broken-top trees and snags to minimize impacts to cavity-dependent species. Retain all trees damaged during felling operations that were not originally marked for treatment will be retained for future snag and cavity recruitment.

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 distances 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).

(2) Three known sites 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 1995 RMP (USDI 1995, p. 45).

(3) Four known Bald Eagle nest sites exist in the Project Area. Seasonally restrict Project activity around nest sites. Avoid disturbance within 0.5 mile from February 1st through August 15th (USDI 1995, p. 57). This limited operating period will affect units 13-5, 19-1, and 23-1. Manage approximately 30-acre core area around nest sites. Retain older forests within 0.5 mile 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 great gray owl nests would be protected with a 125-acre management area and a 0.25-mile protection zone.

   a. Within the 125-acre management area, treatments are limited to protection or improvement of nesting habitat.

   b. Within the 0.25 mile protection zone,

      I. Provide a 300-foot buffer around natural openings greater than 10 acres that have nesting habitat associated with them. Within this 300-foot buffer, treatments are limited to protection or improvement of nesting habitat.

      II. In Units 13-2, 13-3, 13-4, 13-5, 19-1, 23-1, and 29-1, prohibit disturbance from management activities within 300 feet of nesting habitat (one mile radius for blasting) from March 1 to July 31, or until fledging, whichever is later, unless surveys of the nesting habitat indicate no presence or no nesting.

(2) 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.

(3) Suitable habitat for *Pristiloma arcticum crateris* snail species would be protected through the established Riparian Reserves (which includes suitable habitat within 30 feet on each side of the channel).

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

j. Botanical Resources

Objective 1: Minimize the spread of noxious weeds

(1) Vehicle and equipment use off of existing roads in the Project Area would be limited to the dry or snow-covered season.

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

(3) Seeding of native grasses and/or an approved seed mix on highly disturbed soil (e.g., landings, temporary spur roads, etc.) would occur.

(4) Roadside noxious weed populations along haul routes and work areas would be treated prior to soil-disturbing activities, with subsequent treatments as necessary and as funding is available.

(5) Noxious weed populations in existing quarries or stockpiles used for road rocking would be treated prior to use.

k. Recreation

Objective 1. Maintain snowmobile trails for winter recreation

(1) Snow plow only half (or one vehicle width) of Keno Access and Grizzly Creek Roads to provide unplowed track for snowmobiles. Plowed turnouts at appropriate intervals would be approved as needed.

Objective 2. Protect trail tread for the existing Lily Glen equestrian trail.

(1) Designate skid trail crossings perpendicular to the trail in Unit 13-2 to minimize disturbance to the trail tread.

Objective 3. Protect visual resources and promote visitor safety on the Pacific Crest National Scenic Trail.

(1) Mark only trees to be removed in Unit 1-1. Cut stumps as low as possible to minimize visual effects.

(2) A no-cut buffer of 50 feet, measured from the trail center, will be implemented on either side of the PCNST.

(3) Place signs alerting trail users of activity across from Unit 1-1 and on Willow Creek Road, adjacent to the trail.

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.

(2) If damage to range improvements does occur, the BLM shall be notified and proper repair or replacement will occur within 2 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.

m. Cultural Resources

Objective 1: Avoid Impacts and Protect Cultural Resources

(1) 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. Implementation Monitoring

The majority of actions described under the Proposed Action are implemented through a timber sale or service contract. Implementation monitoring is accomplished through the BLM's contract administration process. Project Design Features 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. Timber sale contract work could be shut down if infractions of the contract are severe. The contract violations would need to be corrected before the contractor would be able to continue work or timber harvest. If contract violations are blatant, restitution could be of a monetary value of up to triple the amount of damage.

D. ACTIONS AND ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

NEPA requires that Federal agencies explore all reasonable alternatives, and briefly discuss the reasons for eliminating any alternatives that were explored but not developed in detail (40 CFR 1502.14 (a)). The following alternatives or actions have been considered but eliminated from detailed study for the reasons stated and/or because they would not meet the objectives and Needs for this project.

Treatment of Forest Stands Identified as RA-32

This action would have treated stands identified by Resource Area Wildlife Biologists as Recovery Action 32 (RA 32) forest stands (see Chapter 1.F: *Relevant Assessments and Plans*).

Rationale for Elimination: The Ashland Resource Area BLM has decided to defer forest management in stands identified as RA 32 stands at this time. Using the 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 US Fish and Wildlife Service, BLM Wildlife Biologists identified areas within the Howard Forest Management Project that meet the intent of Recovery Action 32. Stands identified as RA 32 forest stands were removed from consideration for timber harvest and, consequently, from detailed analysis under the Proposed Action.

Inclusion of a Citizen's Alternative, as Submitted during the Scoping process

Scoping comments received included submission of a Citizen's Alternative that would include the following:

- Plantations would be commercially thinned so as to increase vigor and provide wood fiber to meet the intent of the RMP;
- Fuels are reduced in the Project Area;
- Small trees in overly dense stands are thinned;

- Remaining late-successional forests and large diameter trees over 20 inches in diameter (other than white fir) are retained;
- Existing roads are upgraded; and
- Road density is reduced.

Rationale for Elimination (where applicable): While there are plantations within the Howard Forest Management Project Area, all have been entered (some more than once) and treated to meet silvicultural standards. A need to treat them does not exist at this time, and therefore, they were not included in this Project proposal.
Silvicultural systems prescribed for the Howard Forest Management Project are based on stand structure and species composition, compared to the desired stand structure and species composition and the ability to achieve and maintain the desired conditions over time (based on site characteristics such as soil characteristics, elevation, aspect, etc.). The use of a diameter limit would arbitrarily limit the use of the silvicultural prescriptions to meet the prescribed objectives.
An arbitrary diameter limit would sacrifice the effectiveness of prescriptions in achieving these silvicultural objectives. Howard Forest Management Project silvicultural prescriptions are designed to primarily focus on the harvest of smaller-diameter trees to retain larger, healthier trees within a stand, although some larger trees may be removed to meet desired stand densities and species composition.

Thinning of white fir and Douglas-fir to reduce encroachment are included as components in the Action Alternative.

Existing roads that will be used during the project are scheduled to be upgraded and maintained, and while temporary road construction is proposed, there would be a net decrease in road densities in the Watershed with proposed road decommissioning.

No New Road Construction

This alternative would have eliminated any new road construction needed to improve vehicle access for the purpose of managing forest stands.

Rationale for Elimination: The RMP directs that all silvicultural systems (forest thinning strategies) 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. An alternative that would eliminate all new road construction would have made it uneconomical to manage some units within the Project Area. While road construction was not completely eliminated, new temporary road construction was limited to approximately 0.5 mile.

Long-Term Decommissioning of Road 38-3E-23.1

This road was considered for long-term decommissioning as described in the Western Oregon Transportation Management Plan (USDI 2010). The proposed treatment would have blocked vehicle access and remediated any potential or existing erosion/drainage concerns, but kept the road on the General Transportation Road Network (GTRN).

Rationale for Elimination: The road is currently blocked by an existing gate that has been effective in controlling access. There was little evidence of unauthorized OHV use going around the gate or along the road and adjacent areas. In addition, the road surface and associated drainage features were stable and no acute or potential problems were noted. The potential for future use of the road, with regard to forest management practices, was recognized.

Increased Intensity of Forest Thinning

An increased level of intensity of forest thinning was considered with the intent to reduce relative densities across the forest landscape and to strengthen tree vigor.

Rationale for Elimination: By lowering stand relative densities to an optimal growth and yield forest production level, this prescription would have also reduced crown closure to a lower percentage than needed to maintain spotted owl habitat within the home range radius of spotted owl sites. Therefore, an increased level of thinning was eliminated from detailed consideration in forest stands as it would not have met the project objectives identified in Chapter 1**.**

Use of Designated Skid Trails to Avoid Temporary Road Construction

This action would have relied solely on the use of designated skids trails in units to avoid approximately 0.5 miles of temporary road construction.

Rational for Elimination: The construction of temporary roads reduced the length of skidding distance from the outer edges of the units to the landing area by 850 feet for Unit 7-2; 700 feet for Unit 13-4; 325 feet for Unit 17-1; and 425 feet for Unit 17-2, thus improving the production rates and economic efficiency of the sale design. Because the impacts would be equal to less for temporary road construction, when comparing skidding versus log truck traffic, it was decided to replace these longer skidding distances with temporary roads. The roads and landings they served were located to minimize additional tree removal within or outside of units.

CHAPTER 3 - AFFECTED ENVIRONMENT & 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 and the Proposed Action Alternative(s). 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 Howard 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 Howard 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 affected by the Proposed Action 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 Howard 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 Howard 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.

Fuels Reduction Treatments (Reasonably Foreseeable)

In the Spring of 2014, approximately 300 acres of fuels reduction treatments are proposed in areas around Howard Prairie Reservoir and adjacent to the Howard Forest Management Project, in T. 39 S., R. 4 E., Sections 5 and 6. Treatments will include cutting material measuring less than 8 inches DBH, handpiling, with burning of handpiles scheduled to occur in late Fall of 2014. This work was analyzed in the June 2011 *Environmental Assessment for the Howard Prairie Fuels Reduction Project* (DOI-BLM-OR-M060-2011-0009-EA).

Deadwood and Howard Prairie Grazing Allotments (Ongoing)

Livestock grazing is a component of the Medford District's multiple-use program. The 1995 Medford District Record of Decision and Resource Management Plan (RMP) provide Management Objectives and Direction for Grazing on the Medford District. Livestock grazing will be managed in accordance with *Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the States of Oregon and Washington* (USDI 1997). Grazing is to be maintained at levels listed in Appendix B of the 1995 RMP (USDI 1995, pp. 127-133), unless adjustments are needed to make progress towards meeting the Standards and Guidelines for Rangeland Health for Oregon and Washington.

Deadwood Allotment

The Bureau of Land Management is working cooperatively with the U.S. Forest Service to manage a deferred rotation grazing system in accordance with the 1972 Deadwood Coordinated Range Management Plan (CRMP).

The grazing lease authorization for the Deadwood Allotment on Ashland Resource Area expired on February 28, 2006 and is currently authorized under a temporary lease renewed under Public Law 108-108, Section 325. The temporary lease will expire on February 28, 2016. Under Public Law 108-108, Section 325, lease renewals were meant to be temporary pending the completion of the formal lease renewal process, which

includes completing rangeland health assessments, evaluating current livestock practices, determining range health, and compliance with the National Environmental Policy Act (NEPA).

The Deadwood allotment is approximately 11,890 acres, and the BLM-administered portion of the allotment is 7,972 acres, with 393 cows permitted from June 16-August 15 in even years and August 16-September 30 in odd years, totaling 788 Animal Unit Months (AUMs). (One AUM is the amount of forage necessary for the sustenance of one cow or its equivalent for a period of one month.)

Howard Prairie Allotment

The Howard Prairie Allotment is located on Bureau of Reclamation (BOR)-administered land and the grazing lease is managed by the Bureau of Land Management under a Memorandum of Agreement (MOA No. 83-168) dated March 31, 1983. Current lease terms and conditions authorize grazing of 60 AUMs from October 16th to November 15th over the 320-acre allotment area.

Lily Glen Park (Ongoing)

Lily Glen Equestrian Park and Campground at Howard Prairie spans 40 acres of Bureau of Reclamation Lands-administered lands (BOR). Adjacent to the Project Area, there are 6 miles of equestrian trail on BOR-administered lands, and approximately 1.7 miles of trail that cross BLM-administered lands.

Cottonwood Forest Management Project (Ongoing)

Located in the Keene Creek drainage of the Jenny Creek Watershed (HUC5) and analyzed in the *Revised Environmental Assessment for the Cottonwood Forest Management Project* (DOI-BLM-OR-M060-2011-0003-EA), the Cottonwood Decision Record (August 23, 2011) authorized the harvest of 725 acres of conifer forest stands using a variety of silvicultural prescriptions utilizing cable and tractor yarding systems. Approximately 1.15 miles of new permanent road construction, construction of six temporary spurs (up to 0.6 miles) to gain access into units, and approximately 1.9 miles of road decommissioning was also authorized in the DR. An estimated 36 miles of existing roads are being improved as needed and used as haul routes. Project design will result in the maintaining of NRF and Dispersal NSO habitat within units, and in their Letter of Concurrence (#13420-2010-1-0178), the USFWS concluded that the action is not anticipated to result in any incidental take of the northern spotted owl, and is not likely to adversely affect (NLAA) spotted owls, or spotted owl critical habitat with the Action Area (pp. 14-15).

Walters Glade (BLM Klamath Falls Resource Area) (Reasonably Foreseeable)

The BLM Klamath Falls Resource Area has initiated the scoping process for the Walters Glade Project in a scoping letter dated November 27, 2013, which proposes treatments on approximately 3,302 acres of BLM-administered lands. Treatments would include thinning and hazardous fuels treatments, and the majority of the proposed Project Area is located within Designated Critical Habitat for the northern spotted owl. Approximately 934 acres of areas proposed for treatments occur in the Jenny Creek. Project planning is ongoing, and specifics are yet to be determined.

Cold Onion (BLM Klamath Falls Resource Area) (Ongoing)

Within the Jenny Creek Watershed, the Cold Onion Forest Health Project is ongoing in upper potions of the Johnson Creek catchment on the Klamath Falls Resource area of the Lakeview BLM, and the effects were analyzed under the Cold Onion Forest Health Treatments EA (EA OR 014-08-11).

Swinning Timber Sale (Past)

The Swinning Timber Sale, located adjacent to the Howard Forest Management Project Area and analyzed in the July 2010 *Environmental Assessment for Plateau Thin Forest Management Project* (DOI-BLM-OR-M060-2010-0034-EA), harvested approximately 466 acres using a variety of silvicultural prescriptions described in the EA. Maintenance was conducted, as needed, on an estimated 13.25 miles of road used for haul routes, and no new road construction occurred with Project implementation. Project implementation resulted in the downgrade of 318 acres of NRF habitat, none of which was within the home range radius of the northern spotted owl sites within home ranges overlapping the Project Area. In their Medford Summer 2010 LAA Biological Opinion, the USFWS determined that the Swinning Timber Sale was not likely to jeopardize the continued existence of the northern spotted owl. Harvest activity was completed in June 2013.

B. SILVICULTURE

1. Affected Environment

The Howard Forest Management Project Planning Area consists of a portion of lands in the Upper Jenny Creek watershed, a sixth-field subwatershed (HUC 6) of the Jenny Creek Tier 1 Key Watershed, a fifth-field watershed (HUC 5) within the Upper Klamath River Subbasin. Most of the land within the Planning Area drains into Howard Prairie Reservoir for eventual diversion to the Bear Creek Watershed. The remainder of the Planning Area drains into Grizzly Creek below Howard Prairie Dam or Soda Creek above the Grizzly Creek confluence, which is approximately 0.7 mile above the confluence of Soda Creek with Jenny Creek. The total size of the Planning Area is 12,970 acres, or approximately 20 square miles. BLM-administered lands comprise 5,594 acres within this area. For purposes of analyzing the affected environment and the proposed project, the Analysis Area for silvicultural resources consists of BLM-administered lands within the Planning Area. The acreages in each vegetation class represented in the Analysis Area are summarized in Table 3-1.

a. Landscape Pattern

The present day landscape pattern of the vegetation on federal lands within the Howard Planning Area is a result of topography, fires, wind events, timber harvesting, and forest pathogens. There is a natural diversity of vegetation condition classes[1] within stands and between stands whose boundaries are generally dictated by soils, aspect, and past disturbance. Soils are an important determinant in vegetation changes. As a result, the majority of the timber stands are separated by grasslands, shrublands, or oak woodlands. These influences create a coarse-grained pattern across the landscape with a mosaic pattern of different vegetation types and seral stages.

Table 3-1. Vegetation Condition Classes in the Howard Analysis Area (BLM-administered lands)

Vegetation Condition Class	Acres
Grassland, Shrubs	434
Hardwood/Woodlands	11
Early (0-5 years) and Seedlings/Saplings (0-4.9 inches DBH)	704
Poles (5-11 inches DBH)	504
Mid (11-21 inches DBH)	942
Mature (21+ inches DBH)	2,999
Total Acres	5,594
Total Forest Land Acres	4,445

In the Analysis Area, most of the commercial stands originated between 1800 and 1900. Forest fires have played a role in the present day landscape pattern in the Analysis Area. The largest fires occurred in 1910 with the Short Creek Fire and Deadwood Fire in the Moon Prairie area (Minore 1978) which burned over 2,400 and 2,330 acres, respectively, (USDI 1995; Minore 1978). Most other burned areas have regenerated. Most of the forest stands became established within 10 years after fire, although some sites may have taken 30 to 40 years to become forested. The present day vegetation pattern across the watershed landscape results from the dynamic processes of nature and human influences over time. The Howard Analysis Area lies within the Mixed Conifer Zone as described by Franklin and Dyrness (1973).

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

[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)

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. Species that once occupied the early-seral stage of development in a landscape gap will give way to other species as the landscape further develops.

Subtle changes in species composition and stand structure are occurring over the landscape. Many trees with old-growth characteristics are dying as a result of increased competition for limited resources with second-growth trees. White fir is replacing ponderosa pine, sugar pine, incense cedar, and Douglas-fir because of its more shade-tolerant nature. White fir is also encroaching upon the edges of meadows and oak woodlands, although mortality of white fir along these edges is evident.

b. Plant Series and Associations

There are four plant series types in the Howard Analysis Area: Douglas-fir, ponderosa pine, white fir, and white oak (Table 3-2). Plant association descriptions within these series can be found in *Preliminary Plant Associations of the Siskiyou Mountain Province* (Atzet and Wheeler 1984) and *Field Guide to the Forested Plant Associations of Southwestern Oregon* (USDA 1996). The *Preliminary Plant Associations of the Siskiyou Mountain Province* can also be applied to segregate other landscapes that exhibit similar recognizable vegetation patterns (Atzet 2008) as encountered on the landscape in the Southwestern Oregon Cascades.

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

Douglas-fir Series / Plant Associations	Ponderosa Pine Series / Plant Associations	White Fir Series / Plant Associations	White Oak Series/Plant Associations
PSME-ABCO	PIPO–PSME	ABCO-TABR	QUGA/FRVEB
PSME-ABCO/BENE		ABCO/HERB	QUGA–CEMO
PSME-ABCO/HODI		ABCO-PSME/DEPAUPERATE	
		ABCO-PSME/HODI	
PSME-ABCO-PIPO		ABCO-PIPO	

Abbreviations:
PSME: Douglas-fir
ABCO: White fir
BENE: Oregon Grape
HODI: Oceanspray
PIPO: Ponderosa pine
TABR: Pacific yew
QUGA: Oregon white oak
FRVEB: Woodland strawberry
CEMO: Birchleaf mountain mahogany

The Douglas-fir plant associations comprise 79% of forestland in the Analysis Area. These associations are cool and dry. White fir is prevalent in the forest understory, but Douglas-fir is the most prominent species. In frequency of occurrence, the PSME-ABCO-PIPO plant association occurs the most frequently (36%) followed by PSME-ABCO (16%), PSME-ABCO/BENE (15%), and PSME-ABCO/HODI (14%). In acreage, the PSME-ABCO-PIPO plant association makes up 31% of the forestland followed by PSME-ABCO (21%), PSME-ABCO/HODI (16%), and PSME-ABCO/BENE (11%).

Drier forest sites make up 4% of the forestland in the Analysis Area, and are composed of the PIPO-PSME plant association. Ponderosa pine, Douglas-fir, and white fir occur with ponderosa pine being the dominant understory species. Only the hardiest sugar pine and white fir can survive on these sites and their growth rate is slow (Atzet and Wheeler 1984).

In the Analysis Area, 54% of the sugar pine occurs in the PSME-ABCO-PIPO plant association, which is the largest represented plant association in the Project Area. This association is naturally characterized by high basal area, a diversity of shrubs and herbs, and disturbances (Atzet and Wheeler 1984). Of the near 1,200

acres of land in the Planning Area classified as PSME-ABCO-PIPO, 61% is in the understory re-initiation stage of forest development. According to Oliver and Larson (1996), this later stage of succession begins several decades after the stem exclusion stage begins and displays a low stratum of herbs, shrubs, and advance regeneration invading the forest floor, which until then had been relatively free of low vegetation.

In contrast, 35% of the PSME-ABCO-PIPO plant association in the Analysis Area is in the stem exclusion stage of forest development. Overstory trees grow vigorously at the beginning, actively occupying all available growing space, and competing with neighbors (Oliver and Larson 1996). Shade-intolerant trees such as ponderosa pine and sugar pine struggle to survive against shade-tolerant white fir, a species that persists under increasingly lessening light conditions. Pine and other shade-intolerant species are outcompeted for resources, and are eventually excluded from the stand, giving way to a pure (or nearly so) white fir forest. In the absence of any natural disturbances to release growing space, shade-intolerant species such as pine continue to decline in number, reducing stand-level species diversity.

The white fir sites comprise 17% of the forestland in the Analysis Area, and are dominated by the ABCO-TABR plant association (11%). According to survey data, this was the only white fir plant association group where sugar pine was found. Another white fir plant association group, ABCO-PSME/HODI, along with PSME-ABCO/HODI, yield the highest average square feet of basal area per acre. The ABCO-PSME/HODI plant association is hot and dry; while PSME-ABCO/HODI is moderately dry (Atzet and Wheeler 1984).

c. Tree Growth and Vigor

A decrease in stand 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 to grow unencumbered until it reaches a condition where the vegetation in the stand occupies all the available growing space. The result is widespread competition and declining productivity, as is evident in dense stem exclusion stands. 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. More than half of the stands inventoried have relative density indices between 0.55 and 1.00, which bounds the zone of imminent competition-mortality (Drew and Flewelling 1979). Undisturbed populations eventually compete for growing space and gradually thin the population as individuals die in a self-thinning process (Barbour et al. 1987). Currently, the relative densities of stands throughout the Project Area are high. This is primarily due to the lack of natural disturbance and as a result of fire suppression. The stand relative density index (RDI) ranges from 0.496 to 0.906 in the Howard Analysis Area, indicating that physiologically, the trees have entered the zone of imminent competition-induced suppression and mortality.

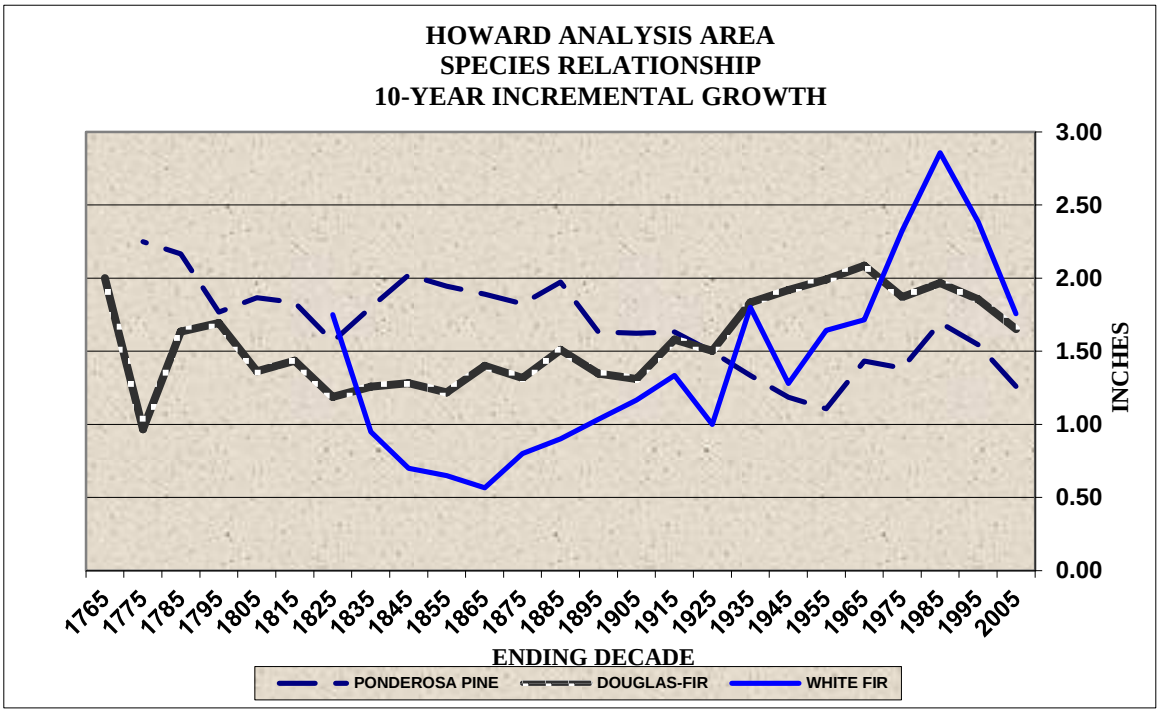
Waring et al (1980) developed a vigor rating using a physiological index of growth efficiency. The Waring Tree Vigor Index is a measure of health defined as the ratio of annual growth of stemwood to the area of leaves present to capture sunlight (Waring et al. 1980). Crown leaf surface area has a linear relationship with sapwood area at breast height, and can be accurately estimated from measurements of sapwood thickness. By measuring diameter at breast height, width of the last growth ring, and sapwood thickness, Waring's vigor index can provide a meaningful measure of tree vitality that is relevant to determine whether or not a particular tree would be susceptible to beetle infestation. The vigor ratings can be accurately applied to individual trees and are comparable among conifers (Larsson et al. 1983; Waring 2007). 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 stemwood 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 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 and Pitman 1985).

Pine species in the Analysis Area are becoming scarce. Shade-tolerant white fir is currently dominating the growing space that these shade-intolerant species once occupied. The vigor rating for ponderosa pine falls below 30 at a rating of 21 g/m²/yr in the Analysis Area. Regarding tree vigor in general, a vigor index of 21 g/m²/yr is very low. In mixed conifer stands, where pine are naturally encountered, shade-tolerant white fir are encroaching and successfully competing against pine species for soil nutrients, water, and growing space. White fir continually advances into the shaded forest floor, occupying the growing space in the understory, and excluding the shade-intolerant pine from naturally regenerating. Pine species currently exhibit poor vigor, and individual tree growth rates are declining (Figure 3-1).

Figure 3-1. Species Relationship of 10-Year Incremental Diameter Growth



Core measurements were taken from 56 ponderosa pine sample trees representing all vegetation condition classes. The current average ponderosa pine tree vigor rating is 21 g of annual wood production per square meter of foliage. In addition, the 10-year incremental growth data for ponderosa pine revealed a current rate of 1.26 inches per decade (Figure 3-1). Furthermore, the current average RDI for ponderosa pine stands was 0.64. This data indicates that, based on Waring's vigor rating indices, last decade's growth rate, and relative density indices, ponderosa pine and sugar pine are growing poorly and their survival in the Analysis Area is threatened. Pine species in the Analysis Area are growing at a rate that leaves them prone to and at increased risk of bark beetle attack. Douglas-fir is also a species that is declining in the Analysis Area, especially in the lower canopy or understory of these mixed conifer stands.

As observed with Douglas-fir (Figure 3-1), the average growth rate per decade has been declining over the last 20 years. However, the decline in growth for ponderosa pine is sharper compared to Douglas-fir. Ponderosa pine growth is declining at a 20-year average of 0.22 inches per decade. The forthcoming decades indicate that if variables remain constant, the growth rate of ponderosa pine for 2015 and 2025 may decline to 1.04 and 0.82, respectively. Regardless, of any future estimates, current data collected in the Analysis Area representing poles, mid-seral, and mature vegetation condition classes (Table 3-1) of the ponderosa pine series reflect a less fire-resilient forest condition.

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). Western pine beetles *(Dendroctonus*

brevicomis) and pine engraver beetles (*Ips spp*.) in southwestern Oregon attack pine species, while the flat-headed wood borers *(Melanophila drummondi*) and Douglas-fir beetles *(Dendroctonus pseudotsugae*) kill Douglas-fir (Aerial Insect and Disease Survey 2007-2008). The bark beetles successfully colonize live trees when their host is under some form of physiological stress. Dolph (1985) found that bark beetle attacks occurred in unmanaged stands when trees grew slowly, i.e. 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). 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, while 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 per acre[2] are less prone to pine bark beetle attack.

Western pine beetle (*Dendroctonus brevicomis)* is present in the Analysis Area. 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 densely 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 disease-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. Mountain pine beetle (*Dendroctonus ponderosa*) was not observed in the Analysis Area.

The susceptibility of trees to damage by bark beetles can be mitigated by stocking control, which is tied closely with tree vigor (Larsson 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 Project 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 Project Area.

For all Project inventoried stands, sample cores were taken from 369 trees representing all vegetation condition classes and plant association groups across the Project Area. Each core was measured to determine individual tree vigor, age, and growth rates. Vigor ratings were determined by the Waring Tree Vigor Index, and growth rates were tabulated by decade. Figure 1-1 illustrates the 10-year growth rate of all 369 sample trees, combining Douglas-fir, white fir, and ponderosa pine, spanning to the decade ending in the year 1765.

The chart illustrates a period of improving tree growth between the decades of 1945 and 1965, followed by a decline from 1985 to 2005. Timber harvesting occurred on BLM-administered lands in the early 1940s and declined in the 1960s, which suggests an increased period of growth following harvest. Since stands are dynamic, conditions will change over time as individual trees continue to compete for growing space. In the last decade, the average diameter growth in the Howard Project Area was 1.60 inches. This figure is a mere snapshot in time, but as a general rule, stands with growth rates equal to or greater than 1.5 inches of

[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.

diameter growth per decade are less prone to bark beetle attack (USDA 1998; Hall 1995). At this time, according to sample core measurements, combined forested stands in the Analysis Area are growing at a favorable rate to withstand beetle attacks. However, when analyzed by species, the average diameter growth of 1.26 inches for ponderosa pine in the last decade falls short of the 1.5 inches of diameter growth per decade required to withstand bark beetle attack. In addition, the growth trend over the last 20 years for all sampled species exhibits a declining curve (Figure 3-1). Since 1985, all three species (Douglas-fir, ponderosa pine, and white fir) in the Project Area individually exhibited a declining growth trend after an increase from previous decades (Figure 3-1). If all influencing variables—i.e. temperature, precipitation, soils, elevation, and densities—remain constant or worsen in terms of optimal forest productivity, trees within the Project Area will continue to experience a growth decline. Based on this trend, it is estimated that by the year 2015 the average ten-year growth rate will drop below 1.5 inches in diameter per decade to a rate of 1.42 inches in diameter per decade. If variables remain the same, the trend could continue at an average decline of 0.18 inches in diameter growth per decade. In 20 years, the decadal growth could be as short as 1.24 inches.

Douglas-fir tree core samples were taken from 311 trees representing all vegetation condition classes in the Douglas-fir Series and all plant association groups. The average tree vigor index, as measured by leaf area index is 70 for Douglas-fir, compared to 21 for ponderosa pine, and the average growth in the last decade was 1.65 inches. Based on Waring's vigor rating index, the data indicates that Douglas-fir in the Project Area can generally survive one or more years of relatively heavy bark beetle attacks, and based on their decadal growth, are less prone to beetle attack. However, the declining trend over the last twenty years indicates that if variables remain constant, the projected growth rate of Douglas-fir in ten years will continue dropping by an estimated average of 0.16 inches per decade. In 2015, the estimated growth rate could drop just shy of the 1.5 inch resiliency threshold, to 1.49 inches per decade, and may decline further to an estimated 1.33 inches per decade by 2025.

White fir tree core samples collected across the Project Area exhibited 1.76 inches of diameter growth between 1995 and 2005. A vigor rating index is not available for white fir species; however, Figure 3-1 also displays the average 10-year incremental growth rate of white fir exhibited in the Planning Area. Mean annual precipitation between the Howard Prairie Dam and Ashland NOAA Climate Stations measured a 30-year average of 26.17 inches per year (Oregon Climate Service 2008). The average RDI for white fir was 0.42, which is low in relation to Drew and Flewelling's zone of competition induced mortality (.55 to 1.00). According to Cochran (1998), "healthy stands of white fir grow very rapidly, produce a dense crown cover, and are visually pleasing." However he raises doubts about growing white fir stands on sites with mean annual precipitation rates below 32 inches even if stand densities are kept very low. Shultz (1994) rated the risk of white fir mortality based on annual precipitation as Low, Medium, High, and Extreme. A mean annual precipitation from 25 to 30 would have a High mortality risk rating while a rating between 30 and 40 mean annual precipitation would be at Medium risk to mortality.

d. Forest Pathogens

Forest pathogens shape stand structure and forest development patterns by creating openings of various sizes. If disease susceptible trees continue to recolonize the sites, they will become infected, and their likelihood of attaining large sizes will be low. Forest pathogens will survive on these sites unless resistant species reoccupy these areas. 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 (<0.5 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. Disease centers are variable in size, containing dead standing trees, and occasionally windthrown trees (Figure 3-2). The root diseases in the Analysis Area 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 windthrown, 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.

Figure 3-2. Root Disease Infection Centers within Howard Project Units.

Western dwarf mistletoe (*Arceuthobium campylopodum*) and Douglas-fir dwarf mistletoe (*Arceuthobium douglasii*) infections occur primarily in small pockets within the Project Area. These small pockets make up less than 1% of the Project 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 a healthy tree. Consequently, bark beetles are drawn to trees in a weakened state and eventually kill the infected tree.

e. Coarse Woody Material

Many ecological processes have created the even and uneven-aged forest stand structure 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) state 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.

All stand prescriptions will have the intermediate (thinning) silviculture method applied to them. Information Bulletin No. OR-97-064 for the implementation of coarse woody debris 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 (CWM) until the next stand once again begins to contribute CWM.” All forest stand treatments will have no fewer than 30 live trees (largest diameter trees available) per acre remaining after harvest and are not prescribed for final harvest in this project. Many of these trees will be available to supply future CWM or snags to the sites. Approximately 21,400 feet of woody material transects were sampled in the Analysis Area.

On 21,400 feet of transect line, CWM averaged 15.2 tons per acre, and ranged from 4.7 to 38.9 tons per acre. The coarse woody material stems were concentrated in the 8-11 and 12-15 inch classes at the large end, although some sites contained pieces between 48 and 51 inches large end diameter. The average total length

per acre equaled 1,440 feet. 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.

Stand inventory data for the Analysis Area indicates that the mid-sized condition class (11 to 21 inches DBH) exhibits an average of 17.1 damaged trees per acre with an average of 18.9 inches DBH. The mid-sized stands also have an average of 14.3 dead standing trees per acre with an average of 17.6 inches DBH. The mature size class stands (21 inches DBH and larger) have an average of 10.1 damaged trees per acre with an average of 23.1 inches DBH. In mature stands, there is an average of 13.2 standing dead trees per acre at a quadratic mean diameter of 22.6 inches DBH. Overall, damaged live trees ranged from 5 to 60.6 TPA, with a quadratic mean diameter of 20.7 inches DBH, while dead standing trees per acre ranged from 0.7 to 26.7 TPA with a mean quadratic diameter from 8.6 to 30.9 inches DBH. Snags over 40 inches DBH (from .2 to 2, average 1.2 snags per acre) were found in some stands, namely in T. 38S. R. 4E. Sections 19 and 20.

2. Environmental Consequences

a. Alternative 1—No Action Alternative

Without silvicultural treatments that control the establishment and growing space of trees, forest structure and species composition can shift. Shade-tolerant white fir would continue to encroach, and stands will gradually shift in species composition where little disturbance occurs. 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, white fir growth will continue to increase in the Analysis Area. The No Action Alternative would not meet the silvicultural objectives stated in Chapter 2 of this Environmental Assessment.

The No Action Alternative would allow forest stands to remain at the overall average of 0.588 RDI, 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 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. No action would allow forest stands to remain overstocked and individual tree vigor and growth would remain poor.

The No Action Alternative would result in higher numbers of white fir trees that may cause long-term ecological impact to the mixed conifer forests of the Howard Project Area. A shift in species composition of this forest type has major implications on forest processes and function. Increased white fir numbers perpetuate forest pathogen effects that may result in a less resilient forest. No action would allow this shade-tolerant species to dominate both the overstory and understory in the Analysis Area, which is the most susceptible tree species in the area to annosus, Armillaria, and laminated root diseases.

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. Tree vigor and growth will continue to decline as these stands continue on this trajectory. Dense stands heighten tree-to-tree competition. 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. During competition, trees commit their energy sources for survival over their competing neighbors. This exhaustive effort predisposes a tree to damage or mortality by incoming insects and diseases. Future silvicultural options diminish when severe stand mortality results. The loss of conifer trees from such agents would limit future management actions, whereby species favored for management could be reduced dramatically due to mortality.

Without management action, shade-intolerant species would continue to decline in number from competition with encroaching shade-tolerant white fir. Leaf area index would decline as live tree crowns decrease in size

from tree competition. 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 root disease infection, catastrophic fire, and eventual dieback from intense competition. 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. With 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 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, harvest has occurred on 1,720 acres of the 4,445 acres of BLM-administered forested lands within the Howard Analysis Area. Harvest treatments include commercial thinning, regeneration harvest, individual tree selection, and mortality salvage. These treatments have primarily removed white fir trees across all diameter classes and lowered density levels in lower- to mid-canopy layers. The remaining trees on these 1,720 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. For example, mortality salvage has replaced trees killed or damaged by insects, wind, or wildfire with young conifers. Additionally, 1,638 acres of pre-commercial thinning has been completed in plantations and mature stands since 1995 on BLM-administered lands within the Howard Analysis Area.

Of the 4,146 acres of privately-owned lands within the Howard Planning Area, varying levels of harvest have occurred over the previous 60 to 80 years. Conifer growth and timber yield rates for these lands are unknown. Most of these lands are arranged in a checkerboard fashion throughout the Planning Area. On the private industrial timber lands in the Planning Area, harvest activities have ranged from partial harvests to clearcuts, conducted in accordance with the Oregon Forest Practices Act. Most of the private industrial timber lands have been logged within the past 60 years. Within these stands, management objectives are to maximize volume growth per acre.

Present Actions

No timber sales are occurring on BLM-administered lands in the Howard Planning Area of the Jenny Creek Watershed. Oregon Department of Forestry (ODF) regulates timber harvest activities on all private industrial lands. In 2013, ODF was contacted and reported no harvest permits had been issued in the Planning Area at that time. On lands owned by private individuals, the amount of logging is unknown, but harvesting is generally limited to small areas and individual trees are used for lumber or firewood.

Future Actions

No future timber sales are being planned by the BLM in the Howard Planning Area of the Jenny Creek Watershed within the 5-year planning cycle. However, a landscape-level forest management project is anticipated in the adjacent South Fork Little Butte Watershed within the 5-year planning cycle.

Vegetative treatments may occur as part of BLM's silvicultural maintenance program. Brush and hardwood control and pre-commercial thinning are the two primary management activities most likely to occur within these treatment areas, both of which would reduce stand densities, increase conifer growth, and redirect forest stands towards conditions that would be more resilient to landscape disturbances. These treatments would enhance seedling survival, reduce vegetative competition, and allow for increased conifer growth.

On private industrial forest lands, future harvest plans are unknown. However, in stands with an average 8-inch DBH and greater, it is reasonably expected that commercial harvest will occur within 5 to 10 years. Industrial landowners would most likely use silvicultural methods (e.g. clearcut and overstory removal) that create early-seral stands. Post-harvest activities, such as conifer planting, applying herbicides to control brush and hardwoods, and pre-commercial thinning, would be scheduled to ensure the survival,

establishment, and maximum growth per acre of conifers. In stands less than 8 inches DBH, little commercial logging is expected in the next 15 to 20 years. On privately-owned lands, limited harvesting activities are expected. Occasional logging of large individual trees would occur and would most likely be limited to small areas.

b. Alternative 2—Proposed Action

Refer to Chapter 2 for Silvicultural Prescriptions in the Proposed Action for this Environmental Assessment.

Stands were modeled in a growth and yield modeling system called ORGANON (Hann 2012). Developed at Oregon State University's College of Forestry, the model predicts forest growth outputs based on scientific formulas programmed into it, and was used to better capture the differences between effects of forest treatments versus no treatment. The Southwest Oregon variant was used to model selected stands in the Howard Analysis Area. Results of predicted outputs can be viewed in the Table(s) below. Mixed conifer stands within northern spotted owl (NSO) Nesting, Roosting, and Foraging (NRF) and Dispersal (DISP) habitat were measured to develop prescriptions.

Table 3-3 displays the difference of stand densities from the effects of Alternatives 1 and 2 following 20 years of growth. The table also highlights the trends associated with stand density and canopy cover as silvicultural prescriptions are applied. Table 3-3 displays the current canopy cover to demonstrate the relationship of RDI of a stand and the number of trees occupying that same stand with and without management intervention.

Table 3-3. ORGANON Modeled Stands; Thinned vs. Un-thinned and 20 Year Growth

Unit	Proposed Rx and NSO Habitat	Current BA/AC (ft^2)	Current Canopy Cover	Projected Canopy Cover% following Harvest	Current RDI	Projected RDI following Harvest	Projected RDI in 20 Years (Unthinned) Alt. 1	Projected RDI in 20 Years (Thinned) Alt. 2
13-1	DM/ DISP	280	74%	44%	0.57	0.32	0.65	0.36
7-1	DM/ DISP	235	69%	47%	0.67	0.37	0.76	0.43
26-2	DM/DISP	248	76%	42%	0.59	0.32	0.65	0.36
19-2	ST/NRF	236	75%	66%	0.69	0.54	0.74	0.59
17-4	ST/NRF	255	71%	62%	0.70	0.54	0.78	0.62
1-1	ST/NRF	248	73%	64%	0.72	0.55	0.81	0.64

DM/DISP=Density Management Prescription in Dispersal Habitat
ST/NRF=Selective Thinning Prescription in Nesting, Roosting, Foraging Habitat

Table 3-4 displays the difference between no action and a treatment that maintains on average 60% canopy cover. No action exhibits tree loss through competition mortality in competition with trees removed and utilized through timber harvesting under a science-based silvicultural prescription. The direct correlation between competition mortality and RDI is evident when comparing a NRF stand with and without treatment implementation. The decreasing trend of trees per acre over a 50-year time period is a direct effect of competition mortality that naturally occurs as stands develop and forest management treatments are not applied. However, without stand treatments that reduce trees per acre, RDIs remain above the 0.55 RDI threshold and leaves stands more vulnerable to disease and insects. The model shows that, within a 50-year time period, stands in which treatments are not applied will maintain a higher RDI. Reducing stand density is critical in meeting the stated purpose and need of the Howard Forest Management Project. Tables 3-3 and 3-4 illustrate this trend for treated stands versus untreated stands.

Table 3-4. NRF Stand (Unit 17-4) With and Without Selective Thinning

Current Stand Condition					
Year	Trees Per Acre	Basal Area (sq ft/ac)	Relative Density Index	Canopy Cover (%)	Quadratic Mean Diameter (in.)
2013	140	255	0.70	71	18.3

Alternative 1-No Action (Growth of Stand if Not Treated (note the decline in trees / acre from natural mortality)					Alternative 2-Proposed Action (Growth of Stand if Thinned to Maintain 60% Canopy Cover)			
Year	TPA	RDI	Canopy Cover %	QMD	TPA	RDI	Canopy Cover %	QMD
2023	137	0.74	72	19.3	94	0.58	63	21.0
2033	134	0.78	73	20.3	93	0.62	65	22.0
2043	130	0.82	74	21.2	91	0.65	65	22.9
2053	127	0.85	75	22.0	90	0.68	66	23.8
2063	124	0.88	75	22.8	89	0.71	67	24.6

Figure 3-3 illustrates the pre- and post-harvest stand conditions of Stand 17-4 (NRF habitat) modeled with ORGANON and SVS over a 50-year time period. The Stand Visualization System (SVS) illustrates the prescriptions, portraying what existing forest stands would 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 four modeled scenarios. The figure(s) below show the short- and long-term changes in stand condition following a Selective Thinning treatment and a “no treatment”.

Figure 3-3. NRF Stand 17-4 With and Without Selective Thinning

(a): Current Stand Condition

(b): 50-Year Untreated Stand Condition

(c): Post-Harvest Stand Condition

(d): 50-Year Post-Harvest Stand Condition

Table 3-5 displays the difference between a No Action (unthinned) Alternative and a treatment that implements the Density Management prescription in a Dispersal stand. The current stand exhibits a RDI of 0.67. A RDI from 0.55 to 1.00 bounds the zone of imminent mortality and suppression, whereas a RDI of 0.550 marks the threshold for competition mortality. The untreated stand, 50 years later, projects a reduction in trees per acre each decade resulting from competition-induced mortality. Each decade compounds the competition as a result of uncontrolled densities. However, in comparison, the fewer numbers of trees lost per acre per decade occurs in the treated stand due to a prescription that lowers the RDI from 0.67 to 0.51 50 years following treatment. After 50 years, the untreated stand holds 142 TPA at a stand RDI of 0.84. In contrast, the 50-year treated stand holds 85 trees per acre at a stand RDI of 0.51 (still below the threshold of 0.55; anything at 0.55 and greater results in mortality from competition between trees for limited resources).

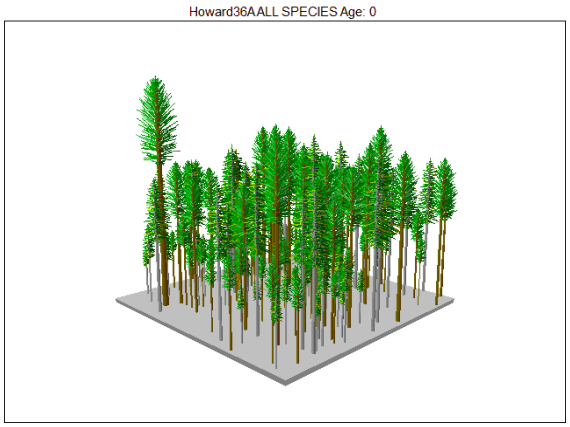
Also, when a treatment is applied, the model projects a dramatic increase in quadratic mean diameter while decreasing the TPA (density) over a 50-year time period.

Table 3-5. Dispersal Stand (Unit 7-1) With and Without Density Management

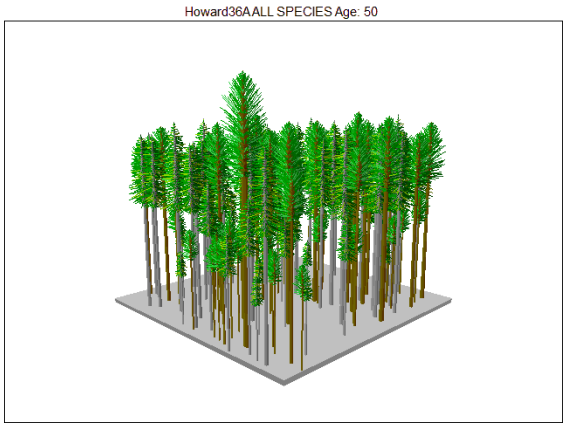
Current Stand Condition								
Year	Trees Per Acre	Basal Area (sq ft/ac)	Relative Density Index	Canopy Cover (%)	Quadratic Mean Diameter (in.)			
2013	165	235	0.67	69	16.1			
Alternative 1-No Action (Growth of Stand if Not Treated (note the decline in trees / acre from natural mortality)					Alternative 2-Proposed Action (Growth of Stand if Thinned to Maintain 40% Canopy Cover)			
Year	TPA	RDI	Canopy Cover %	QMD	TPA	RDI	Canopy Cover %	QMD
2023	161	0.72	70	17.1	93	0.41	49	16.9
2033	155	0.76	71	18.0	91	0.43	50	17.9
2043	151	0.79	72	18.9	89	0.46	52	18.8
2053	146	0.82	72	19.7	87	0.48	53	19.6
2063	142	0.84	73	20.5	85	0.51	54	20.4

Figure 3-4 illustrates the pre- and post-harvest stand conditions of Unit 7-1 (Dispersal) habitat modeled with ORGANON and SVS over a 50-year time period. Currently, the stand has 165 TPA, a RDI of 0.67, and a quadratic mean diameter of 16.1. Without treatment, the trees per acre are reduced over time as competition results in tree mortality. If the density were reduced under the proposed action, there would be approximately 93 trees per acre 10 years post-harvest, and the RDI would be 0.41 (below imminent mortality threshold).

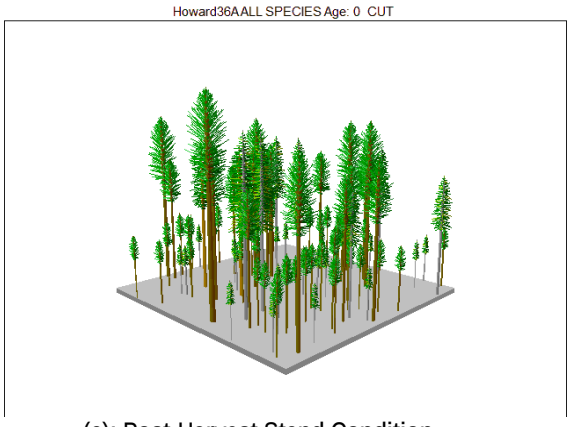
Figure 3-4. Dispersal Stand 7-1 With and Without Density Management



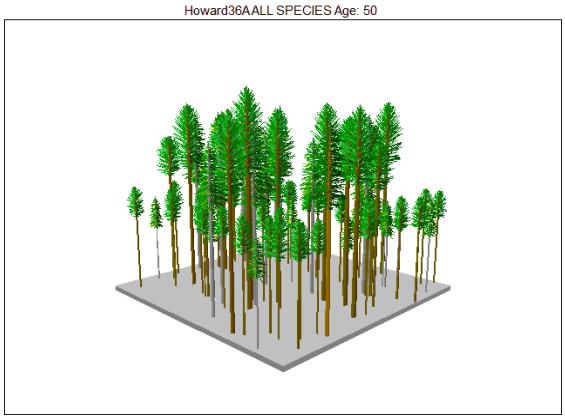
(a): Current Stand Condition



(b): 50-Year Untreated Stand Condition



(c): Post-Harvest Stand Condition



(d): 50-Year Post-Harvest Stand Condition

In summary, stands under the Howard Forest Management Project would benefit immediately from Density Management and Selective Thinning. The following silvilcultural 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 current conditions. The reduction in stand densities, preference of shade-intolerant species over shade-tolerant (white fir), and increased growing space for residual trees will result from such treatments.

Alternative 2 includes 638 acres of commercial harvest, representing 11% of the land in the Analysis Area (5,594 acres). Under Alternative 2, 14% of the forested land base in the Analysis Area is proposed for commercial treatment. Density Management treatments are proposed on 394 acres, representing 7% of the land base in the Analysis Area under Alternative 2. Selective Thinning treatments are proposed on 244 acres, representing 4% of the land base in the Analysis Area under Alternative 2.

Alternative 2 would reduce surface and crown fuels (primarily white fir) 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 their rate of spread to adjacent lands. These treatments would be beneficial to forested stands and the habitat they provide, rather than detrimental. These treatments would create an environment for shade-intolerant species to survive, thus increasing species diversity within these conifer-dominated stands. Maintaining these drought-tolerant species ensures the resiliency of forested stands during a period of climatic uncertainty. The No Action Alternative would leave forested stands in the Project Area vulnerable to severe drought cycles. The relatively high levels of white fir trees and mortality of untreated mixed conifer 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 mixed conifer stands 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 Proposed Action allow flexibility in managing stands in the long-term. The retention of drought-tolerant and fire-resilient species and reducing disease-prone species in the area (e.g. white fir) allows for more silvicultural options in the future.

C. FIRE AND FUELS

Assumptions

Analysis Area: Includes the entirety of the Jenny Creek 5th Field Watershed.
Project Area: Where appropriate, refers to units proposed for treatment under the Proposed Action.

1. Affected Environment

The landscapes that comprise the Analysis Area evolved with frequent fires affecting the vegetation and other key components of the ecosystem. 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 fire exclusion.

Fire is recognized as a key natural disturbance process throughout Southwest Oregon (Atzet and Wheeler 1982). 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 1996). 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). These fires served as a thinning mechanism by 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.

a. Fire Regimes

Climate and topography combine to create the fire regime found throughout the Analysis t 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 the Northern California Siskiyou mountains prevent generalizations about fire and its ecological effects (Agee 1993, pp. 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 to the change from historical to current vegetative structure. The change in vegetation also helps to describe the difference in fuel loading (dead and live fuels in the form of increased vegetation) from historic 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.

One historic fire regime is found within the Analysis Area (Schmidt et al. 2002):

> *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.

Mixed-severity fire regimes (mosaics of frequent, low-severity and infrequent but high-severity) are more difficult to describe due to complexities that result in a mosaics of fire effects. In forests characterized by mixed-severity fire regimes, stand-age maps may be combined with fire scar reconstructions to characterize both high-severity and low-severity fire cycles (Baker and Ehle 2001). Severe fires currently on the landscape are more apt to result with severe effects than would have occurred historically (Agee 1998; Agee 2002).

b. 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 (Mote et al. 2003; Hessl 2004). These forecasts would suggest that, in the future, climatic factors may 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 drier 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 of change in the ecosystems. One option land managers have to affect that change and to protect private property and ecosystems is to utilize silvicultural and fuels management treatments.

c. Condition Class

The process for making an assessment of 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 that often pre-dates 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.

Stands within the Howard Forest Management Project proposed for treatment are in Condition Classes 2 and 3. Stand densities are very high in some areas due to the absence of fire.

d. 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 BLM-administered lands within the Analysis Area, and reflect the results of previous human-caused and natural disturbances. On approximately 77% of BLM- administered lands, 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 commercial harvest under the Proposed Action represent a moderate-to-high fire hazard.

e. 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. Fire risk is highest in the Analysis Area from July through September.

Information from the Oregon Department of Forestry database from 1960 to 2010 show a total of 53 fires occurred throughout the Analysis Area. Lightning accounted for 25% of the total fires, and human-caused fires accounted for 75%. Sixty-six percent of the fires started on BLM-administered lands. Lightning accounted for 29% of the fires started on BLM-administered lands.

f. Surface Fuels and Fire Behavior

The existing surface fire behavior fuel model in the majority of stands proposed for commercial thinning are represented by a Timber Group fire behavior fuel model. Fuel amounts are measured in tons per acre for different sizes of material. Material up to three 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.

If not accompanied by adequate reduction of fuels, timber harvest can increase fire severity by increasing dead surface fuels; therefore, the result is a decrease in canopy fire severity and risk with a simultaneous increase in fire hazard due to increased ground fuels.

Forest fuels (including live and dead material) can be changed in terms of fire behavior and fire effects characteristics by silvicultural and fuels treatments (Agee 1996; Weatherspoon 1996), fire exclusion practices, and natural events.

Weather and topographic effects on fire behavior and severity are interrelated with the amount and distribution of fuels on a site with respect to the aspect, steepness of slope, and position on slope, along with atmospheric elements of temperature, relative humidity, in relation to fuel moisture, and wind speed and direction. When the environmental and atmospheric conditions are conducive to drying fuels and/or heating them to the ignition point during a fire, they are referred to as available fuels. The interrelationship between slope and wind with the amount and arrangement of available fuel is critical in terms of allowing a fire to spread and increase in intensity. Without fuel loading becoming available to burn in a fire due to the effects of extreme weather, there are no adverse effects to the vegetation or other site qualities. For example, in some desert areas where vegetation is sparse and extreme fire weather is the norm (i.e. high temperatures, low relative humidity, windy unstable atmospheric conditions), fires often don't spread except under unusual wind conditions, due to the lack of continuous fuels.

Utilizing the modeling tool BEHAVE, with the parameters of a 6 miles per hour (mph) wind speed and one hour fuels moisture of 6 % , 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 five 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.

g. Effects of Past Management

Practices that have profoundly changed the structure and composition of low- to mid-elevation forests in the Analysis Area include historical and current land uses that encompass logging and road construction, in concert with the policies of fire suppression and results of drought events. These structural changes have contributed to the shift from low-intensity surface fires to severe stand-replacing fires.

Past actions that have cumulatively contributed to the current wildfire behavior and potential include timber harvesting, fuels reduction, and fire suppression. Drought, in combination with dense forest stands, has resulted in high tree mortality, especially in the areas of Pine and Dry Douglas-fir stands. This has resulted in increased fuel loads in these areas. Road building and land development (on private lands) have contributed to the current level of risk by expanding human influence further into the wildlands. Fire history recorded over the past 30 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.

From 2005 to present, fuels treatments have occurred on approximately 2,849 acres of BLM-administered land within the Analysis Area. Approximately 467 of these acres were commercially thinned with follow-up prescribed burning treatments, resulting in reduced fire hazard on these acres.

Fire Suppression

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 1996). 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, large fires were a common occurrence in the area. Based on fire scars and vegetative patterns, fires were of varying severities.

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 Project 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 % 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 the BLM to designate areas that require special fire management activities during suppression efforts in order to insure damage to resources is minimized. It is recognized that restrictions could increase the cost of suppression which the BLM 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

As a result of the absence of fire, there has been a build-up of unnatural levels of fuel and a change to fire-prone vegetative conditions. This is particularly true for ponderosa pine and the dry mixed-conifer forest types. Historically, frequent and low-intensity fires maintained the low- to mid-elevation forests in more open conditions, which were dominated by large-diameter trees. 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 build-up fuels and a shift to more fire-prone vegetative conditions.

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. 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 and display similar fuel quantity may burn with similarity in patch-size and intensity to their historical patterns under some weather conditions, and with more severe characteristics and larger patch-size under severe fire weather conditions.

Logging

Past-harvest techniques (i.e. clearcutting or overstory removal) have resulted in stands of young and more flammable trees, which contribute to the current fire hazard ratings within the Analysis Area.

In 2012, approximately 466 acres of BLM-administered lands were logged adjacent to the Project Area under the Swinning Timber Sale. Project activity included treatment of activity-generated fuels (fuels reduction and prescribed burning) to mitigate for increased fire hazard.

Timber harvest has increased fire severity, *if not* accompanied by adequate reduction of fuels, by increasing surface dead 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 in a drier, hotter microclimate resulting from opening the forest canopy that significantly contributes to fire behavior in a wildfire situation.

Opening forest canopies results in microclimatic changes, particularly at the forest floor. A more open stand allows more wind and solar radiation, resulting in a drier microclimate when compared to a closed stand. This change in fuel moistures plays a major role in fire intensity and crown fire initiation. 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 (1999) 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 when 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 National Forest in northwest California 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.

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. Once again, 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.

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-canopied forests and non-forested 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 or 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.

Fuels Reduction and Fire Restoration

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. Reintroduction of prescribed fire without thinning will be problematic due to the existing conditions of overly dense stands of trees (Agee and Huff 1986). 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 et al. (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; Alexander and Yancik 1977). 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 enough that attempts to kill them with fire (alone) would run a high risk of also killing the overstory trees (Christensen 1988; Arno et al. 1995; Fulé et al. 1997; Moore et al. 1999). 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 forests 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 et al. 2004).

Fuels reduction through commercial thinning is believed by some to be experimental and controversial (DellaSala and Frost 2001). DellaSala and Frost (2001) recommend that only small trees generally less than 12 inches should be considered for removal and no roads be built to conduct mechanical treatments. The efficacy of 12 inch diameter limits is untested (Brown et al. 2004), and is often touted more as a social solution rather than a tested ecological solution.

The 2010 journal article *Alternative Community States Maintained by Fire in the Klamath Mountains* (Odion et al. 2010) and submitted personal communication between Odion and Klamath Siskiyou Wildlands Center (2013) assert that long absence of fire predicts low-severity of fire effects, and that thinning makes "little difference to fire…It is not nearly the magnitude of impact that the agencies claim. Given that fire is being suppressed, there is less high-severity fire occurring than likely did historically" (KSW and Odion 2012). However, a 2012 USDA Forest Service Airtanker Assessment states that "with the changing climate, fire seasons will likely become longer and more severe. This has already started to occur with the Western fire season now, on average, 78 days longer than in the mid-1980s. The trend for the number of acres burned annually by wildfire indicates a doubling of acres burned since 1960" (USDA 2012). Further, the 2010 article fails to account for the effects of topography, aspect, soils, season of burn, or time of burn, all of which play important roles in fire behavior in the Klamath Province (Mitchell 2012). Studies continue to confirm the efficacy of fuels reduction treatments across the West (Prichard et al. 2010; Omi and Martinson 2002; JFSP 2007).

2. Environmental Effects

a. Alternative 1—No Action Alternative

Because no new management is proposed under Alternative 1, 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 on approximately 638 acres. 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 acres currently considered to be Condition Class 2 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 all 638 acres.

Fire suppression would continue because there are no policies proposed or in place that will allow fires to burn naturally within the Project Area. The Project Area is within the Wildland Urban Interface (WUI) and is a priority for fire suppression, especially in close proximity to homes. The 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. 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. Alternative 2—Proposed Action

All fuels reduction work proposed under the Proposed Action is consistent with the objectives identified in the Jackson County Wildfire Protection Plan. .

Activity Fuels / Surface Fuels

If not treated, slash generated from the commercial thinning of timber stands would create surface fuels that would be greater than current levels.

It is anticipated that fuel loadings of material measuring three inches and less after logging would be temporarily increased by approximately 3-11 tons to the acre prior to implementation of scheduled fuel disposal activities. This would change the existing fuel model of most of the timbered stands to a Logging Slash Group, in turn creating 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 Project-generated activity fuels in these stands.

Any areas planned for fuels treatment may be re-examined 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 could be changed to better meet the objectives outlined in this EA. Proposed changes would be limited to treatments and their anticipated effects analyzed under this EA.

Less than one percent of the BLM-administered land in the Analysis Area is proposed for treatment. Fire history in the area shows that 48 fires have occurred on BLM-administered lands in the Analysis Area over the past fifty years. Due to the small number of acres being treated and the rare occurrence of a wildfire in the Analysis Area, the probability of a fire occurring in a harvested unit is very remote.

Fuels treatments for stands that are commercially harvested would occur within 6 months to 2 years 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 would 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.

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 ascending 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; Agee 1996; Agee 1993).

The implementation of thinning under the Proposed Action would promote increased fire-resilient forest stands by thinning from below, removing suppressed, diseased, and/or over-crowded intermediate and co-dominant trees while generally retaining the larger co-dominant and dominant trees within treated stands. 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).

Thinning from below (removing the smaller diameter trees within a stand) would increase the average tree diameters as soon as treatments are completed. Over time, tree diameters would continue to increase with the growth of the residual stand. Larger-diameter trees are more tolerant of surface fires, resulting in less tree mortality in the event of a surface fire. Commercial thinning would also favor more fire-resilient 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 (Huff and Agee 2000).

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 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 would be 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.

The entire Project Area is within the wildland urban interface (WUI). While Cohen (2000) found that even severe fires will not directly ignite structures at distances beyond 200 feet, fire brands from beyond 200 feet may land on combustible surfaces and ignite structures. The thinning proposed with this project, coupled with the continued maintenance of stands that have had previous fuels treatments within the urban interface, reduces the chances that embers originating beyond the immediate defensible zone will ignite structures.

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 (Countryman 1955; Countryman 1972), 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 National Forest in northwest California 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 the Proposed Action vary in how much canopy cover will remain after commercial thinning occurs. 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 15-19% would result in 3% fuel moisture for 1-hour time lag fuels. The fuel moisture of 10-hour fuels would be 5%; and the 100-hour fuel moisture would be 7%.

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% shading (shaded) or less than 50% shading (exposed). Cloud cover, as well as timber overstory (canopy closure), are utilized in calculating percent shading.

Utilizing the example from above (1 hour time lag fuels at 3%) to correct fuel moisture on a site that has the attributes of (a) north slope, (b) slope greater than 31%, (c) 12:00 pm in August, (d) no cloud cover, would add 3 % to the fuel moisture for a total of 6%.

Utilizing the same parameters, but for an area that has shading greater than 50%, one would add 4% for a fine fuel moisture of 7%. The difference between the two sites is 1%, which would result in minimal impacts to fire behavior.

Implementation of the Proposed Action may result in a reduction of canopy cover below 50% on 394 acres of Dispersal NSO habitat via a treat and maintain prescription. Based on the example above, the 1% reduction of fine fuel moistures would have minimal effects on fire behavior.

Smoke Impacts

The Proposed Action proposes to use prescribed fire. 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 Park 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 PM2.5 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.

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 by burning when duff and dead woody fuel have the highest moisture content, which reduces the amount of material actually burned. Smoke dispersal is easier to achieve due to the general weather conditions that occur at this time of year.

Smoke emissions and effects are further reduced because handpiles would be covered to keep material dry to permit burning during the rainy season, when there is a stronger possibility of atmospheric mixing and/or scrubbing, thus dispersing the smoke.

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.

Because of actions to minimize smoke effects and because of DEQ smoke regulations, smoke associated with the Proposed Action would not reduce the air quality of the Medford/Ashland Area. However, despite these measures, a few individuals would still be affected by a few hours (short duration) of smoke, perhaps causing discomfort.

Because smoke impacts are well within PM-2.5 standards there are no direct or indirect effects of any consequence to incrementally add to past, ongoing, and reasonably foreseeable air quality impacts. Hence, there are no cumulative effects from this alternative.

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 involve methods that ensure the most rapid and complete combustion of forest fuels. Covering of handpiles is a Best Burn Practice. This section also 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. The Oregon Department of Environmental Quality and the Oregon Department of Forestry developed a memorandum of understanding (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.

Previous Environmental Assessment comments have suggested 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 et al. 2003). It also states that from an operational standpoint, Kraft paper is a more expensive, less durable, and a 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.

Roadside Brushing

Roadside brush removal is done for safety measures. Material that has grown into the roadbed is cut to increase sight distances for vehicle traffic. Cut material is scattered on the downhill side of the road. The amount of material cut varies, but in most cases is not continuous along the entire road. Based on past projects, the amount of material is less than 2 tons/acre. The largest area potentially impacted by roadside brush removal is approximately one half acre per mile of road brushed. The amount of material left would have little-to-no impact on fire behavior. The material is on the downhill side of the road and the road would act as a fire barrier if a fire started in this material and burned up hill. In the event of a fire starting in this material and burning downhill, the fuel loading below this material is what would impact fire behavior. It is acknowledged that newly cut material in the first year would be more flammable than if not cut.

D. SOIL RESOURCES

Definitions of relevant terms:

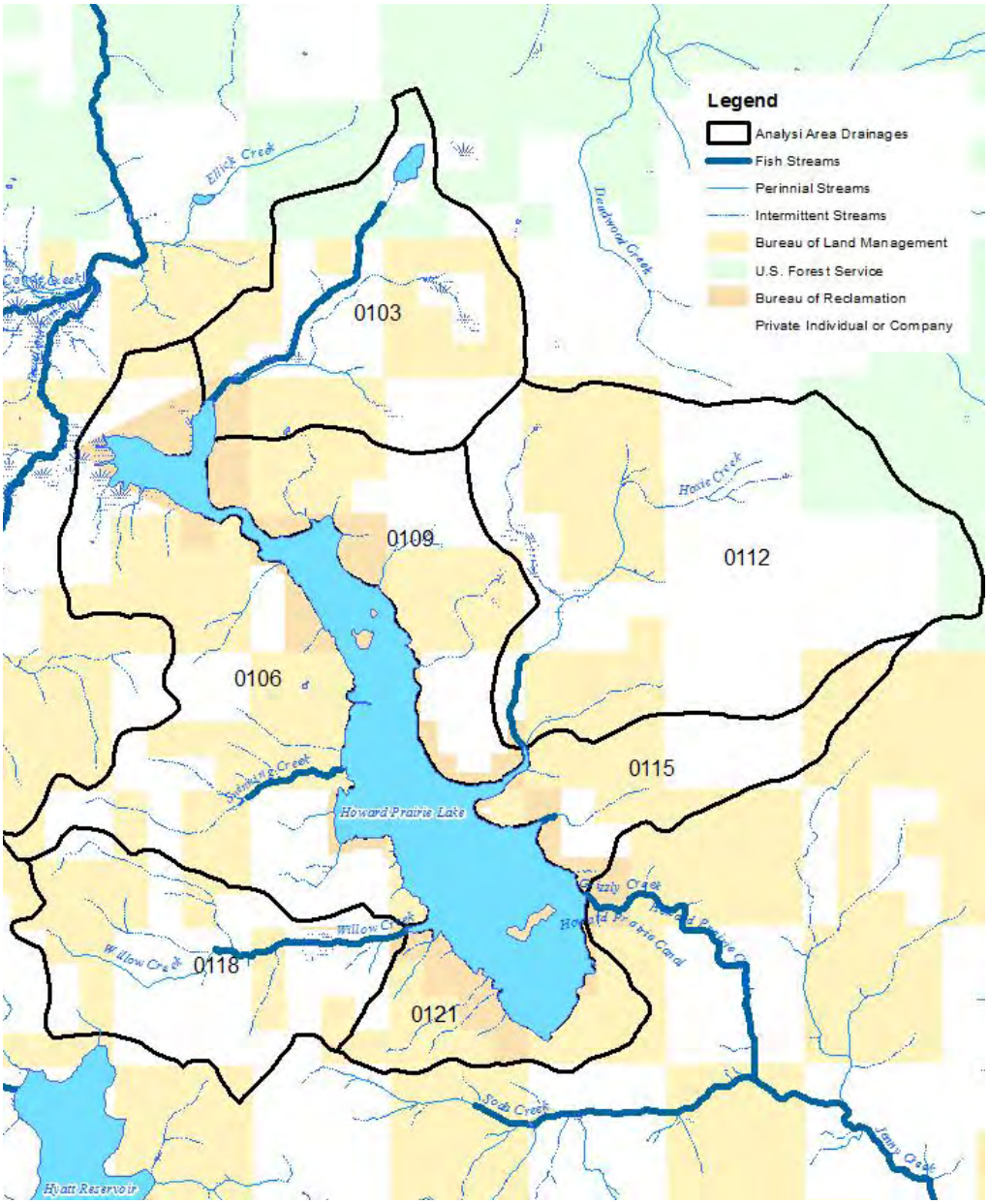
Short-term: less than 10 years
Long-term: 10 years or more

1. Affected Environment

The proposed Howard Forest Management Project is within the northwest portion of the Jenny Creek Watershed. Soils identified in the Project units are the Farva, Pinehurst, and Woodseye soil series recognized by the Natural Resource Conservation Service. The topography within the Project Area ranges between 8-35% slopes. Elevation ranges from approximately 4,500 feet to 6,000 feet. The Project Area is located within the larger Analysis Area, and for the purpose of this analysis, is defined as the area where the soil resource would be affected with the implementation of proposed actions. Cumulative effects as it relates to soil productivity processes of erosion, compaction, and burning will be analyzed within the Project Area (on-site).

The broader Analysis Area (16,391 acres) is the scale at which the risks of erosion leaving the project site and compaction affecting water run-off are analyzed in the Water Resources section. Within the Analysis Area, 6,806 acres are BLM-administered lands, 2,003 acres are other Federal ownership (Forest Service and Bureau of Reclamation) and 7,582 acres are private lands.

Map 3-1. Howard Forest Management Project Analysis Area for Soils Resources



Soil-related issues associated with the Howard Project have been identified through public scoping or interdisciplinary team specialists and will be addressed in this document. These relevant issues are:

- Project activity may increase the risk of soil compaction and soil erosion.
- 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 soils.

a. Description of Soils Series

A table of the predominant soils identified in proposed harvest units is listed below (Table 3-6), followed by a general description of the soil series recognized by the Natural Resource Conservation Service. See the soils map (Map 3-2) for the location of the soils on the landscape. There may be minor amounts of other soil series included within the proposed units.

Table 3-6. Soil Series and Characteristics

Map Unit #	Soil Series Name	Depth (in.)	Soil Texture	Soil Sensitivity Category	Plastic Limit between 2 and 6 inches depth*
1-1, 13-2, 13-4, 17-2, 17-3, 17-4, 19-1, 19-2	Farva	35	Very cobbly loam, extremely cobbly loam. In some areas, the surface layer is stony.	2	PI: NP to 5 LL: 15-25
1-3, 13-1, 24-9	Pinehurst	60+	Loam, clay loam	3	PI: 5-10 LL: 20-30
1-2, 1-4, 7-1, 7-2, 11-1, 13-3, 13-5, 17-1, 23-1, 26-1, 26-2, 29-2, 29-3, 29-5	Mix of both soils				
1-1	Woodseye-Rock outcrop	18	Very stony loam for Woodseye and Rock Outcrop	2	PI: NP-10 LL: 20-35 **

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 Standards and Guidelines. 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 Standards and Guidelines (USDI 1995, p. 168).
S= slopes ≥ 65%
* 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 only the PI and LL for the Woodseye soil. Rock outcrop would not have a PI or LL.

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. The subsoil is brown, extremely cobbly loam about 15 inches thick. The substratum also is brown, extremely cobbly loam. It is about 8 inches thick. Weathered 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. 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.

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 subsoil to a depth of 60 inches is dark reddish brown clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony. Permeability is moderately slow in the 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.

Both the Farva and the Pinehurst soil have a low resistance to compaction, meaning 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.

Both the Farva and the Pinehurst soil have a high potential for recovery from disturbance. Therefore, when a road or skid trail has the surface scarified, the affected soil is expected to have the soil surface quickly stabilized with vegetation re-established. But because the soil is not deeply sub-soiled, it is expected to return towards its former productive state for tree growth, both functionally and structurally, in a long-term timeframe (well over 10 years). 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.

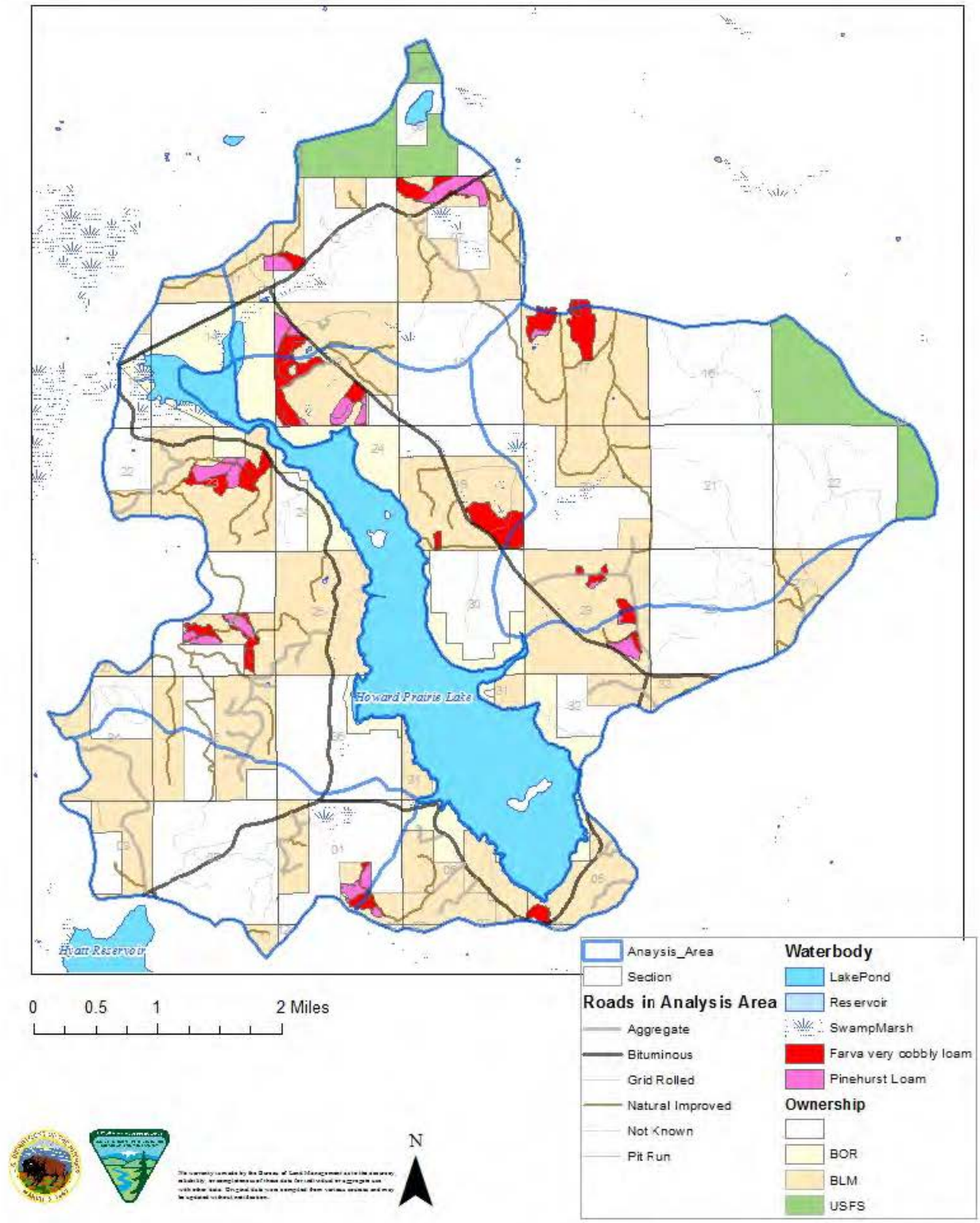
The Woodseye-Rock Outcrop complex is a shallow and somewhat excessively drained soil. It formed in colluvium derived from Andesite. The surface layer is dark brown, very stony loam, about 2 inches thick. The next 16 inches are a dark brown, very cobbly loam. Bedrock is at approximately 18 inches depth. The depth to bedrock ranges from 10-20 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.

Swanson and Dyrness (1975) estimated the natural erosion rates for soils in the Western Cascade Range to be about 0.19 yd^3/ac/year, and erosion rates increased in harvest areas to 0.7 yd^3/ac/yr (in Aramanthus et al. 1985, p. 233). 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 the amount/degree of disturbance. The Analysis Area consists of slopes up to 40% with a very slight potential for landslides. For this reason, it is anticipated that erosion rates in the Project Area will be much less than those reported by Swanson, and should not be of concern.

A big influence on soil compaction is the moisture content of a soil when operated on. The plastic limit is the moisture content where a soil acts as a plastic and can be moldable. When the soil is at a lower water content than this, soil will not change shape under pressure. Soil aggregates could be crushed or displacement could occur. When at a lower water content than the plastic limit, soil compaction is less of a risk (Penn State College of Agricultural Sciences 2014 http://extension.psu.edu/agronomy-guide/cm/sec1/sec11f).

Map 3-2. Generalized Soil Types in the Howard Forest Management Project Area.



b. Roads

There are approximately 186 total miles of road in the Analysis Area. Many of the designed surfaced roads on private land appear to have been built more than ten 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 3-8% 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.

It is estimated that every 1 mile of road occupies 4 acres. Therefore, approximately 740 acres in the Analysis Area are roaded and removed from vegetative productivity. In the Analysis Area, there are approximately 30 miles of off-road vehicle, horse and hiking trails on BLM-administered land. The highest concentrations are in areas in close proximity to Howard Prairie Reservoir. On most of these trails, 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, such as may 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 Analysis 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).

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 all sites that are proposed for treatment. 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. Soil organic matter appears typical for the region, with most of the sites having approximately 1 to ½ inch or less of litter (leaf and needles). Except for areas disturbed by roads and trails, and sites with gravels and cobbles 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. 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. One lesson learned from past actions is that roads were historically poorly designed, and were located without regard to erosion and stream sedimentation impacts. Many of the roads have been poorly maintained and have been degraded as a result of use during the wet season. Clearcutting and broadcast burning 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 been re-established with vegetation and, except for roads, erosion rates are near natural levels.

Past timber harvest on BLM-administered lands in the Analysis Area has been sporadic. An inventory of past actions with harvest dates and units of treatment was made for the Analysis Area using past harvest records and photo interpretation. Timber harvest records, in combination with the operations inventory data, were used for evaluating past actions on BLM-administered land. 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. The inventory of past harvest activities on private land was estimated using aerial photo interpretation. The aerial photos used were from 1966, 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 14,930 acres of the 16,391 acre Analysis Area has had some type of timber harvest in the past, all of which has been ground-based. All past timber harvest in the Project Area was accomplished using tracked equipment. It is assumed that most of past harvest occurred before 1980 and was not on designated skid trails. It is estimated that about 627 acres of past tractor harvest was on designated skid trails. During the 1970s and through the 1980s, implemented 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% of the harvest area. It is estimated that unrestricted tractor logging resulted in about 25% of the area being compacted. Since 1980, there have been approximately 2,284 acres of tractor-harvested acres on BLM-administered land. Oftentimes, compaction is less than 12% in these units. However, assuming all tractor units on BLM-administered lands since 1980 are 12% compacted, the result is approximately 274 acres of land that is compacted from skid trails and associated landings. Approximately 4,078 acres of BLM-administered land were harvested prior to 1980. Soil that was compacted before 1980 would likely still be compacted. In these areas, soil productivity is in the process of being restored and these areas may be up to 25% compacted. In Alternative 2, any operations off designated skid trails are limited by moisture restrictions.

The Swinning timber sale was recently planned and completed in the Analysis Area. In total, 466 acres were ground-based harvested on designated skid trails. These units were field-assessed by the Project soil scientist, and all are under the 12% compaction threshold.

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 5-13%, and compaction's effects can last 30 years. In a 2004 compaction study of 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 15-20 years earlier. Old disturbance areas are composed of secondary or primary skid trails and areas that received 1-2 equipment passes. They estimate it would take from 50-80 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. For this reason, it is assumed that compaction in areas harvested by tractor prior to 1970 are considered recovered.

2. Environmental Consequences

Because no new management is proposed under Alternative 1, the effects described reflect current conditions and trends that are shaped by ongoing management and events unrelated to the Howard Forest Management Project.

Discussions for Alternative 2 reflect the direct and indirect impacts of this alternative. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable. The environmental consequences on the soil resource are being described in terms of the effect that a particular action would have on the soil characteristics or soil erosion processes.

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 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. The appropriate scale for measuring erosion or compaction that may affect water resources would be the designated Analysis Area (see Water Resources section). Short-term impacts (or effects) are those anticipated within ten years or less, and those impacts anticipated more than ten years 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 return to near-normal levels within approximately 5 years.

a. Alternative 1—No Action

The effect of the No Action Alternative on soil resources would be the continuance of existing erosion rates resulting from the current conditions throughout the Analysis Area. Erosion rates are at near-natural levels throughout the Analysis Area, except in areas where roads and trails exist. Except for the Swinning Project Area, units that were harvested in the past have stabilized, with vegetation and erosion rates back to near natural levels.

There is no way to be certain that possible future actions would 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.

b. Alternative 2—Proposed Action

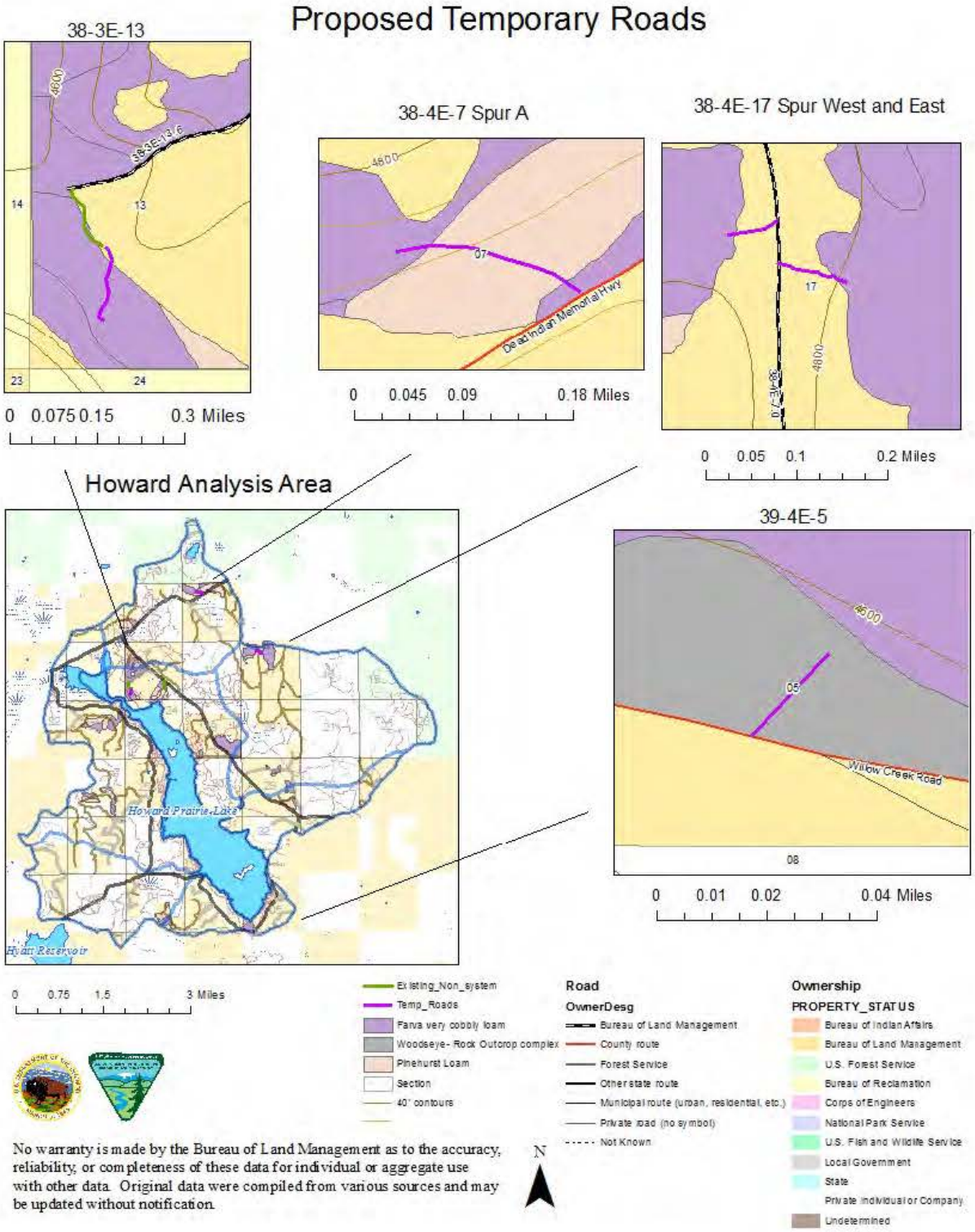
The main concern to the soils resource in this area is the effect to soil productivity (compaction). Soil displacement is not a risk due to the gentle topography.

Alternative 2 includes temporary road construction, road improvements, road decommissioning, and forest management.

Temporary Road Construction

There are five temporary roads (totaling 0.46 miles in length) proposed in Alternative 2 (Map 3-2 and Table 2-4). These temporary roads would be decommissioned as described in Chapter 2. This would include scarifying the surface, installing waterbars where appropriate, scattering slash and other debris along the length, and camouflaging and blocking the entrance using earthen berms, logs, boulders or a combination of these.

Map 3-2. Soils within Areas Proposed for Temporary Road Construction



The proposed temporary road located in T.38 S., R.3 E., Section 13 would be 0.13 miles in length. It is located in the Farva very cobbly loam. The proposed temporary road is on low-gradient slopes (less than 5% slope). Construction of the temporary road would compact the soil, but it is ground that has already been disturbed. Approximately 0.52 acres would be taken out of vegetative productivity. The slope is uniform and does not show indications of instability. 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 potential for recovery. Therefore, when the road is scarified, the affected soil is expected to return to its former productive state in

the long-term (10+ years), both functionally and structurally, in the long-term. Full ripping would not occur due to the rock fragments present in the soil. If these soils are deeply ripped (sub-soiled), over time, freezing and thawing in the soil can cause cobbles and stones to be pushed up to the soil surface.

The proposed temporary road in T.38 S., R.4 E., Section 7 (0.16 miles in length) is located in the Farva very cobbly loam (at the beginning of the road), but is mostly in the Pinehurst loam soils. Slopes range from 5-10%. Approximately 0.64 acres would be taken out of vegetative productivity with construction of this temporary road. The location of the proposed temporary road is generally on an old skid trail. The soil in this location would be both disturbed and compacted, but it is soil that has been disturbed and compacted in the past. The width of disturbance would increase because the proposed road would be wider than the current skid trail. The location of the road is on stable soils. Based on a rating from the NRCS, these soil series have a low resistance to compaction. Although this soil has a low resistance to compaction, it has a high potential for recovery. Therefore, when the road is scarified, the soils are expected to be able to return to their former productive state, both functionally and structurally, in the long-term (10+ years).

The proposed roads in T.38S., R.4 E., Section 17 (Spur West and Spur East, totaling of 0.14 miles in length) are both located off of Road 38-4E-7.0 in the Farva very cobbly loam. Slopes range from 5-10%. Approximately 0.64 acres would be taken out of vegetative productivity temporarily. The soil in this location would be disturbed and compacted, but it is soil that has been disturbed and compacted in the past (previously a skid trail). The width of disturbance, however, would increase because the proposed road would be wider than the current skid trail. The location of the road is on stable soils. Based on a rating from the NRCS, these soil series have a low resistance to compaction. Although this soil has a low resistance to compaction, it has a high potential for recovery. Therefore, as the road is scarified and not sub-soiled, the soils are expected to return to its former productive state, both functionally and structurally, in the long-term.

The proposed road in T.39 S., R.4 E., Section 5 (0.03 miles in length) is located in the Woodseye-Rock Outcrop complex. Slopes are generally less than 20% in the area. Approximately 0.12 acres would be taken out of vegetative productivity. The soil in this location would be disturbed and compacted, but it is soil that has been partially disturbed and compacted in the past (previously a skid trail). The width of disturbance, however, would increase because the proposed road would be wider than the current skid trail. The location of the road is on stable soils. Based on a rating from the NRCS, these soil series have a low resistance to compaction. Although this soil has a low resistance to compaction, it has a high potential for recovery due to soil depth. Therefore, when the road is scarified, the soils are expected to be able to return to their former productive state, both functionally and structurally, in the long-term.

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 are generally decommissioned at the close of project activities. In the context of the Howard Forest Management Project, temporary roads would be scarified and blocked during the same operational season. 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 new temporary roads are located on upland ridges or flat, stable slopes, also decreasing 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, 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 very long-term.

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 total includes mass slope failures from roads and landings on unstable slopes in calculating the number. 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% of that from the bare soil roadbed of otherwise similar construction (Swift 1988, p. 321).

Road Decommissioning/ Long-Term Closures

Approximately 1.87 miles of road would be decommissioned or would be placed in long-term closure (Table 2-5). The roads that would have surface loosening would be Road 39-3E-23.2, and non-system Spurs A and B (both located in T38 R03E S13), totaling approximately 0.92 miles, or an area equivalent to 3.68 acres. Therefore, approximately 3.68 acres of soil that currently has no or very little vegetative productivity would be restored towards being productive land. Road construction and 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.

Road 38-4E-29.02 is naturally overgrown and would be removed from the road layer because it has been naturally decommissioned. Road 38-3E-13.6 would be blocked to preclude use, and would be placed in long-term closure status. The soil surface would not be loosened in either road bed, so it would take longer for vegetative recovery to occur.

Road Improvement

The effect of road improvements to the soil resource is that some of the work (water dips, grading, shaping roads 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.

Road 38-3E-13.6 is proposed to be blocked to prevent unauthorized OHV use at the end of the road, which is resulting in extensive rutting in portions of the proposed unit.

Road 38S-4E-7.07 is currently blocked and within a proposed unit. While use of the area would disturb the soil, the soil is currently compacted. The area of compacted soil is not expected to increase in the road bed. Proper closure of this road is highly important due to the proximity to the highway to prevent unauthorized OHV use in this area.

Implementation of the following Project Design Feature is designed to discourage future use of the road bed by OHVs:

- Following use, all newly constructed and re-opened roads would be effectively decommissioned and/or blocked in the same season to preclude use. Blockage would consist of placing logs, slash, boulders, berms, and other material both at the entrance so that it is camouflaged, and at sufficient intervals along the road’s length.

Temporary Road Construction, Road Decommissioning, and Road Improvements

Temporary road construction would have the greatest impact on the soil resource, as approximately four acres of land are disturbed and taken out of vegetation production for every one mile of road construction proposed. Approximately 1.84 acres would be removed from vegetative production in the long-term due to the construction of five proposed temporary roads. There are currently 186 miles of road in the Analysis Area. During the Project, road miles would slightly increase during the operating season, and then be reduced back to existing levels before the wet season.

The soils in the decommissioned roads are not expected to be recovered in the short-term.

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.

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 temporary road construction and decommissioning.

Landings

The construction of landing areas would disturb less than one-half acre 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.

Forest Management

Soil disturbance from timber harvesting is not avoidable, but 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% of the ground in the proposed harvest units. As a result of implementing designated skid trails, the units tractor logged (638 acres) would result in approximately 12% 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% of the area, compared to 22% for conventional logging (Bradshaw 1979). In a study of thinning and partial-cutting utilizing yarding systems, skidding logs caused soil disturbance on approximately 21% of the site, resulting in 13% displacement and 8% 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 roads 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 reserves. 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% 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 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 bar 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% over undisturbed rates) in the tractor units where slopes exceed 20% 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 roads, causes a slower infiltration rate and larger amounts of sediment laden surface runoff. On slopes less than 20% 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.

The recent forest management activities in the watershed (Swinning timber sale) may be used as an opportunity to predict effects in units within the Howard Project Area due to the similar soil types, climate and terrain. Through monitoring of past actions, negative impacts (if they occur) may be avoided for future projects, and actions that have positive results may continue in future projects. Soil disturbance in the ground-based units were field-reviewed. The amount of area disturbed was determined and the degree of disturbance was evaluated.

Some of the units were harvested in winter (snow) conditions and some were harvested in dry season conditions. All of the units were under the 12% compaction threshold. Some of the snow-yarded units showed very little soil disturbance, and some showed more soil disturbance that was still concentrated to less than 12% of the area. There was soil displacement in some of the ground-based units within the skid trails. The extent of disturbance, however, did not exceed 12%, and due to the gentle slope and waterbars on the skid trails, soil displacement beyond the unit was not observed. Similar results are expected to occur from implementation of Alternative 2.

Logging Systems

In the Project Area, all units would utilize ground-based yarding systems, which include both tractor and mechanical harvesters.

Tractor Harvesting: The requirements for tractor harvest are that they remain on designated skid trails spaced 150 feet apart and manually cut trees and pull them to the skid trails. Where possible, skid trails are located on existing skid trails to avoid the overall increase in unit area compaction.

Mechanical Harvesting: Mechanical harvesting equipment (feller bunchers and cut-to-length machines) would be allowed in the Howard Forest Management Project.

For harvesting equipment to be effective, operations off of designated skid trails are needed. Mechanical equipment is driven to the trees for harvest; however, there is a requirement for equipment to have the capability to reach 20 feet.

There are PDFs that allow mechanical equipment to operate off of designated skid trails without resulting in

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% 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.

Fuels Reduction

Prescribed burning 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% as a result of burning handpiles because the piles would be spaced throughout and occupy approximately 3-5% 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% 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% in moderate burns, 33% 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%) decrease through short-term effects, but potential long-term positive effects would be realized from the proposed actions as the risk of catastrophic fire is diminished.

Summary

There would be a net increase in compacted area in the tractor harvest units, averaging about 12%, 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% 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%), short-term negative decrease, but potential long-term positive effects would be realized by thinning and prescribed fire of density management units. There would be a slight to moderate (15-50%) 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.

Cumulative Effects

The proposed temporary roads would temporarily increase road density by 0.5 miles 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 scarification, 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. An estimate of the amount of time that a skid trail soil density is approximately 50-80 years to recover to near-natural density levels (Lucklow and Guldin 2004). This may be similar to natural surfaced road recovery time although it may be shorter due to scarification and the effects of freezing and thawing that occurs in this area. Additionally, 1.87 miles of existing roads would be decommissioned. Decommissioning the roads would increase the amount of land producing vegetation in the Analysis Area by nearly eight acres. The soils where the decommissioned/closed roads 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 that vegetative recovery would occur would most likely be the fastest where the surface of the soil is loosened. However, it is still expected to be in the long-term. This would, of course reset the vegetative recovery of the soil.

Cumulatively, 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. clearcutting vs. shelterwood 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 Howard 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.

E. WATER RESOURCES

1. Affected Environment

The *Jenny Creek Watershed Analysis* (USDI 1995b) provides general water resources background information for the Analysis Area. Stream surveys and associated GIS mapping were completed for all Federal lands within the Analysis Area, and mapping of streams and roads on private lands was accomplished using aerial photo interpretation. Riparian Reserve locations and widths were determined site-specifically using the guidelines in the Northwest Forest Plan, and incorporated on-the-ground verification of stream types, wetlands, fisheries data, and site potential based on soils.

Water-related issues associated with the Howard Project have been identified through public scoping or interdisciplinary team specialist input, and will be addressed in this document. These relevant issues are:

- There could be short-term increases in sediment from roadbed and drainage ditch disturbance associated with road maintenance activities.
- Concerns have been expressed that timber harvest activities could lead to increased access for off-highway vehicles (OHVs) potentially increasing impacts to soils, water quality, and aquatic and terrestrial habitat.
- Logging (particularly tractor yarding) and road construction could increase soil compaction, and alter hydrologic flow, including peak flow and low flow.
- There is potential for adverse effects to water quality from increased sediment produced from disturbance associated with timber harvest activities including road construction, timber yarding, and timber hauling.
- 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 water quality and hydrologic function.

a. Analysis Area Description

The Howard Forest Management Project is located in the northwestern portion of the Jenny Creek Watershed, which is a 5th Field Tier 1 Key Watershed within the Upper Klamath Subbasin. The Project Area is smaller than the Analysis Area, and for purposes of analyzing the affected environment and the proposed Project, specifically cumulative effects, the Analysis Area for water resources will consider portions of

Upper Jenny Creek. There is a small amount of harvest (12 acres) proposed within Beaver Dam Creek, which is within the Little Butte Creek Watershed; however, no new roads will be constructed, nor will canopy cover be reduced below criteria used to assess potential changes in peakflows or cumulative effects. Therefore, it is not included in this analysis.

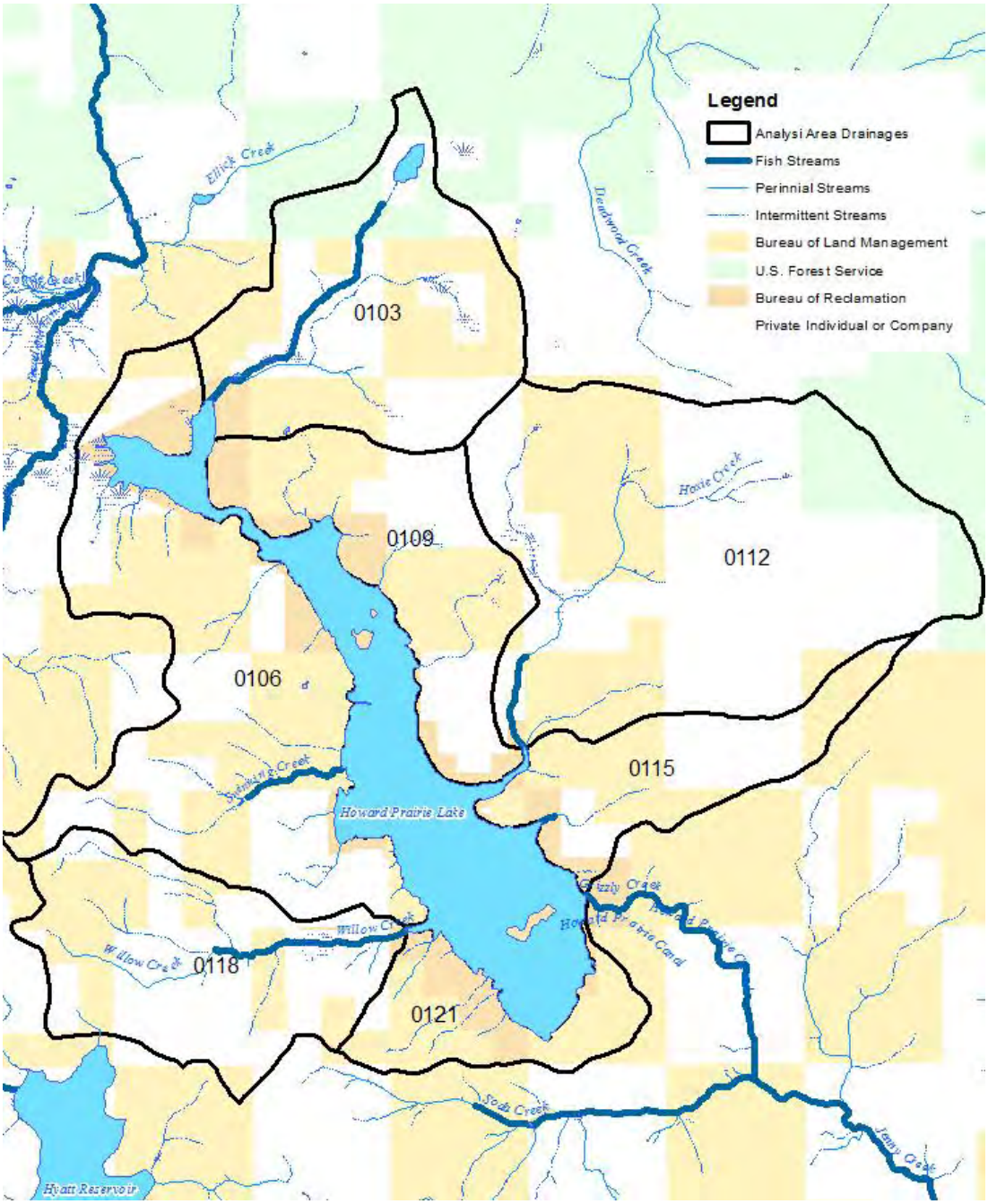
Upper Jenny Creek is called a sub-watershed and represents a 6th Field hydrologic unit codes (HUC). This sub-watershed is further subdivided into 7th Field HUCs, called drainages, which range in size from 842 to 4,572 acres (Table 3-8 and Map 3-3). The total size of the Analysis Area is 16,391 acres, or 25.6 square miles, and consists of drainages where treatments are proposed. The size of a drainage is large enough to assess the cumulative effect of actions that, taken individually at the site-scale may not be significant, but when combined with effects from everything else going on in the drainages, may have a potential impact (i.e. 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 probability of the analysis indicating that there is "no effect," when individual drainages may, in fact, have issues of concern.

With the exception of the 12 acres mentioned previously, all of the land within the Analysis Area drains into Howard Prairie Reservoir for eventual diversion to the Bear Creek Watershed. There is no discharge out of Howard Prairie Dam back into the Jenny Creek Watershed, except under emergency conditions (USDI 1995b). The Analysis Area is located entirely within the snow zone; transient snow zone is not an issue. Winter precipitation primarily occurring as snow ordinarily melts during the spring runoff season from March through June. Precipitation falls predominately from November through March and summer months are typically dry. The precipitation patterns in the winter months are wide-based, with relatively low-intensity and long-duration storms, in contrast to localized, short-duration, and high-intensity summer storms that occasionally occur.

Table 3-8. Analysis Areas and Ownership Associated with the Howard Project.

Sub-Watershed	HUC 7 (drainage)	Acres	BLM (percent)	Private/Other (percent)
Upper Jenny Creek	0103	2,457	40	60
	0106	3,512	48	52
	0109	1,749	44	56
	0112	4,572	29	71
	0115	1,206	51	49
	0118	2,053	36	64
	0121	842	63	37
Total		16,391	41	59

Map 3-3. Drainages (HUC7s) Associated with the Howard Forest Management Planning Area



As discussed previously, the streams within the Analysis Area all drain into Howard Prairie Reservoir. The BLM manages 41% of the land within the Analysis Area (Table 3-8). The Bureau of Reclamation (BOR) manages land within the Analysis Area, with ownership totaling 13%. The Forest Service (USFS) manages land within the Analysis Area, for a total ownership of 4%. Private lands encompass 42% of the Analysis Area, and include land owned by industrial forest companies, residential landowners, and cattle ranches.

Surface water in the Howard Analysis Area includes streams, ditches, springs, wetlands, and a reservoir. Streams 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-administered lands were identified through site visits; USFS and non-federal land stream types 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 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 (USDI 1995, p. 27). 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). Springs, wetlands, lakes/ponds, and small impoundments on BLM-administered lands within the Analysis Area have been identified and mapped in GIS. These waterbody features are also contained within Riparian Reserves.

There are approximately 126 stream miles within the Analysis Area, of which 29 miles (23%) are perennial streams, 21 miles (16%) are long-duration intermittent streams, 23 miles (18%) are short-duration intermittent streams, and 53 miles (42%) of dry draws. There are almost five miles of irrigation ditches in the Analysis Area. Approximately 2.7 miles are on private lands, and 2.2 miles are on Federally-administered lands.

Both small- and large-scale water diversions alter flow within the Analysis Area. There are many uses for small-scale water storage and diversions, including: livestock, wildlife, fire protection, irrigation, and domestic use, with the primary uses being irrigation and livestock. Howard Prairie Dam was constructed in the 1970s by the Talent Irrigation District to divert water to the Rogue Valley. This dam stores approximately 60,600 acre feet of water. Water is moved from the Howard Prairie reservoir through a canal, and along with water from Hyatt Lake, passes through the Keene Creek forebay (reservoir), and then via a tunnel in the mountain to the power plant above Emigrant Reservoir. The flow in the canal coming from Howard Prairie Reservoir averages around 50 cubic feet per second (cfs) during the summer months[3].

Soil compaction (due to ground-based logging and fuels treatment equipment, and the presence of forest roads and trails) may increase the frequency and magnitude of peak streamflows (Harr 1976a). In undisturbed forest soils in western Oregon, infiltration capacities far exceed the maximum rates of rainfall so that all water enters the soil, thus minimizing overland flow. Compaction can reduce the infiltration properties of the soil, resulting in increased runoff. Soil compaction can also impede the subsurface movement of water as it moves downslope in shallow aquifers. Peak flows for small, headwater streams appear to be increased where at least 12% of a watershed was severely compacted by road building, tractor skidding, or tractor windrowing of slash (Harr 1976). Factors that influence the contribution of a compacted area to increased runoff include: proximity of compacted area to streams, connectivity of compacted areas to streams, and watershed characteristics (Harr et al. 1979). Severe fire that exposes bare soil can also reduce the infiltration properties of the soil, resulting in increased runoff.

Increases in peak flows may occur within drainages where a high proportion of the landscape is compacted from roads and other disturbances and where vegetation has been modified resulting in a reduction of canopy cover. These effects can be magnified within the transitional snow zone, where the likelihood of synergistic effects from rain and snowmelt are elevated. When this occurs, increased sedimentation and habitat alteration can result from increased channel scour and bank erosion. Although there have been numerous studies in the Pacific Northwest that examine the effects of forest harvest on peak flows, the published results vary widely, depending on a number of factors including the type of event (rain; rain-on-snow; snow melt), the characteristics of the drainage basin, and the location in the basin of roads and clearcuts. No paired watershed studies provide data on forest management practices commonly used today by federal land managers, including commercial thinning and extensive riparian buffers. Most of the paired watershed studies in the Pacific Northwest examine clearcut and shelterwood harvests, where clearcuts included riparian vegetation. Peak flow changes for catchments that were 100% clearcut included a decrease of 36 %, no significant change, and increases from 23 to 42%. Peak flow changes for catchments that were 25 or 30% patch cut included several with no significant change and increases of 13 and 17%. For the two shelterwood treatments, one had no significant change and the other had a 32% increase. Treatment types were a mix, with some catchments cable yarded, some tractor yarded, some had both cable and tractor yarding, some were roaded, and some were broadcast burned. Peak flow change does not appear to be related in any simple

[3] http://www.usbr.gov/pn/hydromet/

way to the percentage of basin area cut or basal area removed (Moore and Wondzell 2005). The magnitude of peak flow increases declined with increasing event magnitude in most cases, with the greatest increases typically associated with autumn rain events on relatively dry catchments. These autumn events resulted in small peak flows with little hydraulic consequence (Moore and Wondzell 2005). Peak flow increases for flow events with a return interval of 5 years or greater were either small or there was no increase (Beschta et al. 2000). Post-treatment recovery rates varied among studies. For the catchments in the Oregon Cascades, recovery times of at least 10 years in all cases where there was a significant treatment effect and at least 30 years in two cases were reported (Moore and Wondzell 2005). In the snow zone under certain circumstances, greater snow accumulation can occur in clearings, producing the potential for higher peak flows during spring snowmelt (Moore and Wondzell 2005).

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

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

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

Average annual precipitation in the Howard Analysis Area is about 38 inches[4]. Low streamflows normally coincide with the period of low precipitation from July through October. The highest streamflows usually occur from January through May. Streamflows during the months of April and May and part of June are augmented by melting snowpack. 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. Flows in Grizzly Creek at the outflow of the reservoir, especially low summertime flows, have been augmented with water from the reservoir since the dam was built. The Howard Prairie Dam has resulted in a dramatic change in the hydrologic connectivity between headwater streams and the larger streams they flow into and it serves to regulate the movement and transport of sediment from upstream sources.

Water quantity in the Howard 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 Area include: land clearing (for agricultural and residential use), timber harvest, roads, water withdrawals, dam building, and fire suppression.

[4] http://www.weather.gov/climate/

Streamflows are naturally low during the summer due to low precipitation, reduced soil drainage, and sustained high evapotranspiration. Fire suppression has resulted in many overly dense forest stands with high evapotranspiration rates that likely contribute to decreasing the amount of water available for summer streamflows. Past harvests in the Analysis Area often included riparian vegetation. Vigorous regrowth of phreatophytic (i.e. deeply rooted trees that obtain their water from the water table) hardwoods following past harvest of riparian areas significantly increased evapotranspiration rates during the growing season, causing a reduction in summer flows.

The degree to which hydrologic processes are affected by vegetation canopy reduction (e.g. land clearing or timber harvest) will be analyzed based on the amount of the Analysis Area that is below the historic canopy cover. The historic canopy cover for the Analysis Area varies by ecoregion. The Analysis Area associated with the proposed project straddle two ecoregions: the Southern Cascades ecoregion, and the Southern Cascade Slope ecoregion (WPN1999, pp. A-80 and A-115).

Forest types within the Southern Cascades ecoregion historically had 40-45% canopy cover (WPN 1999, p. A-83). For analysis purposes, historic canopy cover is assumed to be approximately 40% for forested lands in the Southern Cascades, which is at the low end of the range for this ecoregion. Canopy cover for the Southern Cascade Slope ecoregion was historically less than 30% (WPN 1999, p. A-118).

For this analysis, 2012 aerial photos were used to estimate forest stands with canopy covers less than the historic level for all ownerships (Table 3-9).

Table 3-9. Percent of Forest Lands with Canopy Cover Less Than Historic Level.

Analysis Area	Percent of Total Forest Lands with Less Than Historic Canopy Cover		
	BLM	Private/Other[1]	Total
0103	10	56	36
0106	8	5	7
0109	1	33	19
0112	7	41	31
0115	6	65	34
0118	8	29	21
0121	5	10	6
Totals	7	36	24

1 Represents a combination of private, Forest Service, and BOR lands

While the Howard Project would drain to the Klamath River under natural conditions (prior to the dam), the Analysis Area borders the Upper Rogue sub-basin, which has similar forest types and structures, climate, historic fire frequency, and soil types as found in the Howard Analysis Area. Therefore, information on historic ranges of variation in landscape scale patterns described in “A First Approximation of Ecosystem Health for National Forest System Lands” is applicable to this Analysis Area. This means that within the Upper Rogue sub-basin, from 10 to 40% of the forest lands would have less than the historic canopy cover at any given time due to natural disturbances such as wildfire, drought, insect infestations, forest pathogens, etc. The percent of forested lands below the historic canopy cover is within the conservative range of natural variability (10 to 40%) for the Analysis Area.

Areas of compacted soil, such as occur from roads and landings, tractor yarding, or ground-based fuel treatments, can be a concern from a hydrologic perspective because such areas can decrease the infiltration properties of the soil, resulting in increased surface runoff.

Road miles were obtained from the BLM GTRN database, an aerial photo survey (2010 and 2011 photos), and field visits. This is the best information available, although it is acknowledged that there may be a few roads not included, such as non-GTRN roads that are hidden by tree canopy, OHV trails, and private roads built after the photos were taken. These additional roads would not change the outcome of the analysis.

Road density provides a general index of relative extent of the amount of road in the Analysis Area. Both road density and road density within Riparian Reserves are gross indicators of the level of road impacts in watersheds. High road densities, greater than 4.0 miles per square mile (King and Tennyson 1984) are found in all of the drainages within the Analysis Area (Table 3-10). 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. Overall road density is 7.3 mi /mi^2, while road density within Riparian Reserves is 9.7 mi /mi^2.

Table 3-10. Road Miles and Road Density by Analysis Area HUC7

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
0103	11.4	19.9	31.2	7.4	8.6	8.1	1.4	6.3	7.6	15.8	9.5	10.2
0106	19.2	21.6	40.8	7.3	7.5	7.4	4.6	3.6	8.2	10.4	4.8	6.9
0109	10.0	15.4	25.4	8.2	10.1	9.3	2.5	3.1	5.6	11.7	14.3	13.1
0112	10.5	32.7	43.3	5.0	6.5	6.1	3.0	4.6	7.7	11.7	10.4	10.9
0115	6.0	6.0	12.0	6.2	6.6	6.4	1.0	1.2	2.2	14.9	12.1	13.3
0118	5.6	17.2	22.9	4.9	8.4	7.1	1.4	4.2	5.5	6.8	10.8	9.2
0121	5.8	5.2	10.9	6.9	10.6	8.3	1.3	2.1	3.3	10.5	11.7	11.2
Totals	68.5	118.0	186.5	6.6	7.8	7.3	15.2	25.1	40.1	10.9	9.2	9.7

1 Non-BLM lands include Forest Service, Bureau of Reclamation, and Private ownership.
2 Road density is measured in miles/miles^2.

Roads located near a stream or mid-slope generally have a greater chance of directly affecting the hydrologic function of the stream system. Concentration of runoff by road drainage systems may contribute to more rapid delivery of storm runoff directly to streams, resulting in increased peak flows. Road segments linked to the channel network increase flow routing efficiency and offer a plausible mechanism for peak flow increases (Wemple et al. 1996).

In addition to roads, the Analysis Area contains an additional 13.5 miles of off-highway vehicle (OHV) routes located on BLM managed lands that were identified from BLM inventories. OHV routes are a more recent development affecting water quality. This use is especially damaging in wet conditions when ruts are formed that accelerate erosion and transport sediment to surface water. Since these areas are often in remote locations, the erosion may progress unabated for an extended period of time, resulting in extensive damage. If a trail becomes impassible due to rutting, frequently a new, adjacent trail is established. Currently the majority of OHV use is focused on accessing the shoreline of Howard Prairie Reservoir, with more diffuse use occurring in scattered locations throughout the remainder of the Analysis Area.

Timber harvesting operations have variable effects on sediment production. A study in Washington State (Rashin et al. 2006) concluded that the primary operational factors that influenced the effectiveness of timber harvest BMPs in controlling sediment delivery to streams were: the proximity of timber falling and yarding activities to streams and particularly whether yarding routes crossed streams; the presence or absence of designated stream buffers; and the use of special timber-falling and yarding practices to prevent direct mechanical disturbances of stream channels. Stream buffer practices were most effective where timber falling and yarding activities were kept at least 10 meters (32.8 feet) from streams and outside of steep inner gorge areas. The overall effectiveness of streamside buffers was diminished by cable yarding routes or skid trails that crossed buffers and streams.

Excluding commercial harvest from Riparian Reserves prevents disturbance to stream channels during the felling and yarding operations. Increased surface erosion can result from ground disturbance and soil compaction caused by tractor logging. The amount of surface erosion generated by pile burning is generally

proportional to the severity and extent of the impacted area, as well as proximity to stream channels and adjacent slope gradient.

Most of the increase in sedimentation associated with forestry activities is attributed to forest roads. There are two processes by which roads increase sediment in streams: 1) by increasing the incidence of mass failures; and 2) by erosion of the road surface, cut banks, and ditches and subsequent transport of this material to the stream. In the Howard Analysis Area, surface erosion from road surfaces, cut banks, and ditches represents the dominant source of road-related sediment input to streams.

There is high variability in sediment production from road segment to road segment. Most segments produce little sediment, while only a few produce a great deal (Luce and Black 1999). Sections of road having a steep gradient, being heavily used, and draining directly into larger streams have the highest potential to produce and deliver material of a size most apt to deposit on or in the streambed. Older roads in mid-slope positions dominate the production of sediment during extreme storms (Wemple et al. 2001). Ridgetop roads usually have the least effect on streams. The majority of roads in the Analysis Area are located on relatively gentle topography.

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

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

A study of soil loss from forest roads in the southern Appalachian Mountains (Swift 1984) concluded that soil loss rates from a non-surfaced roadbed were eight times greater than from roadbeds with six to eight inches of gravel. New fill slopes, although uncompacted and unvegetated, eroded only where storm runoff from culverts or dips flowed over loose soil. Vegetation on the cutslope and ditch was shown to be effective in reducing erosion from forest roads in the Oregon Coast Range (Luce and Black 1999). Road segments where vegetation was cleared from the cutslope and ditch produced about seven times as much sediment as road segments where vegetation was retained. Closure of unsurfaced roads during the wet season can also help to reduce erosion (Kattelmann 1996).

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

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

A review of forest management impacts on water quality concluded that the use of BMPs (see Chapter 2; USDI 1995, Appendix D and as modified by Resource Management Plan Maintenance dated July 12, 2012) in forest operations was generally effective in avoiding significant water quality problems. However, the report noted that proper implementation of BMPs was essential to minimizing non-point source pollution. Such implementation must include ephemeral channels, often overlooked in the application of BMPs (Kattelmann, 1996, p. 871). Ephemeral streams displaying evidence of a defined channel and annual scour and deposition on BLM-administered lands ("short-duration intermittent") have designated Riparian Reserves along them, and are subject to all of the PDFs/BMPs applicable to Riparian Reserves, and

additional PDFs/BMPs apply to other non-riparian draws with no active stream channel and not meeting the Riparian Reserve criteria ("dry draws"). In general, because all stream crossings (whether by road, culvert or bridge) are coincident with the active channel, there is little opportunity to buffer any inadequacies of design or construction. While any crossing will have some impact, careful engineering, construction and maintenance can limit the severity (Kattelmann 1996, p. 892). The use of BMPs in forest operations is generally effective in avoiding significant water quality problems (Kattelmann 1996, p.871). As this project incorporates PDFs and BMPs into the design of the project, much can be done to protect water quality simply by avoiding activities in sensitive areas, such as riparian zones, areas susceptible to mass movement, and areas where soils may become saturated and produce overland flow (Kattelmann 1996, p. 871).

Stream sediments may negatively impact aquatic species such as salmonids, amphibians and insects, and may impair the quality of domestic water supplies. Sediment suspended in water increases turbidity, limiting the depth to which light can penetrate if turbidity is increased to a sufficient degree. High turbidity levels can severely limit the ability of sight-feeding fish to find and obtain food.

The 1996 amendments to the Safe Drinking Water Act (SDWA) mandated that state agencies conduct source water assessments for every public water system. This Analysis Area does not fall within a source water area, and, as such, would not affect any public water system.

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. 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. DEQ's 2004/2006 303(d) list is the most recent listing of these streams (ODEQ 2006).

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 Antidegradation Policy (OAR 2005; 340-041-0004) under any proposed actions. The DEQ released the final Upper Klamath Sub-basin Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) in December 2010. A water quality restoration plan (WQRP) for BLM-administered lands in the Jenny Creek Watershed (USDI 2011), within the Upper Klamath sub-basin, was prepared by the BLM and approved by DEQ in 2012. Recovery goals in the WQRP focus on protecting areas where water quality meets standards and avoiding future impairments of these areas, and restoring areas that do not currently meet water quality standards. Necessary federal and state permits would be obtained for any proposed instream work.

In advance of a TMDL setting specific numeric targets for the Analysis Area, the Oregon statewide narrative criteria found in OAR 340-041-0007(1) (ODEQ 2013) is the water quality criteria that applies to BLM management:

> (1) Notwithstanding the water quality standards contained in this Division, the highest and best practicable treatment and/or control of wastes, activities, and flows must in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor, and other deleterious factors at the lowest possible levels.

Within the Howard Analysis Area, two streams are included on the DEQ's 2004/2006 303(d) list for summer temperature: Grizzly Creek and Hoxie Creek. The DEQ identifies the listed segment of Grizzly Creek from

below the Howard Prairie Dam to the confluence with Jenny Creek. According to the U.S. Geologic Survey's (USGS) Geographic Names Information System (GNIS), the segment that the DEQ refers to as Grizzly Creek from Soda Creek to Jenny Creek is actually Soda Creek. Jenny Creek, which is approximately 0.7 miles below the confluence of Grizzly and Soda Creeks, is also on the DEQ's 2004/2006 303(d) list for summer temperature. The Proposed Action would not have any effect on stream temperatures because it does not include any manipulation of Riparian Reserves, and therefore, effects on stream temperature will not be addressed in this environmental assessment.

There is an overall road density in the Analysis Areas of 7.3 mi /mi^2 (Table 3-10). Roads built in riparian areas can adversely affect both stream temperature and sediment. There are approximately 40 road miles (approximately 21% of all road miles) located within Riparian Reserves on lands within the Analysis Area. Approximately 8%, or 15 miles, of these roads are located on BLM-administered lands.

Natural or unsurfaced roads are generally more likely than surfaced roads (rocked or paved) to contribute sediment to streams. Roads on BLM-administered lands in the Analysis Area are stable and not readily predisposed to landsliding. As a consequence, road sediment sources are primarily surface erosion from natural surfaced roads and road ditches that connect to streams. Along with grazing, sediment from chronic erosion of natural surface roads are the two leading sediment sources within the Analysis Area.

Previous ground-disturbing activities, such as road building, logging, residential and agricultural clearing of riparian zones, livestock grazing, and maintenance of irrigation diversions, irrigation return flows, irrigation ditch blowouts, and the use of off-highway-vehicles in sensitive areas have contributed sediment to streams in the Analysis Area. Agricultural and residential development contributed sediment through channel modification, grazing, and land clearing.

Livestock grazing has occurred throughout the Analysis Area since the mid-1800s (USDI 1995b). Large numbers of cattle and sheep were driven from lower valley pastures to high plateau meadows each summer during the mid-1800s to the early 1900s. These large numbers of livestock had an adverse impact on watershed conditions, especially along stream courses and near springs and meadows (USDI 1995b). Current grazing occurs on BLM-administered lands within the Analysis Area. The Analysis Area encompasses portions of three grazing allotments (Keene Creek, Deadwood, and Howard Prairie). However, the Keene Creek Allotment was bought out in its entirety in 2009 as part of the Omnibus Public Lands Management Act of 2009, Public Law No. 111-011; authorized grazing no longer occurs in the area formally managed as the Keene Creek Allotment. For the Deadwood and Howard Prairie allotments, the season of use varies by allotment, but this area is generally open to grazing June through November.

Rangeland Health Assessments (RHAs) and RHA Determinations were completed for the Deadwood Allotment in July 2008 (www.blm.gov/or/districts/medford/index.php). It was determined that the allotment was not meeting the standards for Riparian/Wetland Areas, Ecological Processes, Water Quality, and Native, T&E, and Locally Important Species. Even though streamside riparian areas on BLM-administered lands are generally improving throughout these allotments, current livestock grazing may be negatively affecting riparian and aquatic conditions in many locations, and is currently being evaluated in the Deadwood Environmental Assessment.

Logging activities started in the late nineteenth and early twentieth centuries, but were limited in scale until the late 1940s (USDI 1995b). During the second half of the twentieth century, large-scale intensive timber harvest and road building resulted in increased sediment production. Until the Oregon Forest Practices Act was passed in 1972, yarding was typically accomplished using tractors, even on steep slopes, with little regard for protecting stream crossings. Riparian areas received little protection, and ground-disturbing activities such as yarding resulted in sediment reaching the streams. Trees were harvested from streambanks, leaving little vegetation to prevent the banks from eroding into the streams during high flows. Early forest roads were often poorly designed and located in unstable areas, or areas where the water table was close to the surface, resulting in road failures that provided a major source of sediment.

The BLM implemented a land management plan in 1979 that provided 100 foot no-cut riparian buffers for anadromous fish-bearing streams and retained shade from hardwoods and non-commercial conifers on resident fish-bearing streams, but provided minimal to no protection of non-fish-bearing streams. Road design and construction practices improved during the 1980s; however, extensive road building also occurred.

Although commercial harvest has not occurred in riparian areas since implementation of the Northwest Forest Plan in the mid-1990s, BLM stream surveys indicate the presence of some historic timber harvest in BLM-administered riparian areas.

The advent of the Northwest Forest Plan in 1994 (USDA and USDI 1994) followed by the Medford District Record of Decision and Resource Management Plan in 1995 (USDI 1995) resulted in major improvements for stream and watershed protection and restoration on federal lands. Riparian Reserves establish protection for all fish-bearing streams as well as nonfish-bearing perennial and intermittent streams, wetlands, lakes, and ponds. Over the past 10 years, road construction has declined and road decommissioning and upgrading has slightly increased. Implementation of best management practices during road and logging operations have reduced impacts on water quality. Water quality on Federally-administered lands appears to be on an upward trend with reductions in sediment input.

2. Environmental Consequences

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

a. Alternative 1—No Action Alternative

No actions are proposed under Alternative 1 (the No Action Alternative); therefore direct and indirect effects are the current conditions in the Analysis Area which are the result of past actions not related to the Howard Project. Alternative 1 describes anticipated effects of not implementing an action at this time.

Under Alternative 1, there would be no changes in percent of BLM forested lands with canopy cover less than the historic level, areas of compacted soil, or road densities. There would, therefore, be no change to the potential of increasing the magnitude and frequency of peak flows 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 are more likely to chronically deliver sediment to channels, modify flow, and experience road failures during extreme precipitation events.

In the long-term, 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. 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, potentially increasing soil erosion and sedimentation.

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, 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. Analysis 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 historic canopy closure (Table 3-9). This would include the Swinning Timber Sale, which was implemented in early 2013 on BLM administered lands within the Analysis Area. There have been no major wildfires within the Analysis Area in the last 30 years. There have been several smaller fires the Analysis Area, and the current condition of the burned areas is accounted for in the historic canopy closure analyses.

Under Alternative 1, there would be no change in existing water quality on BLM-administered lands. Streams in the Analysis Area that are on the DEQ's 2004/2006 303(d) list would continue to exceed water quality standards for temperature. 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. A minimum level of BLM road maintenance would occur to adequately drain roads, provide for public safety, and repair drainage failures. This work may have a positive benefit to water quality. Since there would be no road closures or decommissioning, there would be no action to decrease road interactions with streams and resource impacts attributed to OHV use, particularly within Riparian Reserves would continue as they currently exist.

Reasonably foreseeable future actions planned for BLM-administered lands in the Analysis Area include approximately 300 acres of fuels reduction treatments. Because these treatments would not use heavy mechanized equipment, or create any new roads, there would not be any means for affecting peak flows through compaction or erosion through disturbance. It is likely the increased water available through stem reduction would be taken up by the resulting increased vigor and growth of the remaining vegetation. It is, therefore, unlikely that fuel treatments would affect overall water yield or stream flows. Therefore, this action would not affect water quantity or quality within the Analysis Area.

Additional foreseeable future actions planned for 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 lease renewals on the Deadwood allotment.

There are no reasonably foreseeable future actions proposed for Forest Service or Bureau of Reclamation managed lands within the Analysis Area. This project will be included in forthcoming NEPA documents for the Walters Glade project that is proposed (currently in the Scoping phase) on BLM-administered lands (Klamath Falls Resource Area) in the Jenny Creek Watershed.

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, p. 4-5). The actual timing of any timber harvest on private land is dependent on many factors, including valuations based on supply/demand, ownership, etc. A reasonably foreseeable future scenario for private lands was developed by using 2012 aerial photos and assuming a 60-year rotation for private timber lands within the Analysis Area (Table 3-11). It was assumed that canopy cover would be zero percent after the reasonably foreseeable future timber harvest on private lands. 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.

An estimated 1,485 acres of timber harvest is potentially available for harvest on private lands within the Analysis Area (Table 3-11). Private forest lands in the Analysis Area would be managed according to the Oregon Forest Practices Act, which was evaluated in 2002 for adequacy in achieving and maintaining water quality goals. The evaluation noted that current protection requirements may be inadequate to prevent short-term temperature increases on nonfish-bearing and small fish-bearing streams. In addition, the report indicates that wet-weather hauling and steep-slope ground skidding practices allowed under the Forest Practices Act are not adequate in meeting sedimentation and turbidity standards. Agricultural/rural residential lands would be managed according to county ordinances and also encouraged to reduce water pollution by following suggested practices described in DEQ's Water Quality Management Plan (WQMP)

for this area. Conforming to the WQMP should ensure achievement of water quality standards necessary to achieve TMDLs by private land owners.

Under the reasonably foreseeable future timber harvest on private forest lands, there would be an increase in the percent of forest land with canopy covers less than historic levels in four of the drainages in the Analysis Area, with the increases ranging from 6% to14% (Table 3-11).

Table 3-11. Reasonably Foreseeable Future Timber Harvest on Private Forest Lands

Analysis Area HUC 7	Reasonably Foreseeable Future Harvest on Private Forest Lands		
	Acres	Current Percent Canopy covers Less Than Historic[1]	Percent Canopy covers Following Private Harvest[2]
0103	12	36	36
0106	243	7	15
0109	164	19	28
0112	635	31	45
0115	0	34	34
0118	431	21	27
0121	0	6	6
Totals	1,485	24	33

1 Includes all ownerships.
2 Assuming all private forestland greater than 60 years is harvested close to the same time.

The projected increase in canopy cover that would be less than historic levels for private lands is added to Federally-administered lands to obtain a total by Analysis Area (Table 3-9). Under the reasonably foreseeable future timber harvest scenario, one drainage (0112) would exceed the range of natural variability (10 to 40 percent) for early successional vegetation (Table 3-11).

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 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, primarily in stream channels draining into Howard Prairie Reservoir, 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 much of the BLM-administered lands have been treated to reduce fuel amounts and continuity, given the right conditions, a high-intensity wildfire over part or all of the area may occur. Should this happen, it could 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 and increased erosion.

In conclusion, past actions from the 1850s to the 1980s on both private and federal lands throughout the Analysis Area contributed to water quality degradation, specifically sediment increases. With the cessation of some activities, such as intensive grazing, and the moderation of impacts from other activities, such as logging and road building, water quality conditions are improving. Natural surface roads and OHV trails that are used during the wet season and ground skidding on moderate slopes would likely continue to have erosion concerns and contribute sediment to nearby streams. Reasonably foreseeable future actions on private lands would be required to adhere to the TMDLs and WQMP by the DEQ, and water quality in the Analysis Area would be expected to continue to improve. Reasonably foreseeable future livestock grazing on private (and to a lesser extent, BLM-administered land) may continue to alter stream banks and continue to cause increases in turbidity/sedimentation to area streams. The Deadwood grazing lease renewal process would review stream conditions and identify practices to reduce aquatic impacts from grazing, if needed.

In the long-term, the lack of continued vegetation management on BLM-administered lands may lead to a high-intensity fire over part or all of the area that could expose large areas of bare soil, thus increasing sedimentation. Under Alternative 1, a high-intensity wildfire would be a concern for potential increases in the magnitude and frequency of peak streamflows and increased sediment delivery should one occur.

b. Alternative 2—Proposed Action

Yarding

Tractor yarding would be limited to designated skid trails, thus minimizing the compacted area to 12% or less. Observations of the units proposed for harvest reveal many old skid trails still apparent across the landscape, and where feasible, these old skid trails would be re-used. Designating skid trails and re-using 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 as a result of using such equipment during dry soil conditions.

The 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 as vegetation becomes established.

Actions proposed under Alternative 2 would not affect streamflows in the Analysis Area, as little-to-no net change in soil compaction is anticipated due to reusing old skid trails, designating skid trails, and limiting harvest to dry soil conditions. There would be a slight decrease in overall road density with decommissioning of existing roads. Because canopy cover would not be reduced below historic conditions, it is unlikely streamflows would be affected. Peak streamflows are not expected to be affected by soil compaction resulting from this project because there would not be any connectivity from the yarding activities to stream channels**.** Project Design Features and BMPs, such as waterbarring tractor skid trails and not expanding existing landings into Riparian Reserves would prevent surface flow from reaching stream channels.

The proposed fuel reduction treatments within the commercial harvest units would not affect the existing canopy cover levels, nor increase ground disturbance. Fuels treatments would only focus on hand-treating activity-generated slash, and would include handpiling and burning or scattering the material. The combination of Riparian Reserve buffers and the relatively flat to rolling terrain in the Analysis Area would reduce (if not prevent) the movement of sediment or ash into stream channels. Any increases in sediment or ash to waterbodies as a result of pile burning would be slight, if any, and not expected to be detectable in any streams or the reservoir. On BLM-administered lands, the proposed treatments would tend to reduce the risk of high-intensity fire. To the extent Alternative 2 reduces the risk of such a fire as compared to Alternative 1, the risk of an adverse change in streamflow would likely be reduced in Alternative 2 as compared to Alternative 1 if a wildfire were to occur over a majority of the area.

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% 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). This suggests 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 six years or less, where channel forming processes are minor in effect. Because canopy cover in Alternative 2 would not be reduced below 40%, proposed commercial harvest and associated activity fuels treatments would not change the overall percent of historic canopy closure on forest lands in the Analysis Area. No noticeable increase in the magnitude or frequency of peak streamflows would be expected as a result of canopy cover reductions proposed under Alternative 2.

Roads

Road operations proposed under Alternative 2 include temporary construction, maintenance, renovation (opening up closed roads), decommissioning, and landing construction. Road-related actions would have the greatest potential for increasing the amount of sediment delivered to streams in the Analysis Area. All road work would be done during the dry season to prevent or minimize sediment delivery to streams to the maximum extent practicable. Proposed road treatments under Alternative 2 would not result in an increase in road density or percent of area in roads in the Analysis Area. Temporary road construction would be short-term; roads would be fully decommissioned after use. All other road treatments would occur on existing roads.

Under Alternative 2, five new temporary road segments, totaling approximately 0.46 miles, would be constructed. All temporary roads would be fully decommissioned to prevent vehicle access prior to the completion of project activity. These roads would be located on stable, low-to-flat slopes (topographic benches), with no culvert or ditch installations, and none would be located within Riparian Reserves. Thus, there would be a low risk of sediment reaching a water body. Additionally, exempted native surfaced roads would not be used outside of the dry season unless 2-4 inches of hard packed snow exists. Erosion prevention and sediment control measures implemented during the construction and subsequent decommissioning would greatly limit any offsite soil movement.

Road maintenance would consist of placing rock surfacing on native surfaced roads, adding rock to the existing base, blading the road surface, and re-establishing drainage. Rock surfacing would reduce the amount of soil moving off the road surface, resulting in less sediment entering streams. Both the rock surfacing and drainage improvements would help to reduce the sediment input from roads to the maximum extent practicable, and were identified as means to meet restoration priorities in the *Jenny Creek Watershed Analysis* (USDI 1995b).

The subsequent decommissioning of temporary roads would include decompacting the surface and placing slash and other debris to camouflage and block the roads to vehicle traffic. Work would be conducted during the dry season, when streamflows are not present in ephemeral draws. Any sedimentation resulting from decommissioning activities would be localized and minor in extent.

Alternative 2 also includes fully decommissioning BLM Road 38-3E-23.2, and a long-term closure of BLM Road 38-3E-13.6. Road 38-3E-23.2 is approximately 0.65 miles in length, is partially located within a Riparian Reserve, and at times has been a catalyst for illegal motorized use, which has resulted in road and resource damage. The road will be scarified as needed; two stream crossings, one of which is a barrier to aquatic species, will be restored by removing the culverts, and slash and other debris will be scattered at the entrance and along its length to preclude vehicle use. Road 38-3E-13.6 is an access point for an un-authorized OHV route that accesses the shoreline of Howard Prairie Reservoir, is partially within a Riparian Reserve, and is braided in places with deep rutting. When conditions are wet or saturated, the result has been sporadic sediment discharge to an adjacent intermittent stream. This road is approximately 0.5 miles in length, and would be blocked at the entrance with an earthen berm and/or a log, with logs placed along the length to prevent all vehicle access. Both of these actions will provide long-term benefits to soil, water, and aquatic species, and are consistent with direction contained in the WQRP and the Watershed Assessment (USDI 2011 and USDI 1995b).

Other proposed road actions are to naturally decommission BLM Road 38-4E-29.02. This road is currently vegetated with small conifers and will not be used for harvest operations. It was identified during the planning process as being unnecessary and will be removed from the transportation system. It will not be physically treated. Two other non-system spurs identified as Spur A and Spur B (both located in T38 R03E S13) will be utilized, one of which (Spur A), is currently receiving use. The effect has been minor, but long-term impacts to soil and water resources are anticipated without closure of Spur A. Following operations, these spurs will be fully decommissioned, resulting in a reduction of approximately 0.12 miles of previously open non-system road.

Overall, approximately 1.22 miles of roads would be fully decommissioned under Alternative 2. Road densities attributed to fully decommissioning Road 38-3E-23.2 within drainage 0106 will be slightly reduced from 7.4 to 7.3 miles/ miles^2, including the elimination of 0.2 miles of road within a Riparian Reserve. As a result of fully decommissioning Road 38-4E-29.02, road densities within drainage 0115 would be reduced from 6.4 to 6.1 miles/ miles$^{2.}$. And, as a result of fully decommissioning non-system spur A road densities within drainage 0109 would remain unchanged. The reduction of road densities and the elimination of current or potential impacts would result in a slight long-term decrease of adverse effects to soil and water within the Analysis Area.

Although Alternative 2 proposes actions to reduce existing soil and water impacts from OHV use, a secondary effect of timber harvest is the potential to increase unauthorized motorized vehicle access by opening up the forest stand along with the presence of skid trails, especially when the topography is gentle and there is already use occurring, such as around Howard Prairie Reservoir. This alternative would implement PDFs designed to discourage this by blocking and scattering slash and other debris on skid trails that connect to roads and radiate from landings.

PDFs, which apply the BMPs as described in Appendix D of the 1995 RMP (and modified by Resource Management Plan Maintenance), are integral to the design of the Proposed Action. PDFs 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). The implementation of PDFs as part of the proposed Action Alternative is included in the analysis of anticipated environmental impacts. With 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.

Overall, proposed road maintenance and use in and near streams could increase sedimentation in the short-term, although any increases would likely be minor. It is expected that sediment/turbidity levels resulting from the proposed road work would not be detectable at the mouth of any tributary to Howard Prairie Reservoir. The location and design features of the proposed temporary road construction, rock surfacing, road drainage improvements to existing roads may result in a small net reduction in sediment delivered to streams over the long-term. Sedimentation as a result of log truck travel on roads in the Analysis Area would be low due to the use of existing surfaced roads, dust abatement, and BMPs for seasonal hauling restrictions. Natural surface roads used as haul routes during the dry season have the potential to directly transport airborne particulates to stream channels. Repeated use of the roads during dry conditions would create dust that may settle into the channels. However, through following standard BMPs, it is unlikely that enough dust would reach a stream channel at any one time to create enough turbidity to exceed DEQ's turbidity limit[5]. It is unlikely winter hauling would produce sediment in streams because log trucks would be restricted to surfaced or exempted natural surface roads when there is a minimum of 2-4 inches of hard-packed snow.

Under Alternative 2, five new landings associated with temporary roads would be constructed to accommodate mechanized harvesting. No new landings are proposed for construction or expansion within Riparian Reserves. Where necessary, renovation of existing landings would not occur during the wet season (October 15th to June 15th), when the potential for soil erosion and water quality degradation exists. As necessary, stabilization of landings (i.e. rock surfacing, seeding and mulching, or other approved methods) would be implemented prior to the onset of seasonal rains. Erosion from the landings would be minimal due to their location, low gradient slopes within the Analysis Area, and application of erosion control measures, which will greatly reduce the likelihood of any sediment from entering stream channels.

Harvest

Proposed actions due to commercial harvest would include tree felling and log yarding. Of these actions, yarding would be most likely to lead to sedimentation due to ground disturbance. The potential for sediment in commercial harvest units to reach stream channels is low due to erosion prevention BMPs, such as no

[5] http://www.deq.state.or.us/wq/standards/turbidity.htm

harvest or yarding in Riparian Reserves, limiting the extent of skid trails, and the relatively flat topography. Waterbars on tractor skid trails would prevent water from concentrating on bare compacted ground and move it to adjacent vegetated or slash-covered slopes.

Summary

To summarize, Alternative 2 would have minimal adverse effects on water quality because:

- Proposed temporary road construction would occur on flat or gentle terrain, minimizing the risk of road erosion;
- Proposed temporary road construction would not occur within Riparian Reserves;
- The reduction of road densities via road decommissioning would result in a slight long-term decrease of adverse effects to soil and water within the Analysis Area.
- Rock surfacing on existing native surfaced roads and the adding of rock to the existing base where necessary would likely decrease sediment delivery;
- The potential for sediment from commercial harvest units to reach stream channels is low with implementation of PDFs and BMPs;
- Manual activities fuels treatments would not affect canopy cover or increase ground disturbance, and therefore would not have any effect on peak flows, erosion rates, or sedimentation in the Analysis Area;
- Sediment increases from pile burning would be very slight given the low-intensity burn and BMPs that stipulate no ignition or fire lines would occur in Riparian Reserves; and
- No landing construction or expansion would occur inside Riparian Reserves, and BMPs would greatly limit any sediment moving off-site.

"Minimal adverse effects" means actions would not result in the listing of streams as water quality limited. Hoxie and Grizzly Creeks are within the Analysis Area and on the 2004/2006 303(d) list for temperature. Alternative 2 maintains primary and secondary shade components through no harvest within Riparian Reserves; therefore, stream temperatures would not be affected. Under Alternative 2, road drainage improvements and decommissioning may provide a minor long-term benefit to water quality. Road upgrades are identified as important strategies for 303(d) listed stream restoration in the *Jenny Creek WQRP* (USDI 2011).

Existing human-caused sediment sources in the Analysis Area are primarily related to grazing, the existing road network, and OHV use. The primary sediment source resulting from Alternative 2 would likely occur from ground disturbance caused by log hauling and road activities. However, the impact is expected to be minimal given the implementation of PDFs and BMPs. Long-term cumulative benefits to water quality from road improvements and decommissioning proposed under Alternative 2 would be slightly greater than under Alternative 1.

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 and 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 many of the BLM-administered lands have been treated to reduce fuel amounts and continuity, additional vegetation and fuels treatments may decrease the likelihood a high-intensity wildfire over part or all of the area may occur. 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 projects effect on climate change and resultant impacts.

Cumulative Effects

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 and ground disturbance attributed to development of private lands will continue (USDI 1995).

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, with expected improvements on BLM-administered lands. Additionally, mixed ownership of lands surrounding Howard Prairie Reservoir makes a comprehensive effort to address vehicle use and access more complex and less likely to occur. Resource damage is likely to continue, particularly when soils are wet or saturated.

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 at less than historic levels. 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 historic canopy cover, potential cumulative impacts would be magnified. Although this alternative would not result in additional adverse effects, this is particularly true in HUC 0112, where 45% of the HUC7 would be below historic canopy cover and total road density is 6.1 miles/miles^2. Sediment production resulting from road use and construction may slightly increase in the short-term, but slightly decrease in the long-term due to road decommissioning, upgrades, and closures. In many cases riparian vegetation vigor would improve over time, thus potentially decreasing stream temperatures. Although there are both natural and human induced risk factors for cumulative effects, because road density or canopy cover metrics remain unchanged beyond existing condition, Alternative 2 is not expected to increase these risk factors within the Analysis Area drainages.

F. AQUATIC HABITAT & FISH

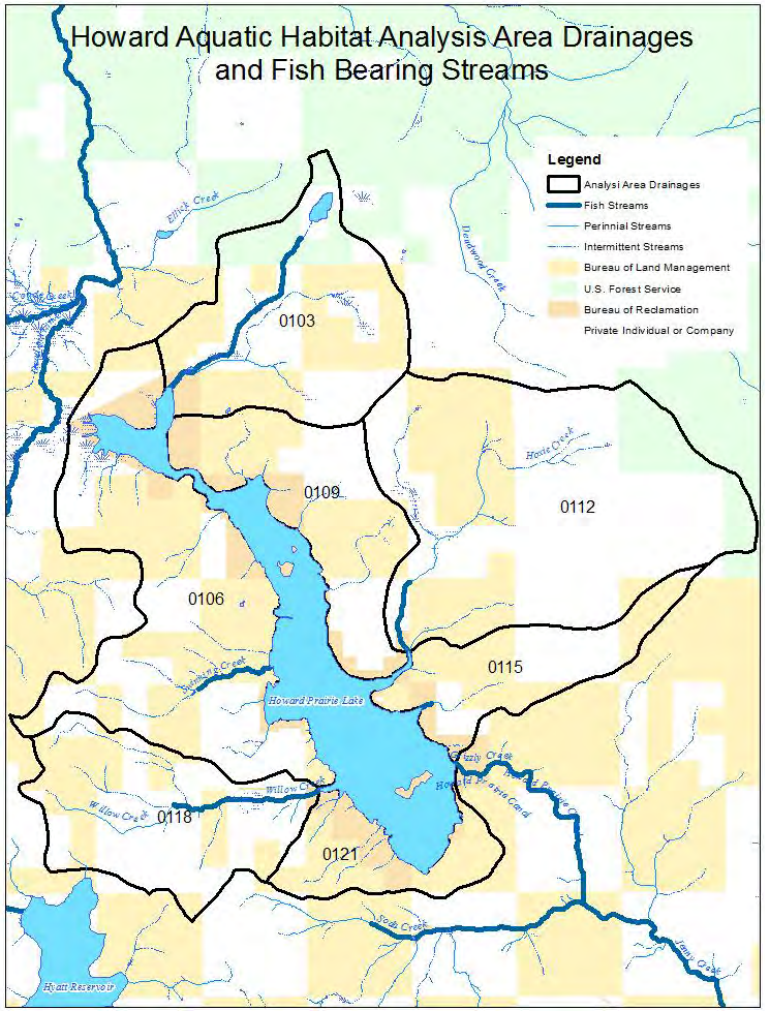
The proposed Howard Forest Management Project would be located primarily in the upper portion of the Jenny Creek fifth field watershed, specifically in that portion which drains to Howard Prairie Reservoir. The bulk of the analysis will focus on the Jenny Creek Watershed, a Key Watershed designated for the presence of Jenny Creek suckers and native Redband trout, two fish species endemic to lower portions of the Watershed (below Howard Prairie Reservoir).

Approximately 12 acres of harvest units and 1.1 miles of near ridge top haul routes cross over the drainage divide into the Little Butte Creek Watershed. As the units are on flat land on the drainage divide, and located far from any water courses, proposed activities would have no causal mechanism to affect water quality or aquatic habitat in the Little Butte Creek Watershed; therefore, this area will not be included in the following analysis. The haul route does include four crossings over intermittent channels and will be included in the analysis for haul only.

Project elements proposed as part of the Howard Forest Management Project would occur above and upstream of the reservoir. Howard Prairie is a large water storage reservoir formed by a substantial dam which is maintained and operated by the Bureau of Reclamation. The presence of the reservoir effectively limits potential impacts to aquatic habitat resulting from this project to areas upstream of the dam and reservoir. The slack water created by the impoundment would capture and trap any potentially contributed sediment, where it would be assimilated in with the existing mud and silt, and potential water quality or quantity changes resulting from project implementation would be insignificant and immeasurable in the reservoir when compared to the changes imparted by the reservoir itself (i.e. water temperature increases, and regulated flow releases). For this reason, the fisheries and aquatic Analysis Area consists only of the drainage area above the Howard Prairie Dam. This area is comprised of seven drainages, or Hydrological Unit Code (HUC) 7th field drainages, which have potential to be affected by actions proposed in the Howard

Forest Management Project. These drainages include the named channels of Grizzly, Willow, Swinning, and Hoxie Creeks, and several unnamed frontal drainages.

Map 3-4. Fish and Aquatic Habitat Analysis Area in the Howard Project



1. Key Fisheries and Aquatic Resources Issues

The following key issues, both existing and anticipated, for fish and aquatic resources have been identified through public scoping or interdisciplinary team specialists. These relevant issues are:

- There could be short-term increases in stream turbidity from roadbed and drainage ditch disturbance associated with road maintenance activities.
- Riparian areas and instream aquatic habitats in the Watershed are currently degraded from a host of past and ongoing activities within the Watershed, particularly (but not limited to):
    1) Extensive water developments, including four large impoundments and several canals, have significantly altered the hydrologic regime of the Watershed. This has affected water quantity, water quality, biological connectivity, aquatic habitat, and biological communities in Jenny Creek.
    2) Extensive road construction has created high road densities, and has led to increased sediment inputs to aquatic habitat.
    3) Historic and ongoing grazing has resulted in increased erosion and sediment transport to many stream reaches within the Analysis Area drainages.

4) Past timber harvest has reduced riparian canopy cover and the potential for large wood inputs in areas.

- Sediment and lack of flushing flows due to reservoir operations are thought to be of concern to Jenny Creek suckers in the lower watershed. Sediment levels in Analysis Area streams are documented as being high. Sedimentation from use of roads, and other ground disturbing activities associated with timber harvest has potential to increase sediment levels in stream channels, which could degrade habitat, as a result of implementing proposed actions.
- Off Highway Vehicle (OHV) use is occurring within portions of the Watershed, particularly in areas of gentle topography found near the reservoirs. Within the Analysis Area, 13.5 miles of trails have been identified on BLM-administered lands, which are concentrated in two of the drainages in the Analysis Area (HUCs # 0103 and 0109). There have been concerns expressed that openings and new roads created by timber harvest operations may encourage increased use by OHVs; potentially further increasing sediment delivery levels to aquatic habitats.
- 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.
- Comments have been received that the 1995 Jenny Creek Watershed Assessment (WA) states, "Of the estimated 76.5 miles of perennial streams in the watershed, only one half mile of upper Shoat Springs Creek is in proper functioning condition." (This was true at the time the assessment was written, because very few stream miles had been assessed at that time. In the years since the WA was written, inventories have been ongoing and many more reaches have since been rated as PFC. However, it is true that the perennial stream reaches in the Howard Forest Management Project Analysis Area are not in Proper Functioning Condition.)

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). 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 (USDI USFWS 1999, p. 24049).

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.

There is no CCH or EFH in the Analysis Area. The lower couple of miles of Jenny Creek likely historically supported anadromous fishes such as Coho and steelhead, but Iron Gate Dam currently blocks all upstream access on the mainstem Klamath River below the Jenny Creek confluence. A natural bedrock fall complex near the California/Oregon border on Jenny Creek would preclude use of most of the watershed by Coho or steelhead in the event the Klamath dams are removed or retrofit with passage structures.

Riparian Reserves

Under the Northwest Forest Plan (NWFP), Riparian Reserves (RRs) have been established on all stream channels displaying annual scour located on Federal lands. Areas of unstable/potentially unstable ground are also managed as RRs. Riparian Reserve widths have been identified as 170 feet in the Jenny Creek Watershed. Widths are measured as slope-distance from the edge of the stream, and are applied to both sides of the channel. These Riparian Reserve widths are in accordance with the 1995 Medford District RMP, and follow the Standards and Guidelines in the SEIS Record of Decision (ROD) (USDI 1994, p. C-31). 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, filter sediment carried from disturbed ground via overland flow, and provide habitat for a diverse range of other aquatic and terrestrial organisms (Meehan 1991).

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 the 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 proposed actions are described in Section G: *Consistency with the Aquatic Conservation Strategy*.

2. Past, Ongoing, and Reasonably Foreseeable Future Actions

This section will present projects that are past, ongoing, or proposed in the foreseeable future that may add cumulative impacts to fisheries resources, when combined with anticipated impacts resulting from the Howard Forest Management Project, within the Analysis Area. Anticipated effects 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 Howard Forest Management Project will be discussed at the end of this analysis.

Federal Timber Harvest

The Swinning Timber Sale, analyzed in the July 2010 *Environmental Assessment for Plateau Thin Forest Management Project* (DOI-BLM-OR-M060-2010-0034-EA), occurred on BLM-administered lands in the Analysis Area. Harvest operations were completed in early 2013. Effects resulting from the Swinning sale (i.e. new openings in forest canopy or created by new landings) will be considered as part of the current, baseline condition (the Affected Environment) in this EA analysis.

The Cottonwood Timber Sale, analyzed under the August 2011 *Revised Environmental Assessment for the Cottonwood Forest Management Project* (DOI-BLM-OR-M060-2011-0003-EA), is currently being actively harvested. Harvest-related activities proposed in the Cottonwood sale would not occur in the Howard Analysis Area, but would occur within the Keene Creek sub-watershed of the Jenny Creek Watershed. Activities would all occur upstream of a large impoundment located on Keene Creek (a Jenny Creek tributary), which diverts water out of the Jenny Creek Watershed and into the Bear Creek Watershed. As such, no potential effects to water quality or aquatic habitat resulting from the Cottonwood timber sale would have any likelihood of being transmitted downstream of the diversion reservoir, and hence, the project would not contribute to cumulative effects in the greater Jenny Creek Watershed.

Also not within the Analysis Area, but within the Jenny Creek Watershed, the Cold Onion Forest Health Project is ongoing in upper potions of the Johnson Creek catchment on the Klamath Falls Resource area of the Lakeview BLM, and analyzed under the Cold Onion Forest Health Treatments EA (EA OR 014-08-11). The analysis determined that potential adverse effects to aquatic environments from proposed activities would be limited to small, site-level, short-term inputs of sediment and/or turbidity. These inputs were determined to have no potential to adversely or meaningfully impact water quality, and therefore, no potential for these projects to contribute to significant adverse cumulative effects to water quality or aquatic habitat in the Jenny Creek Watershed.

Similarly, the Walters Glade Timber Sale has been proposed by the Klamath Falls Resource area, which includes some of the eastern most reaches of the Jenny Creek Watershed, in lands which drain to Jenny Creek downstream of Howard Prairie and outside of the Howard aquatic Analysis Area. At this time the Walters Glade project is in the early stages of planning (scoping), and treatment proposals and potential effects are unknown, precluding any meaningful analysis at this time. The cumulative effects (if any) of the Walters Glade and Howard Timber Sales would be addressed in the Environmental Analysis of the Walters Glade project after the project has been further developed.

Private Timber Harvest

At this time, it is not known when or where other private timber harvest will occur in the Analysis Area, but is assumed 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). This analysis will assume that, in general, all suitable private lands will continue to be subject to intense timber harvest, 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.

Grazing

Cattle grazing is widespread throughout both the Analysis Area and in the larger Watershed, both on private and BLM-administered lands. The portion of the Deadwood allotment on BLM-administered lands was recently renewed. The renewal process did not change the management of the allotment; hence, grazing will continue as it has in the past, contributing to site-level impacts to aquatic habitat. No decision has been made regarding the Deadwood allotment at this time. Therefore, this analysis will assume that grazing will continue at present levels, and impacts will continue as presently reflected in the baseline conditions, as discussed below.

3. Affected Environment—Fish and Designated Habitat

This section will present baseline conditions in the Jenny Creek Watershed and within the Analysis Area drainages specifically, as well as anticipated effects resulting from this project. The effects of past actions manifest themselves in the current conditions. Effects resulting from the Howard Forest Management Project, coupled with effects from past actions (the current baseline) and with foreseeable future effects from ongoing projects as described above, are the cumulative effects of this project to fisheries resources.

a. Fish Distribution

Jenny Creek Watershed

The Jenny Creek Watershed supports only three native fish species for most of its length: the endemic Jenny Creek sucker (*Catastomus rimiculus sp*), a subspecies of rainbow trout known as the redband trout (*Onchorynchus mykiss sp.*), and a minnow, the speckled dace (*Rhinichthys osculus*). Redband trout are uniquely adapted to survive in warmer waters than most other salmonids, and can tolerate water temperatures as high as 84°F (Rodnick et al. 2004). This adaptation suits them well in systems like Jenny Creek, which are subject to warmer water temperatures than most salmonids prefer. A large barrier falls located a couple of miles upstream of the mouth of Jenny Creek precludes migratory fish from most of the watershed. Before the construction of Iron Gate Dam on the mainstem Klamath River, it is likely that other native fish species, such as summer run steelhead (*Onchorynchus mykiss)* and Coho salmon (*Onchorynchus kisutch*) would have utilized this short lower reach. These runs were extirpated by the construction of the dam, which does not have any fish passage facilities. Nonnative species in the watershed include largemouth and smallmouth bass (*Micopterus salmoides* and *M. dolomieu*), bluegill (*Lepomis macrochirus*), black bullhead (*Ameiurus melas*), and golden shiner (*Notemigonus crysoleucas*). These fish have been introduced to provide sport fishing opportunities, and their distribution is primarily limited to the reservoirs, though they may be found occasionally in the free-flowing reaches in limited numbers.

Analysis Area Streams

Grizzly, Willow, Swinning, and Hoxie Creeks all support populations of fish, totaling approximately five miles of accessible habitat (Table 3-12). These streams are all tributaries to Howard Prairie Reservoir, and they provide spawning habitat for fishes in the reservoir, primarily rainbow trout, which were introduced as game fish by the Oregon Department of Fish and Wildlife (ODFW). It is unclear if the rainbow trout found in the Analysis Area streams are descendants of hatchery-stocked fish, native redbands, or hybridized crosses between the two, though anecdotal observations have described them as appearing more like a typical rainbow then a redband. Howard Prairie is managed by the ODFW as a recreational sport fishery for stocked rainbow trout, and a host of non-native warm water fish.

Table 3-12. Fish Distribution in the Howard Forest Management Project Analysis Area Streams

Stream	miles
Swinning Creek (HUC # 0106)	0.8
Hoxie Creek (HUC # 0112)	0.7
Grizzly Creek (HUC # 0103)	2.0
Willow Creek (HUC # 0118)	1.5
TOTAL	5.0

4. Environmental Consequences—Fish and Designated Habitat

There are no Threatened or Endangered aquatic species in the Jenny Creek Watershed; therefore, there is no designated critical or essential fish habitat. Jenny Creek suckers and redband trout are both listed as Special Status Species, but this listing does not designate aquatic habitat for either species.

5. Affected Environment—Aquatic Habitat

Jenny Creek Watershed

Aquatic habitat in the Watershed includes free-flowing stream reaches, natural ponds, and dam-regulated impoundments, ranging in size from less than ten surface acres (Little Hyatt Reservoir), to the over-1700 surface acre Howard Prairie Reservoir. Natural stream reaches display a wide degree of diversity, largely driven by variances in local topography, and range from low-gradient meandering meadow reaches, to old growth-dominated step pool reaches, to moderately high-gradient reaches constrained by steep canyon walls containing plunges and large scour pools. Many reaches support habitat and browse suitable for beavers, and beaver dams and their associated pools are abundant in several stream reaches. This diversity of habitat provides for a good balance of spawning, rearing, holding, and overwinter habitat for native aquatic species.

The greatest alteration of habitat in the Watershed results from the construction and operation of the man-made impoundments. Besides creating large unnatural slack water habitats suitable for non-native species, the dams present complete upstream passage barriers to migration by aquatic species, and allow for the transfer of water outside the watershed. They have also significantly altered the hydrological regime, most notably by reducing the frequency and magnitude of flood events. Flood events are important in that they flush accumulated sediment out of the system, and can help create new habitat via scouring and deposition of native substrate. Ponding of water also causes it to warm significantly in the summer, resulting in elevated stream temperatures in mainstem reaches below the reservoirs, which can be detrimental to the health of native aquatic species not adapted to warm water temperatures.

Other disturbances to aquatic habitat of note include an extensive road network, which allows for the transport and input of sediment to the stream system; intensive past grazing practices, which have reduced bank stability and riparian vegetation and increased rates of erosion and stream warming; small diversions, which may create partial or complete passage barriers; withdrawls of water for agricultural purposes; and the channelization of stream reaches via berms or streamside roads. Impacts stemming from past grazing and road-related erosion on Federal lands have been reduced as a result of the retirement of grazing leases within the Cascade Siskiyou National Monument and Soda Mountain Wilderness areas, and the decommissioning and closure of many miles of road.

Some stream reaches in the watershed suffer from excessive sedimentation. The following reaches have been identified as key areas within the Watershed impacted by excessive sediment: the mainstem of Jenny Creek, in part identified due to the lack of a regular flushing flow event; and Lincoln Creek, a large Keene Creek tributary, identified due to high road densities which have a high degree of hydrological connectivity (USDI 1995b). Additionally, many stream reaches are subject to elevated water temperatures, particularly upper reaches of Keene Creek in the vicinity of the reservoirs, and in the mainstem of Jenny Creek.

Cattle grazing is widespread throughout the upper portions of the watershed, on 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.

OHV use is occurring in the watershed. Some steps have been undertaken recently to address OHV use, as one user-created riparian jeep trail was recently obliterated adjacent to Hoxie Creek, as a condition of new road construction authorized to allow access to private lands (Environmental Assessment #DOI-BLM-OR-M060-2012-0004-EA). 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. Inventories of BLM-administered lands have documented 13.5 miles of user-created OHV trails in the Analysis Area. The majority (13 miles) of the trails are found along the eastern shore of Howard Prairie Reservoir and in the vicinity of Dick Lake (HUCs 0103 and 0109). Trails have hydrological connectivity in HUC # 0109, as there are 20 trail/stream crossings, the worst of which are located on BOR-administered lands along a perennial stream that is crossed five times by a user-created 4X4 jeep trail. These trails are resulting in chronic sediment inputs to channels throughout this seventh field drainage. There are no Howard Forest Management Project units proposed adjacent to these high-use areas.

Analysis Area Streams

In general, the Analysis Area is characterized by relatively flat forested lands, interspersed with numerous wet and dry meadows. The parent geological material consists primarily of clay coupled with volcanic rocks. The Analysis Area streams are all small, low-gradient streams which feed Howard Prairie Reservoir, and flow through a mix of forested and meadow landscapes. Timber and cattle grazing are the dominate land uses, and the area is very popular for outdoor recreational activities, as well. There are relatively few residences or other habitations in the area. Road densities are high (see Water Resources analysis); the majority of the roads in the Analysis Area are utilized to access timber lands on Federal and private lands. The Analysis Area is high enough in elevation that the majority of annual precipitation falls as snow. As a result, the Analysis Area streams flow largely in response to snow melt, with a hydrograph peak in the spring, followed by a slow receding of flows throughout the rest of the year.

Grizzly Creek is the primary tributary to Howard Prairie Reservoir, and enters the lake at its northern end. Swinning and Willow Creeks are small tributaries that empty into the reservoir's western shore, while Hoxie Creek is a larger catchment which enters the reservoir on its eastern shore. These streams all contain perennial reaches, many of which tend to be interrupted during drought periods. The exception is Swinning Creek, which is seasonal and goes dry for a period of time every fall. BLM-administered lands include most of the fish-bearing reach of Swinning Creek, only a small portion of the fish-bearing reach on Willow Creek, and no fish-bearing portions of either Grizzly or Hoxie Creeks.

Perennial reaches on the Analysis Area streams on BLM-administered lands were evaluated by stream surveyors in 2002 and 2006. Surveyors documented high (> 20%) levels of sediment, and actively eroding banks in perennial reaches of the Analysis Area streams (stream reach numbers 3089, 2441, and 5000 in Willow Creek; 3413 and 3415 in Swinning Creek; 3393 and 5058 in Grizzly Creek; 3559 and 3589 in Hoxie Creek; and 3643 in an unnamed frontal tributary). The two reaches in Grizzly Creek were rated as Not Functioning (NF), while the other stream reaches were all rated as Functioning at Risk (FAR) by surveyors during Proper Functioning Condition (PFC) surveys. In nearly every surveyed reach, grazing-related impacts were identified as contributing to these findings (USDI 2002 and 2006). The high levels of sediment documented in the Analysis Area streams is likely related, in some part, to the nature of the stream systems and the soils they drain. Low-gradient streams tend to aggrade fine sediments, coupled with constant sediment inputs resulting from clay soils that have naturally exposed un-vegetated surfaces during snow run off. Additionally, roads and cattle grazing, in particular, appear to have contributed to instream aquatic habitat degradation through increased sediment inputs, primarily by increased bank erosion through hoof shear. Given that the streams are all very small, prone to interrupted surface flow during the summer, and the high sediment levels which dominate the substrate, they provide only marginal habitat for fish.

6. Environmental Consequences—Aquatic Habitat

a. Alternative 1—No Action Alternative

The No Action Alternative would have no direct or indirect effects, and therefore would not add a cumulative effect to aquatic habitats, as no ground disturbing activities would occur. Aquatic habitats within the drainages, individual catchments, and the larger watershed would continue to exist in their current state. As no new road construction would occur, road densities would remain at current levels within the Analysis Area. In general, though, fish habitat would continue to be impacted as a result of past and ongoing activities, notably altered flow regimes, grazing and continuing high road densities.

b. Alternative 2—Proposed Action

Alternative 2 proposes various prescriptions of commercial timber harvest and yarding, temporary road construction, road maintenance, road decommissioning, and log hauling. Commercial harvest activities could be followed up by activity fuels treatments depending upon remaining fuel loads. No road construction would cross or parallel any stream channels, dry draws, or Riparian Reserves.

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. The Soils and Water Resources sections of this document describe where and by what means erosion will likely occur, and the mechanisms for displaced sediments to enter the stream network. The harvest and yarding of timber, temporary road construction, road decommissioning, new landing construction, and log hauling proposed under Alternative 2 have been identified as having the greatest potential to increase erosion rates (see Section D: Soil Resources). Of these activities, only portions of haul routes would have direct connectivity to aquatic habitat. Units and haul routes are widely spread amongst the Analysis Area drainages (Table 3-13).

Table 3-13. Amount of Harvest Activity Proposed in Alternative 2 in Each of the Analysis Area Drainages in the Howard Forest Management Project, Including the Number of Stream Crossings the Estimated Haul Routes Would Include.*

HUC 7 Drainage	Proposed Activities					
	Harvest (acres)	Temp. Road construction (feet)	Road Decommission (miles)	Haul (miles)	# haul route Stream Crossings	
					Perennial	Intermittent
0103	136	825	0	1.9	0	0
0106	145	0	0.7	3.9	0	2
0109	155	700	0.3	1.4	0	2
0112	102	725	0.5	2.0	0	1
0115	32	0	0	.8	0	0
0118	31	0	0	.3	0	0
0121	27	150	0	1.3	0	1
L. Butte Cr	12	0	0	1.1	0	4
TOTAL	640	2400’	1.5	12.8	0	10

*Note that haul routes are estimated based on easiest access to timber units, and only includes those portions which are not paved. . All reported acres, feet and miles in this table are rounded up.

Commercial Timber Harvest

There are three primary mechanisms by which timber harvest 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 (see Section D: Water Resources).
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) downslope towards stream channels.

In the Howard Forest Management Project, all harvest would occur outside of Riparian Reserves, at a minimum distance of one site potential tree height (170 feet) 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. Harvest units as proposed would retain at a minimum 40% overstory canopy cover following harvest, a level the Water Resources analysis in this document determined would have no probability of measurably affecting or altering the timing of peak or base flows (see Section E: Water Resources).

Riparian buffers are known to be effective at filtering off-site sediment movement, such as may occur following ground disturbance in harvest units (Rashin et al. 2006). In the Howard Forest Management Project, all harvest units would be buffered from stream channels by full width Riparian Reserves, and therefore, any fine sediment mobilized from units or skid trails would be filtered by vegetation within the Riparian Reserves, and assimilated into the forest floor before reaching aquatic habitat. In sum, no connectivity, and therefore no causal mechanism, would exist for commercial timber harvest to input sediment through the RR buffers and into stream channels.

Because 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, these project elements would not directly affect the aquatic environment. There is the potential that an indirect effect, in the form of increased erosion rates, could result if unauthorized OHV use were to occur on the skid trails or in the thinned stands following harvest. The potential for this to occur is high in two of the analysis drainages in particular (HUC # 0103 and 0109), as there are four miles and nine miles (respectively) of user-created OHV trails in these drainages, and 2.5 miles of trails within proposed harvest units, as well. There is comparatively less (0.3 miles of trail per drainage or less) OHV use occurring in the other Analysis Area drainages.

Within HUCs 0103 and 0109, the thinned units would be tractor yarded, and are easily accessible to OHVs. PDFs to discourage use of tractor yarding corridors are included in this Project, but the gentle topography of the area makes it difficult to successfully preclude OHV use from any area, let alone in harvest units. Therefore, there is a risk that OHV use could increase in the tractor units, especially in areas where use is already occurring, and this would result in increased surface erosion. However, this is unlikely to affect aquatic habitat because the tractor units are flat, and would retain full-width Riparian Reserve buffers between streams, making it unlikely that sediment would move off-site and be transported through the Riparian Reserves to channels. Connectivity between the skid trails and aquatic habitat would not exist, and therefore, OHV-use as an indirect effect of harvest would have no causal mechanism to indirectly impact fish or aquatic habitat, and as such, would not add a cumulative effect.

Activity Fuels

Activities fuels treatments as proposed would treat slash generated from commercial harvest operations (hand pile burning only). Ground cover, such as forbs and grasses, understory shrubs and trees, and all riparian plant species would remain after fuels activities. This activity would not impact aquatic habitat. As outlined in the PDFs, the treatments would leave no-treatment buffers around stream channels, and would

not reduce shade afforded to stream channels. The vegetative buffers remaining adjacent to channels would trap any off-site sediment or ash 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, fuels treatments as proposed in the Howard Forest Management Project would have no causal mechanism to affect any aquatic habitats, and hence would not contribute to cumulative effects.

New Landings

All new temporary roads incorporate landings into the road design. All would be in upslope areas, outside of Riparian Reserves, and disconnected from the hydrologic network. Though erosion rates are likely to be increased substantially on the disturbed ground of the new landings, displaced soil would not migrate into any stream channels located far away because there would not be any connectivity. For these reasons, new landing construction, use, and follow-up stabilization would have no causal mechanism to influence aquatic habitat, and would not impart any direct, indirect, or cumulative effects.

Roads

Of all forest management activities, roads typically have the greatest potential to influence aquatic habitat in forested watersheds. Impacts include both near-term and ongoing (chronic) impacts. Near-term impacts stem from activities which include new ground disturbance, such as construction or maintenance of road segments. These activities lead to increased potential for erosion and transport of sediment to channels. Sediment contribution to channels stemming from these activities generally diminishes after 1-3 years (Luce and Black 2001; Megahan 1974).

Long-term and indirect effects are more pervasive, and may persist even beyond the life of the road. For example, new road construction requires clearing along the road right-of-way (ROW). Where a road crosses a stream, this means the removal of shade-producing riparian vegetation, which would not fully recover until long after the road is decommissioned or abandoned. Road segments located away from stream channels can also greatly influence aquatic habitat. Numerous studies have shown how roads may increase the length of the drainage network by intercepting ground or surface flow and precipitation, resulting in disruption of natural flow paths. This, in turn, may lead to increases in peak flow and/or timing to peak flows (Wemple et al. 1996; Jones et al. 1999). Increased peak flows, if great enough, can cause channel adjustments that physically alter aquatic habitat. Additionally, roads cut through steep side slopes or in unstable areas are susceptible to failure, which can trigger mass wasting events such as debris torrents, capable of scouring out channels and transporting and depositing tons of material, including large wood and sediment of all size classes, in large episodic pulses.

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). Intercepted runoff, which becomes concentrated over erodible road surfaces, mobilizes and transports sediment with it. Surfaces armored by pavement do not experience this type of chronic weathering, and rocked roads are more resistant than natural surfaced ones. For these reasons, natural surfaced (or broken down rocked surfaced) roads with a high degree of hydrological connectivity are particularly problematic to aquatic habitat. Within the Jenny Creek watershed, fine sediment delivery to stream channels resulting from weathering of road surfaces is the main concern. The area is not at high risk for debris torrents due to mild slopes. Within the Analysis Area, the risk of road-derived sediment contribution to the stream network is further reduced given the gentle topography of the area, as flat roads do not have as great a potential to route sediment to streams as do steep roads.

It is important to note that not all roads or road segments contribute deleterious effects to aquatic habitat. 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. Mid-slope and valley-bottom roads constructed in areas of high drainage density (which necessitates many crossings) have a high degree of connectivity, while ridgetop segments that do not cross channels have no connectivity. Segments with high connectivity have

high potential to affect aquatic habitat, while those with no connectivity have no potential. None of the proposed temporary roads in the Howard Forest Management Project would have hydrological connectivity to the aquatic system, and therefore have no potential to impact the aquatic system.

In addition to channel crossings, the design of the road also plays into the degree of hydrological connectivity. Roads which are designed to shed intercepted water quickly off their surface and back to the forest floor have connectivity only from the point of the last turn-out device to where the road crosses the stream. Examples of such designs include outsloped road surfaces, rolling dips, and waterbars, which when constructed and maintained properly are effective and common designs used to reduce connectivity between roads and the aquatic system (Luce and Black 2001; MacDonald and Coe 2008). Contrast this with an insloped road drained by an inboard ditch with few cross drains: such a road would have a greater portion of its length directly connected to the stream, and hence a greater potential to impact aquatic habitat. 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 than dry season use. In the Howard Forest Management Project, road maintenance, construction, decommissioning, and log haul are proposed. These activities would be restricted to the dry season except for haul, which would be allowed during snow conditions when the potential risk of increasing surface erosion rates from the roads are low (see PDFs as described in Chapter 2).

Road Maintenance and Road Construction

Some limited road maintenance (less than 0.5 mile) is proposed to facilitate log truck access to two units. Maintenance would primarily consist of removing barricades and spot re-shaping, rocking and widening. Activities would occur in upland areas far from streams or other hydrological features; therefore, this activity would have no hydrological connectivity, and no causal mechanism to affect water quality. Road maintenance as proposed for the Howard Forest Management Project would not contribute direct, indirect, or cumulative effects to aquatic habitat.

Under Alternative 2 in the Howard Forest Management Project, five new temporary roads are proposed to facilitate access to timber units, totaling approximately 0.46 miles in length. Road construction, use, and decommissioning would occur during the same dry season, and all surfaces would be scarified, seeded, mulched/slashed, waterbarred, and barricaded following harvest operations. None of the roads would cross any stream channels, springs, seeps, dry draws, or Riparian Reserves; therefore, there is no hydrological connectivity between this project element and the aquatic system. For this reason, this activity would contribute no direct effects to aquatic habitat. As the roads would be located on flat ground, they would not intercept ground water. The only effect the roads could potentially impart to hydrological processes would be to intercept precipitation directly, which would then be less likely to infiltrate the surface given increased compaction of the road surface. Intercepted precipitation that did not infiltrate directly into the soil through the compacted surfaces would be shed off of the roads at some point, and returned to the forest floor. This would not yield a detectible effect to water quality or quantity, nor impart any indirect effects to aquatic habitat, as the amount of disturbed area would be a very small fraction of any given drainage area, and much too small to result in any quantifiable changes to watershed yield. Because the roads would be decommissioned following use, they would not result in an increase in road densities in the Jenny Creek Watershed in the long-term.

Road Decommissioning

Road 38-3E-23.2 (0.65 miles) would be fully decommissioned and returned to a more natural state by heavy machinery. This road includes two channel crossings (one perennial) and is within a Riparian Reserve for approximately 900 feet. The perennial crossing is via an undersized and perched culvert which acts as a passage barrier to aquatic organisms. The road was recently highly disturbed by a private individual who gained accessed from private lands and drove down the road while the surface was saturated, resulting in extensive rutting and off road damage to a sensitive meadow area. Because the road grade is relatively flat, it did not appear as if disturbed soil had migrated to aquatic habitat during this trespass.

Fully decommissioning Road 38-3E-23.2 would include removing the drainage structures, de-compacting the road prism in areas, seeding, mulching, and spreading of slash, and allowing full vegetative recovery over time. This would involve some ground disturbance, but long-term benefits to aquatic habitat would greatly outweigh the short-term, one-time negative effects anticipated to occur, as a result of removing the culverts. Removing the culverts would likely result in the input of fine sediment at the crossing locations; previous projects the BLM has performed which involved small stream culvert removal suggest that less than a cubic yard of sediment at each crossing would likely be contributed to the small channels of an unnamed Howard Prairie frontal drainage in HUC # 0106. Sediment contributed to the small streams would be likely to work its way downstream to Howard Prairie Reservoir (about 0.5 mile downstream) by the end of the first spring following decommissioning, where it would be assimilated into the existing muddy bottom. Fully decommissioning the road would preclude future trespass and associated erosion to occur, would restore aquatic connectivity to aquatic organisms, and allow for the recovery of approximately 0.5 acre of riparian vegetation.

The remaining segments would be decommissioned via methods using lighter touches, ranging from scarifying and slashing the surfaces (non-system spur Roads 38-3E-13.0 A and B, totaling 0.27 miles), to allowing time and nature to naturally decommission the surface (Road 38-4E-29.2, 0.45 miles), as described in Chapter 2 of this document. These other segments do not include channel crossings or riparian areas, and decommissioning them would not impart negative impacts to aquatic habitat.

In addition to the permanent decommissioning, Road 38-3E-13.6 (0.5 miles) would be placed in long-term closure status upon completion of harvest activities. This would include placing woody material and slash on the road surface, and constructing a barricade at its intersection with the paved Keno Access Road to preclude use of the road which currently provides access to sensitive areas being impacted by off-road vehicles. Closure of this road would reduce erosion rates of the road and areas it accesses for the duration of the closure. This would net some benefit to aquatic habitat, as the road includes one intermittent channel crossing.

Haul Routes

Haul is known to accelerate erosion rates on roads through the breakdown of surface material and creation of erosion features, such as ruts. Roads are more susceptible to disturbance when they become saturated. During such periods, they are more likely to develop ruts which can expose the subgrade. Dry-season use is less damaging, as ruts are unlikely to result, but heavy use (even in the dry season) would result in increased erosion of the road surface through the breakdown of aggregate or native surfaces. Because haul increases erosion rates, portions of haul routes with connectivity to streams would be expected to contribute some amount of sediment to the aquatic system. 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 approximately 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. Though a quantitative comparison of wet season vs. dry season haul erosion rates is not readily available, the authors did note that proscription of wet-weather haul is an effective BMP for reducing sediment production stemming from haul.

For the Howard Forest Management Project, all haul would be seasonally-restricted to the dry season, or when 2-4 inches of frozen packed snow covers surfaced or exempted natural surface roads. Thus, sediment production would be less than rates reported by Luce and Black. Snow hauling, if conducted under appropriate conditions, should yield no increased erosion, as road surfaces would be covered and protected by a layer of compacted snow and ice. Repeated use of the unpaved haul roads during the dry season may potentially directly and indirectly contribute fine sediment and turbidity to streams as road surfaces become pulverized (i.e. dust, a form of fine sediment) after repeated heavy truck traffic. The heavier the volume of haul, the greater the potential for breakdown of the road surfaces to occur. Small direct contributions of fine sediment could occur if dust mobilized by haul should settle out in perennial stream channel crossings 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 events 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. Given the nature of the sediment (very small particles or dust), inputs would likely be manifested as turbidity pulses, which would be flushed through the system during high flow events.

In the Howard Project, log haul would occur on an estimated 12.8 miles of non-paved roads in the Analysis Area (1.1 miles of routes in the Little Butte Watershed). Proposed commercial units in this sale are widely spread over a large geographic area, as are the haul routes. This will limit the amount of traffic that any one non-paved road segment will receive, reducing the potential for impacts to surfaces relative to higher volumes of traffic. Haul routes are largely confined to upslope areas but do include 10 channel crossings, all of which are intermittent. No unpaved routes would parallel or cross fish habitat, and no routes closely parallel any stream in the entire haul Analysis Area. Therefore, the only mechanism by which road-derived sediment is likely to affect aquatic habitat as a result of log haul is from storm runoff, not directly through airborne contributions.

There is no potential for haul to contribute sediment to drainages # 0103, 0115, and 0118, as there are fewer than 3 miles of upslope haul routes in these drainages and no stream crossings. Routes in these drainages would have no hydrological connectivity with aquatic habitats. Any increased erosion of the road surfaces resulting from haul would have no mechanism to be input into aquatic habitat.

There is a slight potential for haul to contribute sediment to aquatic habitat in the drainages # 0106, 0109, 0112, and 0121, and in the Little Butte Watershed. Routes in these drainages would cross ten intermittent channels, but as they are well spread out spatially (reducing the amount of traffic any one area would receive), and because the routes that include the crossings are low-gradient, stable, well-drained, and provide access to only four units, the potential is low. Sediment generated through the breakdown of aggregate on these surfaces would not likely be transported down the roads given the gentle topography of the area. In the event transport did occur, drainage controls on the roads would serve to turn out the majority of mobilized sediment during precipitation events to downslope vegetation.

In the event haul did lead to increased inputs of sediment, the magnitude would be small, as there are few input points, the roads are flat, stable, and incorporate drainage controls. For these reasons, only in the vicinity of the ten channel crossings would sediment have any probability of migrating off the prism and into aquatic habitat. The timing of the inputs would likely occur only during a precipitation event of sufficient magnitude (i.e. small flood event) to get the intermittent streams and ditch lines flowing, and the inputs would be spatially spread over multiple input locations, and would occur in the nature of increased turbidity (very fine sediment). Under such conditions, it is extremely unlikely that sediment input by haul would be detectable behind background levels in Analysis Area streams. In the Howard Analysis Area streams, sediment/turbidity mobilized off the road prisms and into streams would eventually settle out as fine sediment in the reservoir, where it would be assimilated into the existing mud bottom substrate. In the Little Butte Watershed, in the event that haul related sediment was contributed to the intermittent streams, it would be transported downstream as a brief and undetectable plume of increased turbidity, indiscernible beyond background levels which would occur during a high flow event.

To sum, although haul would have a small likelihood of inputting sediment (turbidity) into aquatic habitat, the magnitude of the inputs would be very small because snow- and dry-season haul restrictions would reduce impacts to the road surfaces, there are relatively few channel crossings, the amount of hydrologically connected haul is light, and the majority of the road system is disconnected from the aquatic system by drainage control devices. It is not anticipated that inputs would be discernible above those contributions chronically occurring.

Aquatic Habitat Effects Summary

Short-term, there would be a low probability of one-time inputs of fine sediment in the form of very small turbidity pulses to channels in the Analysis Area resulting from haul, and a higher probability of coarser grained sediment input into an unnamed Howard Prairie frontal resulting from pulling two culverts associated with road decommissioning. Any sediment increases would be minor relative to existing sediment levels, and would not meaningfully impact either aquatic organisms or aquatic habitat. The construction of 0.46 miles of temporary roads would represent a short-term increase in road densities, and would represent a decline of this gross health indicator in the drainages, but would be more than offset by the full decommissioning of 1.37 miles of road which includes riparian areas and two crossings, which cumulatively would yield a reduction of road in the Key Watershed. New construction is not anticipated to contribute sediment to aquatic habitat or alter hydrologic functions, as none of the new road construction would be hydrologically connected to the stream system. Upland work, such as timber harvest and follow-up fuels treatments, 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 implementation of BMPs. Stream temperatures would not be affected, as no riparian vegetation is proposed to be treated.

Future private timber harvest is assumed to continue at present levels, and cumulative effects to water resources have been assessed (see Section E: Water Resources). Future private harvest is expected to continue to contribute to the declining trend in streambank stability, sedimentation potential, and health of riparian areas currently present in the Analysis Area. Cattle grazing is expected to continue at current intensities across the Analysis Area, resulting in continued habitat degradation.

The Howard Forest Management Project would, in the short-term, contribute a small amount of sediment to a small Howard Prairie Reservoir frontal stream. No direct inputs of fine sediment would occur to fish habitat resulting from haul, and indirect inputs would be of insufficient magnitude to meaningfully affect fish or fish habitat and would occur at times that would preclude detection in fish bearing channels (i.e. as brief pulses of elevated turbidity during high flow events). Aquatic habitat would be benefited at the site scale through improved connectivity and reduced chronic erosion resulting from road decommissioning.

In sum, no negative measurable changes to long term aquatic habitat conditions are anticipated to result from implementation of Alternative 2, while road decommissioning would yield a slight long-term benefit to one small non-fish bearing stream.

7. Affected Environment—Riparian Reserves

Riparian areas in the Jenny Creek Watershed range from conifer forested terrain to willow, alder, and aspen stands, from wet and dry meadows to barren “beaches” when upper Watershed reservoirs are at low pool. In general, riparian corridors in most of the Jenny Creek Watershed are relatively intact, given that there has been very little agricultural or urban development in the Watershed. The majority of the major road systems in the Watershed tend to run perpendicular to major drainage courses, limiting the amount of streamside clearing resulting from roads, when compared to other watersheds in the Resource Area, which typically have roads which closely parallel streams considerable distances up their valleys.

Past logging practices, streamside grazing, and the large impoundments are the major disturbances in riparian areas in the Jenny Creek Watershed. Pre-Northwest Forest Plan logging on Federal lands did not incorporate Riparian Reserves around stream channels.

Streamside areas adjacent to past harvest units are in some state of recovery, depending upon the length of time since harvest. Streamside grazing can reduce riparian vegetation, though these impacts are typically limited to small trees, shrubs, forbs and grasses. Large overstory shade-producing trees, if present, would not be affected by grazing. Significant restoration of riparian areas has occurred in lower reaches of Jenny Creek through the retirement of grazing rights, and planting and natural recruitment of riparian vegetation.

The reservoirs have also altered riparian vegetation, or at least its location, as the flood pools inundated upland areas. Riparian areas around the reservoirs are subject to seasonal drought conditions as the

reservoirs are drawn down throughout the summer. In spite of this, willow, aspen, and other riparian species are commonly found along the reservoir shorelines.

Within the Analysis Area drainages, there are an estimated 906 acres of Riparian Reserves (calculated from GIS) on BLM-administered lands, and 603 acres on Forest Service and BOR-administered lands. There are riparian areas located on private lands that do not receive the same level of protection as that provided by RRs. Overlaying the vegetation condition (GIS) layer with the Riparian Reserve boundary layer is a useful way to display current vegetative states of the reserves over the large area encompassed within the project boundary. 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. Note also that the 906 calculated acres include wetlands and areas surrounding the reservoirs that are inundated by water (approximately 12 acres). These 12 acres are excluded from the following analysis. A summary of existing vegetative states in Riparian Reserves on BLM-administered lands within the Howard Analysis Area is presented by catchment in Table 3-14.

Table 3-14. Riparian Reserve Seral State on BLM-administered Lands in the Howard Analysis Area.

HUC 7 Drainage	Riparian Reserve Acres by Vegetation Type						
	Grass and shrubs	Hardwoods	Early Seral (seedlings/saplings)	Poles (5-11" DBH)	Mid Seral (11-21" DBH)	Mature (>21" DBH)	Total Acres of RR.s
0103	6	0	9	8	18	14	55
0106	13	0	8	45	27	192	285
0109	31	0	1	0	9	94	135
0112	86	0	19	5	25	30	165
0115	5	0	0	0	4	34	43
0118	4	0	9	0	16	104	133
0121	1	3	18	0	22	34	78
Total	146	3	64	58	121	502	894

The seral stage of vegetation surrounding the reserves can provide insight to how well the reserves 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 trees in a mid-seral stage (minimum 11-21 inches in diameter at breast height [DBH]) or older will function to provide sufficient shade to stream channels, and that pole-sized trees (5-11 inches DBH) and younger may not provide sufficient shade to stream channels to prevent solar penetration to the stream channel. It was also assumed that only stands in a mature stage (>21 inches DBH) 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-sized trees may tend to underestimate the percent of reserves that are currently providing sufficient levels of shade to stream channels. Table 3-15 displays the percent of all reserves that are in mid-seral or greater stage (capable of providing high levels of shade), and in a mature stage (capable of providing large wood to channels).

Table 3-15. Percent of All Reserves in Mid-Seral or Greater, and Mature Seral Stages in the Analysis Area.

HUC 7 Drainage	% of Reserves in Mid Seral Stage or Greater (Trees 11-21" DBH)[1]	% of Reserves in Mature Stage (Trees >21" DBH)[1]
0103	58	25
0106	77	67
0109	76	70
0112	33	18
0115	88	79
0118	90	78

HUC 7 Drainage	% of Reserves in Mid Seral Stage or Greater (Trees 11-21" DBH)[1]	% of Reserves in Mature Stage (Trees >21" DBH)[1]
0121	72	44
Total Analysis Area	70	56

[1] Does not include acres of hardwoods, which likely underestimates actual shade provided to stream channels.

This analysis suggests that within the Howard Analysis Area, Riparian Reserves capable of providing ample shade are prevalent in all but two drainages (#s 0103 and 0112). Drainage # 0112 contains a very high percentage of meadows (52% of all riparian vegetation), which is the natural state of this drainage. Drainage # 0103 contains relatively high percentages of pole- and sapling-sized vegetation, indicative of past riparian harvest. (Note that there are few [58] Riparian Reserve acres in this drainage.) Shade and a lack of source inputs for large wood are a concern in this small drainage area. It will take several decades before Reserves recover to the point where they are capable of providing sufficient shade in this drainage. Drainage #0121 rates somewhat low in percentage of mature trees, but high in mid-seral trees, so shade is not an issue in this drainage. Sources of large wood inputs will be below optimal in drainage #0121 until streamside stands age and begin to exhibit mortality. Other drainage areas exhibit Riparian Reserves capable of not only providing high levels of streamside shade, but also capable of contributing large wood to channels.

8. Environmental Consequences—Riparian Reserves

a. Alternative 1—No Action Alternative

The No Action Alternative would have no direct or indirect effects to Riparian Reserves within the Jenny Creek Watershed. The reserves 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 on Federal lands. As this alternative would not contribute any direct or indirect effects to the reserves, no cumulative effects would result from implementation of the No Action Alternative.

b. Alternative 2—Proposed Action

Activities proposed in Riparian Reserves under the Howard Forest Management Project are limited to log haul and road decommissioning. Haul would not change the existing condition of the Riparian Reserves, while road decommissioning would allow for the recovery of approximately 0.5 acre of riparian vegetation. No activities propose the removal of riparian vegetation. As such, implementation of the Howard Forest Management Project would have no negative direct, indirect, or cumulative effects to Riparian Reserves. The positive effect of allowing 0.5 acre of Riparian Reserves to return to a more natural state would be beneficial, and over time could be expected to slightly reduce solar inputs to a perennial channel in the vicinity of the crossings proposed to be removed.

As the recovery of Riparian Reserves on Federal lands continues, it is anticipated that both shade levels and inputs of large wood will eventually increase over stream channels on BLM-administered lands within the Analysis Area. However, it will take many years for the Riparian Reserves to achieve their full potential, and benefits would be limited in areas already impacted by permanent roads.

G. CONSISTENCY WITH AQUATIC CONSERVATION STRATEGY

1. Introduction

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 Analysis Area covers seven small 7th field drainages, all of which drain into Howard Prairie Reservoir, one of several large impoundments in the upper half of the Jenny Creek 5th Field Watershed. How the four components of ACS relate to the Howard 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 NWFP's Aquatic Conservation Strategy and are listed in the PDFs for the Howard 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 Jenny Creel Watershed is a Tier 1 Key Watershed, designated for the presence of two endemic fish species, the Jenny Creek sucker and the Redband trout. These species are not present in the upper watershed, where the Analysis Area drainages are located.**

3. Watershed Analysis: The BLM completed the Jenny Creek Watershed Analysis in 1995. The Watershed Analysis encompasses the Project and Analysis Areas.

4. Watershed Restoration: Most of the restoration activities in the watershed have focused on the lower Watershed, those areas which support the Jenny Creek sucker and Redband trout. Wilderness and National Monument Designations, land exchanges, cattle exclusion, grazing allotment retirements, riparian plantings, securing of instream water rights, decommissioning of roads and ditches, and restoring fish passage to provide better access to habitat, are among the restorative actions which have occurred in Jenny Creek since the Watershed Analysis was written.

2. Consistency Review

ACSO 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 Watershed. One of the treatment objectives of the Howard Forest Management Project is to compensate for an altered fire regime, to reduce the likelihood of insect and disease-induced mortality, and to 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. Over time, this may be noticeable at the site-level, but would have only a minor benefit at the watershed scale, as less than 1% of the Jenny Creek Watershed would be treated.

ACSO 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 Jenny Creek Watershed, the presence of four large impoundments has, by far, the biggest effect on this indicator. The dams do not allow for any upstream passage by aquatic organisms in the upper half of the watershed. Additionally, there are several smaller diversions throughout the watershed which are barriers to certain life stages of aquatic organisms at certain flows. The only project element proposed in the Howard Forest Management Project that would affect this indicator is the removal of two culverts associated with the road decommissioning. This would represent a site-level benefit of this indicator, as the spatial connectivity would be fully restored at the two crossing locations.

ACSO 3. *Maintain and restore the* ***physical integrity*** *of the aquatic system, including shorelines, banks, and bottom configurations.*

The only project element proposed in the Howard Forest Management Project that would affect this indicator is the removal of the two crossings, as discussed above. Again, this would represent a site-level benefit to

this indicator, as the physical integrity of the channel (banks and bottom configuration) would be fully restored by removal of the culverts.

ACSO 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 stream channels. In the long-term, shade levels would be slightly increased at the perennial crossing proposed to be removed, though this would not likely result in a measurable decrease in water temperatures. Short-term, there is a low potential that log haul could increase one-time turbidity inputs to aquatic habitat throughout the Analysis Area, though the magnitude of inputs is not anticipated to be measurable or discernible above background turbidity which would occur during high flow events. Road decommissioning is expected to input up to two cubic yards of sediment at the site of two crossing proposed for removal. This sediment would likely work its way downstream to Howard Prairie Reservoir within a year of the decommissioning. This one-time input would be much less than the road could be expected to contribute to the stream over the lifetime of the road, should it not be decommissioned. 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 normal BMPs.

ACSO 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 haul, which could potentially contribute small amounts of sediment in the nature of turbidity pulses to aquatic habitats, and road decommissioning, which would contribute larger amounts of coarser sediment in the vicinity of the two crossings proposed to be removed. Haul may potentially (though the probability is low, per EA analysis) result in site level inputs of very small amounts of fine sediment (turbidity) to those portions of streams crossing haul routes. This turbidity would pass through habitat during a time of year (in response to storm events) when stream flows are elevated and prone to natural increases in turbidity. At such a time, it would be undetectable in downstream habitats impacted by turbidity from a myriad of other sources. (See also ACS Objective #4.) Road decommissioning could potentially result in detectable site-level impacts downstream of the two crossing points in the near-term. It is anticipated that spring flows the following season would flush the sediment into the reservoir, at which point it would be assimilated into the muddy bottom substrate characteristic of reservoirs. In general, high road densities, water release operations from the reservoirs, and the legacy of past and ongoing grazing will continue to impact the sediment regime in the watershed.

ACSO 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.*

Storage dams, water releases, transfers and withdrawals for agriculture and residential use, and the high amount of non-porous surfaces (roads, buildings, etc.) have the most significant impacts to instream flows in the watersheds. Peak flows and summer low flows would not be affected by the Howard Forest Management Project. See Section E: *Water Resources* for details. Any effects on ground water availability from the Project would be too insignificant to be noticeable at the site-scale, much less the drainage or watershed scale.

ACSO 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 would

leave canopy cover within the range of natural variability within the Planning Area. 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.

ACSO 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.*

The only Howard Forest Management Project activities proposed in Riparian Reserves are log haul and road decommissioning, which would not negatively disturb riparian vegetation. Decommissioning would allow for the recovery of approximately 0.5 acre of riparian vegetation at the site level of a small perennial stream. This indicator would remain unaffected at larger spatial scales.

ACSO 9. *Maintain and restore* ***habitat*** *to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.*

See previous objectives. No detectable effects beyond site level turbidity inputs to aquatic and riparian habitat are anticipated to occur as a result of this project. These inputs would not meaningfully affect populations of native riparian-dependent flora and fauna at any spatial scale.

H. TERRESTRIAL WILDLIFE

1. Introduction

This section discusses terrestrial wildlife habitats and the potential effects to Threatened, Endangered, and Special Status wildlife species. Only Federally-listed, Survey and Manage, and Bureau Sensitive Species known or suspected to be present within the Project Area and may be affected by the proposed actions are addressed in this EA.

For the purpose of this analysis, this section will hereafter refer to three reference scales: the Project Area, the Planning Area, and the Wildlife Analysis Area.

Project Area: describes where the action is proposed, such as units where forest thinning, road construction or road improvements are proposed.

Planning Area: the overall area of consideration that was reviewed for the development of the Howard Forest Management Project Proposed Action (Alternative 2).

Wildlife Analysis Area: totaling 27,870 acres, this area is for a more applicable spatial scale for species with larger home ranges and dispersal movements. The Wildlife Analysis Area includes all areas within the home range circles for NSO which overlap proposed treatment areas.

Terrestrial wildlife-related issues associated with the Howard Forest Management Project have been identified through public scoping or interdisciplinary team specialists, and are addressed in this document. These relevant issues are:

- Proposed Project activity has the potential to negatively impact Northern goshawks[6], Pacific fisher, and rare and Neotropical bird species in the Project Area, including migratory patterns and habitat connectivity and quality.

[6] Northern goshawks are no longer listed as a Bureau Sensitive Species (delisted with implementation of the 2008 State Director's list), nor are they included on the USFWS Birds of Conservation Concern. IM OR-110-2007-006 provided implementation guidance for the then-forthcoming finalization of the 2008 State Director's Special Status Species List and new Special Status Species Policy, and declared that species that were not included on the 2008 list were no longer considered

- Proposed Project activity has the potential to reduce the complexity of forest structure, including vertical and horizontal diversity, snag and snag recruitment, and downed coarse woody material that provides habitat for a variety of wildlife species.
- Some commenters submitted articles that discuss the impacts of proposed road construction on density, habitat fragmentation, edge effects, and other effects to wildlife.
- The effects of timber harvest and road construction, when combined with other past, ongoing, and reasonably foreseeable future actions on private and public lands, could potentially contribute to adverse cumulative effects to terrestrial habitats and associated organisms.
- Spotted owl habitat is specifically rated for suitability for spotted owls, while late-successional habitat not rated as suitable spotted owl habitat may provide habitat for other species.

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 or Endangered) or Special Status Species habitat is known or suspected to be present in the Analysis Area, or if the area is outside the range for a particular species, then no further analysis of those species 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 included in analysis.
- Coarse wood already on the ground would be retained and protected from disturbance to the greatest extent possible during proposed Project activities.
- Snags which would need to be felled for safety reasons would be retained as down wood within the proposed harvest units to the extent possible.
- "Treat and Maintain" spotted owl habitat means that the action would occur within nesting, roosting, and foraging (NRF) or Dispersal habitat, but would not change the conditions that classify the stand as NRF or Dispersal, post-treatment. NRF habitat would retain at least 60% canopy cover, large trees, multistoried canopy, standing dead and down wood, and diverse understory adequate to support prey, and may contain some mistletoe or other decay. Dispersal habitat would retain at least 40% canopy cover. The habitat classification of the stand following treatment would be the same as the present, pre-treatment habitat classification.

2. Affected Environment—General

a. Vegetation Conditions and Terrestrial Wildlife Habitats (General)

The vegetation condition classes presented in the table below provide habitat for the terrestrial wildlife species found in the Howard Forest Management Project Planning Area. Current habitat conditions reflect past actions—both natural and anthropogenic. The most influential of these actions include timber harvest, fire, and livestock grazing. Acreage of each vegetation condition class and several wildlife species that are representative of the various habitats are also displayed. Approximately 255 vertebrate terrestrial wildlife species are known or suspected (based on known range and habitat associations) to occur in the Planning Area. This includes species that migrate through the area.

The Howard Forest Management Project is located within the Upper Jenny Creek 6th field Subwatershed.

Special Status Species (per IM OR-2007-072) and that on-the-ground management was no longer required. The Final State Director's Special Status Species List was finalized with IM OR-2008-038; goshawks have not been included in subsequent updates of this list. No detailed analysis of Northern goshawks is required. However, this document includes PDFs (Chapter 2) for protection of nesting raptors, which would include protection for this species.

Table 3-16. Vegetation Condition Classes on BLM-Administered Lands within the Howard Planning Area.

Vegetation Condition Class	Approximate Acres in the Planning Area (BLM-Administered Land)	Representative Species (from Brown 1985)
Grasslands	292	Gopher snake, California ground squirrel, western meadowlark
Brushland/Shrubland	142	Western fence lizard, wrentit, dusky-footed woodrat
Hardwood/Woodland	11	Acorn woodpecker, western gray squirrel, common garter snake
Seedling/Sapling	704	Cassin's Vireo, deer mouse, black-tailed deer
Small Conifer	504	Golden-crowned kinglet, porcupine
Large Conifer	942	Hutton's Vireo, pine marten
Mature Conifer	2,999	Northern spotted owl, northern flying squirrel, pileated woodpecker

Late Successional Reserves (LSRs)

Per the 1994 Northwest Forest Plan ROD:

> Late-Successional Reserves are "designed to maintain and enhance late-successional forests as a network of existing old-growth ecosystems…The reserves are designed to serve a number of purposes. First, they provide a distribution, quantity, and quality of old-growth forest habitat sufficient to avoid foreclosure of future management options. Second, they provide habitat for populations of species that are associated with late-successional forests. Third, they will help ensure that late-successional species diversity will be conserved. (USDI 1994, pp. B-4 and B-5)

Adjoining the Analysis Area to the north is a large USFS-administered LSR, Dead Indian LSR, which also functions as habitat for species utilizing this type of habitat (i.e. Pacific fisher). This LSR is within the Southern Oregon Cascades Study Area, which is one of eight Federally-sponsored study areas that represent the Effectiveness Monitoring Program for Spotted Owls under the Northwest Forest Plan (Lint et al. 2005; Forsman et al. 2011). To the south of the Project Area is the former Jenny Creek LSR, which was incorporated into the Cascade-Siskiyou National Monument in 2008. This area provides approximately 10,525 acres of habitat for NSO south of the Project Area.

Private Lands

Private lands within the Wildlife Analysis Area are made up of early-, mid-, and late-seral forests, agriculture, 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 will 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 will 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. It is anticipated there would be some loss of owl habitat on private lands, but the rate of loss, or the specific location of harvest cannot be predicted.

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; are Bureau Sensitive Species (IM No. OR-2012-018); or are listed as Survey and Manage species under the Northwest Forest Plan. The table below lists the Special Status Species that are known or suspected to be present in the Planning Area. Only those species that could reasonably be present in the Planning Area are included – not species that would be considered "accidental" in the Planning Area. 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[7] 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 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 3-17. Special Status Wildlife Species Known, Suspected or Habitat Occurs in the Wildlife Analysis Area

Bald Eagle	*Haliaeetus leucocephalus*	BS—Known
Chase Sideband Snail	*Monadenia chaceana*	BS and S&M—Known
Franklin's Bumblebee	*Bombus franklini*	BS—Suspected
Fringed Myotis	*Myotis thysanodes*	BS—Suspected
Great Gray Owl	*Strix nebulosa*	S&M—Known
Johnson's Hairstreak Butterfly	*Callophrys johnsoni*	BS—Known
Mardon Skipper Butterfly	*Polites mardon*	FC—Known
Northern Spotted Owl	*Strix occidentalis caurina*	FT—Known
Northwestern Pond Turtle	*Actinemys marmorata marmorata*	BS—Suspected
Oregon Shoulderband Snail	*Helmithoglypta hertleini*	BS and S&M—Suspected
Oregon Spotted Frog	*Rana pretiosa*	FC—Suspected
Pacific fisher	*Martes pennanti*	FC—Known
Pallid Bat	*Antrozous pallidus*	BS—Suspected
Siskiyou Hesperian Snail	*Vespericola sierranus*	BS—Suspected
Siskiyou Short-horned Grasshopper	*Chloealtis aspasma*	BS—Suspected
Travelling Sideband Snail	*Monadenia fidelis celeuthia*	BS—Suspected
Western Bumblebee	*Bombus occidentalis*	BS—Known

Status: BS=Bureau Sensitive
FT=Federal Threatened FC= Federal Candidate
S&M=Survey and Manage

[7] 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).

c. Federally Listed Species

Northern Spotted Owl (NSOs) (Federally Threatened)

The northern spotted owl (NSO), a Federally-listed Threatened species, is associated with existing habitat within and adjacent to the Howard Project Area. NSOs prefer coniferous forest with multiple 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 an abundance of dead and down woody material. Based on studies of NSO habitat selection (including habitat structure and use and prey preference throughout the range of the NSO), NSO habitat consists of four components: nesting, roosting, foraging, and dispersal (Thomas et al. 1990).

NSO populations have declined range-wide 2.8% annually from 1994-2008 (Davis et al. 2011). In the most recent annual report from the Southern Oregon Cascades study area, NSO populations have declined over a 20-year period (Dugger et al. 2014). Habitat loss due to timber harvest was identified as the paramount threat in 1990. The rate of suitable habitat loss due to timber harvest on private, State, and Federal forest lands declined in the late 1980s and early 1990s (Anthony et al. 2004). The harvest rates in suitable habitat on BLM-administered lands in Oregon was 3% per year (22,000 acres), in 1990, and dropped to 0.52% per year (4,911 acres) by 2003 (Anthony et al. 2004, p. 28). During the period of declining rates of habitat loss, NSO populations in southwestern Oregon are declining. In addition, it is estimated that in the NWFP area, late-successional forest habitat development through in-growth (tree growth) is occurring at approximately 8% (600,000 acres) per decade over the baseline condition established in the NWFP (Anthony et al. 2004). Not all of these estimated in-growth acres would function as suitable nesting, roosting, and foraging habitat. Some would more likely function as dispersal or foraging habitat when they are added back into the baseline. The emergence of barred owls suggests an increase in risk to NSO since 1990.

There are two (2) NSO sites with some portion of their provincial home range on BLM-administered land and two (2) NSO sites on Forest Service land within the Wildlife Analysis Area. There is only one known NSO nest site located within the Wildlife Analysis Area; however, this nest site is outside of any proposed treatment units.

To the north of Howard Prairie Reservoir on land administered by the Forest Service, Oregon State University has been monitoring NSO activities since 1990 under the auspices of the Northwest Forest Plan (Lint et al. 1999). This study area covers 2,400 square kilometers and 89 NSO sites (NSO sites surveyed continuously since 1992). At the south end of this study area is the Dead Indian LSR, which provides for 11 NSO pairs and encompasses 41,310 hectares. The most current annual detection rate for the study area is 35%, which is the lowest rate of detection in 20 years (Dugger et al. 2014).

A limited number of surveys have been conducted within the Howard Forest Management Project Area over the past 10 years. For the purposes of this analysis, historic NSO sites are assumed to be occupied.

When discussing changes to NSO 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 Howard Forest Management Project Area:

Canopy cover is used as one of the critical habitat thresholds because it is important to NSO nest site selection and general habitat use, because increased levels of canopy afford protection from predators, and to mitigate temperature extremes (Courtney et al. 2004).

NRF treated and maintained denotes that habitat is affected but still provides nesting, roosting or foraging habitat because a minimum 60% canopy cover would be retained, as well as other key habitat features such as snags and coarse woody material.

Dispersal treated and maintained denotes that habitat is affected but still provides dispersal because at least 40% canopy cover would be retained.

When analyzing the impacts to NSOs 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 (70 acres) radius area around a known or likely nest site, and is included in the Core Area (Swindle et al. 1997; Perkins et al. 2000; Miller et al. 1989; Meyer et al. 1998).

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 NSOs during the nesting season; it is included in the provincial home range circle. Core Areas represent the areas which are defended by territorial NSOs and generally do not overlap the Core Areas of other NSO pairs (Wagner and Anthony 1998; Dugger et al. 2005; Zabel et al. 2003; Bingham and Noon 1997).

Provincial Home Range is defined by a circle located around an NSO activity center and represents the area NSOs 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 2894 acres) (Thomas et al. 1990; Courtney et al. 2004). The home ranges of several NSO 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 NSO life functions depending on where the treatment would occur in relation to known NSO nest sites.

NSO Critical Habitat

Critical habitat for the NSO was designated in 1992 in *Federal Register* 57, and includes the primary constituent elements that support nesting, roosting, foraging, and dispersal. Designated critical habitat also includes forest land that is currently unsuitable, but has the capability of becoming NRF habitat in the future (USFWS 1992). Critical habitat was revised for the northern spotted owl and the final designation was published by the USFWS in the *Federal Register* and signed on August 12, 2008 (USFWS 2008) and became effective on September 12, 2008. The 2008 USFWS's Critical Habitat delineations were challenged in court, the 2008 Designation of Critical Habitat for the Northern Spotted Owl was remanded, and the USFWS was ordered to revise the CHU designation. On March 8, 2012, the Service released the *Revised Critical Habitat for the Northern Spotted Owl; Proposed Rule* (77 Federal Register 46:14062-14165). The final CHU Rule was published in the Federal Register on December 4, 2012 **(**77 Federal Register 233:71876-72068) and became effective January 3, 2013.

No proposed treatment units are located in 2012 designated critical habitat for the NSO.

NSO Habitat

Within the Wildlife Analysis Area, wildlife habitat was typed into habitat categories pertinent to the NSO. These habitat types are used throughout this document to describe and quantify habitat conditions across the landscape. These habitat categories are:

- Nesting, Roosting and Foraging habitat (NRF);
- Dispersal-only habitat;
- Capable habitat; and
- Non-habitat

The NSO habitat values for BLM-administered lands within the Wildlife Analysis Area were derived from two sources: 1) a Medford District maintained GIS data layer representing NSO habitat values across BLM-

administered lands; and 2) field visits conducted in 2013 by BLM wildlife biologists. Habitat values for non-Federal lands within the watershed were not available at the time of this analysis.

Table 3 18. NSO Habitat Type by Federal Land Ownership with the Wildlife Analysis Area

NSO Habitat Type	BLM (acres)	Bureau of Reclamation (acres)	US Forest Service (acres)	Total Acres Federal Lands**
NRF Habitat	3,584	514	777	4,875
Dispersal Only	1,346	188	Information unavailable*	1,534
Capable Habitat	1,636	0	Information unavailable*	1,636
Non-Habitat	3,881	2,153	Information unavailable*	6,034

*Only NRF habitat information (on USFS-administered lands) is available to BLM Wildlife Biologists when conducting analysis. Values across these areas total 1,886 acres, and are not reflected in any Total Acres values in this table.

Table 3-19. NSO Habitat on BLM-Administered Lands in the Howard Wildlife Analysis Area

Habitat Type	Description	Areas (Acres)
NRF (Suitable)	Meets all NSO life requirements. Stands are generally older than 80 years, have a high canopy cover (greater than 60%), high diversity of different diameters of trees, high basal area (greater than 240 ft2/acres), high incidence of large live trees with various deformities, large snags and large accumulations of fallen trees and other woody debris on the ground and sufficient open space below the canopy for NSOs to fly, 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 NSOs in the understory. Also functions as Dispersal habitat.	3,584 (34%)
Dispersal-Only Habitat	Not suitable for NSO nesting/roosting/foraging, but has sufficient patchy cover to be used for travel between suitable stands, a minimum 40% canopy cover, and an average tree diameter greater than 11 inches with flying space for NSOs in the understory. (Dispersal-only habitat is used throughout this document to refer to habitat that does not meet the criteria of NRF habitat, but has adequate cover to facilitate movement between blocks of suitable NRF habitat.)	1,346 (13%)
Capable Habitat	Forest that is currently not NSO habit, but can become NRF or dispersal in the future as trees mature and canopy fills in.	1,636 (16%)
Non-Habitat	Lands that do not provide habitat for NSOs and would not develop into NRF or dispersal in the future (open prairies, meadows, shrub lands, etc.).	3,881 (37%)
	TOTAL	10,447

Not all lands in the Wildlife Analysis Area are capable of becoming NRF habitat due to the natural limitations of some soil types, natural landscape variations (e.g. meadows, waterbodies), and agricultural and rural development.

In the Wildlife Analysis Area for the Howard Forest Management Project, there are approximately 11,905 acres of privately-held lands. When privately-held land is added to all Federally-administered lands (15,965), the acres within the Wildlife Analysis Area total approximately 27, 870.

RA-32

Highly suitable habitat, or Recovery Action 32 habitat (RA-32), is a sub-set of NRF habitat. Under the NSO Revised 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 (USFWS 2011).

These forests are characterized as having large diameter trees, high levels of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags and large coarse wood. Stands proposed for harvest in the Howard Forest Management Project 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, 121 acres were determined to meet RA-32 stand conditions. No treatment will occur in these 121 acres, as these areas were dropped from consideration in the Proposed Action (see Chapter 2: *Actions and Alternatives Considered but Eliminated from Detailed Analysis*).

NSO Prey Base

Northern flying squirrels are a major source of NSO prey in southwest Oregon (Forsman et al. 2004). Flying squirrel densities are correlated with high cavity density, large amounts of hypogeous fungi, and crown class differentiation (Carey et al. 1999; Carey 2000).

Woodrats, another prey species for NSO 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 this major prey species in southwest Oregon. Woodrats build stick nests, sometimes incorporating logs as part of the structure.

The Southern Oregon Cascades Study collected and identified regurgitated pellets found near NSO nests between 2000-2010. The samples consisted primarily of northern flying squirrels, woodrat species, and hares and rabbits (Dugger et al. 2012).

Pacific Fisher (Federal Candidate Species)

The Pacific fisher (*Martes pennanti*) was petitioned for listing as Endangered or Threatened under the Endangered Species Act on December 12, 2000. In 2003, the USFWS released their notice of 90-day Petition Finding and Initiation of Status Review (68 Federal Register, No. 132, 41169-41174) (USFWS 2003), and in 2004 published their Notice of 12-Month Petition Finding, concluding that listing Pacific fishers as Threatened was warranted, but was precluded by higher priority listing actions (Federal Register 69(68): 18769-18792) (USFWS 2004). The species remains a USFWS candidate species (Federal Register 71(176) 53777) (USFWS 2006). In their 2006 update on the status of the Pacific fisher, the USFWS defined the reasons for listing as:

> Major threats that fragment or remove key elements of Pacific fisher habitat include various forest vegetation management practices such as timber harvest and fuels reduction treatments. Other potential major threats include: Stand-replacing fire, Sudden Oak Death, (*Phytophthora*), urban and rural development, recreation development, and highways. (USFWS 2006)

The USFWS also states that the three remaining Pacific fisher populations “appear to be stable or not rapidly declining based on recent survey and monitoring efforts” (Id.) An interagency team of Federal agency and State biologists from British Columbia, Washington, Oregon, and California completed a draft Conservation Strategy (September 2011), which is currently being reviewed by Regional Supervisors. Pacific fishers remain a BLM Bureau Sensitive Species.

Pacific fishers (a mammal in the weasel family) are found in forested 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 fallen 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 Pacific fishers as the vegetative and structural complexity that lead to abundant prey populations and potential den sites (Lofroth et al. 2010). Pacific 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 Pacific 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. Pacific fishers also use snags, mistletoe brooms, rodent nests, logs, and cull piles for rest sites (Lofroth et al. 2010).

Currently, there are two documented populations of Pacific fisher in southwest Oregon: 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). 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 evidence collected from Pacific fishers in the southern Oregon Cascades found that these individuals were genetically related to the Pacific fisher population in the Siskiyou Mountains. This evidence shows that Pacific fishers are able to cross I-5 (Stephens 2013). Genetic samples from a location near Hyatt Lake confirm the presence of both populations at the same location. Interbreeding has not been confirmed, but is likely to occur.

Pacific 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 km2) during breeding season to 15,300 acres (62 km^2) during the nonbreeding season (Aubry and Raley 2006). Other Pacific fisher research studies on the west coast have shown that Pacific fisher mean home range sizes 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.

Based on the NSO habitat analysis, approximately 4,875 acres of suitable Pacific fisher denning and resting habitat exist on Federally-administered lands (3,584 acres on BLM-administered lands) within the Wildlife Analysis Area. Of the total acres within the home range Analysis Area for a female Pacific fisher, approximately 34% serves as resting and denning habitat (on Federal ownership lands). However, all of these acres may not provide optimal Pacific 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 Pacific 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.

Pacific fisher surveys using baited camera stations and hair snares have been conducted in portions of the Howard Analysis Area. Pacific fishers were detected at camera stations in the Analysis Area. These detections establish that Pacific fisher occur within the Wildlife Analysis Area. Habitat is present within this area that possesses the structure (e.g. large hollow snags and downed logs) necessary for fisher den sites. No den sites have been documented in the area, but no practical survey methods exist for den site location. It is likely that habitat across the Wildlife Analysis Area is used for all stages of Pacific fishers' life history (i.e. foraging, resting, dispersing, reproduction).

Powell and Zielinski (1994) and Zielinski et al. (2004) suggest that habitat suitable for denning and resting sites may be more limiting for Pacific fishers than foraging habitat. The NRF habitat type described above for the NSO also adequately describes suitable Pacific fisher denning and resting habitat because there is a direct correlation of key habitat features used to assess NSO habitat and Pacific 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 Pacific 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*).

d. Survey and Manage Species

Great Gray Owl

The great gray owl (*Strix nebulosa*) is a NWFP Survey and Manage species. Great gray owls nest in open forests adjacent to meadows. Broken-top trees, abandoned raptor nests, mistletoe clumps, and other platforms provide suitable nest structures (USDA and USDI 2004). Suitable nesting habitat is defined in the *Survey Protocol for the Great Gray Owl* as large-diameter trees with roosting cover within 200 meters of suitable foraging habitat (USDI and USDA 2004). Foraging habitat is described as relatively open, grassy habitats, such as bogs, natural meadows, open forests and recent selective/regeneration harvest areas (USDA USDI 2004). Large amounts of habitat suitable for great gray owl reproduction exist in and around the Howard Project Area.

The forested stands present within the Analysis Area are of mixed suitability as habitat for great gray owls. Some stands are dense, making it difficult for great gray owls to navigate through the stands while hunting prey. Other stands offer habitat components more typically utilized by great gray owls (e.g. broken-topped trees, grass and forb communicates to support prey species). Large trees near meadow systems are preferred by this species for nest sites.

Protocol surveys are ongoing for great gray owls in the Howard Project Area; five reproductive sites have been located in surveys conducted thus far. All located reproductive sites will be protected with a 0.25 mile (or equivalent area polygon) no-treatment buffer. Two new nests were located in 2012 and 2013 and will be protected by a 100-acre buffer.

Mollusks

The primary habitat attributes mollusk species are associated with are talus deposits or rocky areas with herbaceous vegetation, rock outcroppings, riparian areas and perennial water sources. Large down logs, talus deposits, sloughed-off material at the base of snags and large accumulations of deciduous leaf material are commonly used as refugia by these species during the dry season.

Potential habitat exists throughout the Wildlife Analysis Area for four Survey and Manage mollusk species: Oregon shoulderband (*Helminthoglypta hertleini)*, traveling sideband (*Monadenia fidelis celeuthia*), Chase sideband (*Monadenia chaceana),* and Siskiyou Hesperian (*Vespericola sierranus*).

Oregon shoulderband utilizes down woody debris and rocky areas (including talus deposits and outcrops), which contain stable interstitial spaces large enough for snails to enter. Previous Medford District detections were found in rocky areas associated with damp grassy areas, oak woodlands, and shrub lands, or in conifer forests closely associated with these habitat types.

Traveling sideband is generally associated with deciduous, mixed, or coniferous forests, but can also be found in open woods and grassy places, such as white oak (*Quercus garryana*) woodlands.

Chase sideband is associated with rocky areas, talus deposits, associated riparian areas, and coarse woody material.

Siskiyou Hesperian 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.

Protocol surveys for terrestrial mollusks have been conducted in the Project Area. Voucher specimens collected during surveys have been identified. Of the four target species listed above, Chase sideband was the only species located. This known site is outside of any proposed treatment areas.

Potential habitat that occurs within treated units will remain suitable after treatments due to retention of forest canopy and woody debris.

e. BLM Bureau Sensitive Species

Bureau Special Status Species (SSS) are species listed or proposed for listing under the ESA, or 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. 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 Sensitive species were considered and evaluated for this project, and only those that could be impacted by the Proposed Action are discussed in more detail.

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. Although the nearest documented location for this species is located 10 miles south of the Project Area, habitat does exist in the Wildlife Analysis Area, and therefore, the Johnson's hairstreak will be included in this analysis.

Siskiyou Short-horned Grasshopper

This species is often associated with meadow ecosystems within the Wildlife Analysis Area, and specifically, 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. This species has been documented within the Wildlife Analysis Area.

Western Bumblebee

This species is a meadow-associated species. Until recently, this species was common across much of the western United States. 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. There have been sightings of this species near the Lily Glen equestrian campground, within the Wildlife Analysis Area.

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 Bald Eagle Management Guidelines (USFWS 2007) 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.

Bald eagles are known to nest in the Wildlife Analysis Area, with at least four known nest sites around Howard Prairie Reservoir, located in large ponderosa pines. Nest sites are protected and no trees will be removed in bald eagle management areas.

Mardon Skipper Butterfly

The Mardon skipper butterfly is a Bureau Sensitive Species and is also listed as a Federal Candidate species under the U.S. Endangered Species Act. These open-meadow obligates are known from four geographic areas: (1) southern Puget Sound, (2) the Mt. Adams area and the Wenatchee National Forest in southern Washington, (3) the Cascade mountains in southern Oregon, and (4) Del Norte County, California.

All sites in southern Oregon are within an area that is approximately 144 miles², with the southern border at Hobart Peak in the Cascade Siskiyou National Monument. All of the sites are small (less than 0.5 to 10 acres), high-elevation (4,500 to 5,100 feet) grasslands within mixed conifer forests that are associated with an ephemeral or permanent water source (Beyer and Black 2007).

The Xerces Society has completed surveys (beginning in 2004) of the Cascade Mountains in southwestern Oregon. At present, 21 confirmed current and historic sites in 13 complexes are known from Forest Service and BLM-administered lands in the Cascade Mountains in southwestern Oregon. Of these 21 sites on public lands, 17 were found to have extant populations of Mardon skippers in surveys from 2009 to 2012. There are four documented mardon skipper sites in the Wildlife Analysis Area.

Bats

The two Bureau Sensitive bat species (pallid and fringed myotis) utilize manmade structures, snags and rock outcroppings for roosting and hibernacula sites.

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 Analysis Area, but are likely to 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, and in crevices and cavities in large trees. No fringed myotis bats have been documented in the Wildlife Analysis Area.

f. Other Wildlife Species of Concern

Land Birds (Neotropical Migrants)

All neotropical migrants go to Central or South America each year. They are addressed here due to widespread concern regarding downward population trends and habitat declines. The BLM has interim guidance for meeting Federal responsibilities under the Migratory Bird Treaty Act and Executive Order 13186 (EO). Both the Act and the EO promote the conservation of migratory bird populations. The interim guidance was transmitted through Instruction Memorandum No. 2008-050 (USDI 2008b). The Instruction Memorandum relies on two lists prepared by the U.S. 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). The following table displays those species that are known or likely to be present in the Wildlife Analysis Area.

Table 3-21. Bird Species of Conservation Concern and Game Birds Below Desired Condition Known or Likely to be Present in the Wildlife Analysis Area

Species	Status
Band-tailed Pigeon (*Patagioenas fasciata*)	GBBDC
Flammulated owl (*Otus flammeolus*)	BCC
Mourning Dove (*Zenaida macroura*)	GBBDC
Olive-sided Flycatcher (*Contopus cooperi*)	BCC
Rufous Hummingbird (*Selasphorus rufus*)	BCC
Purple finch (*Carpodacus purpureus*)	BCC

BCC – Birds of Conservation Concern (USFWS 2008b)
GBBDC – Game Birds Below Desired Condition

Land birds use a wide variety of habitats, including late-successional forests, riparian areas, brush in recovering clearcuts, and small trees in developing stands. Some birds, such as the olive-sided flycatcher, use residual canopy trees for perching, and forage over adjacent clearcuts. Many land birds are associated with deciduous shrubs and trees in early successional habitats (e.g., orange crowned warblers and Rufous hummingbirds). Some of the recovering clearcuts and pine savannahs in the Wildlife Analysis Area with lower tree and shrub heights would provide these optimal foraging conditions.

Resident birds remain in the same general area or migrate to lower elevations in the winter. Total numbers of late-successional dependent migratory or resident birds within the Howard Forest Management Project Area are unknown. However, knowledge of specific numbers is not necessary to assess effects of land management activities on migratory or resident birds. 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.

Golden Eagles

There are no known golden eagle nest sites in the Wildlife Analysis Area, but they are regularly observed east of Moon Prairie. In Oregon, golden eagles range in a wide variety of habitats. The preferred foraging habitats are generally open areas with a shrub component that provides food and cover for prey (primarily black tailed jackrabbit). Nests are typically large (3-10 feet tall and 3 feet wide), and often built in large live ponderosa pines or on ledges along rims and cliffs (Marshall et al. 2003).

2. Environmental Effects

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 effects to wildlife species because they reflect the modification to and the resulting functionality of the residual stand after treatment. Each wildlife species will 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.

a. Alternative 1—No Action Alternative

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 species compositions than that of late-successional stands (Sensenig 2002). At the very least, they would require a much longer time scale to develop into more complex, late-successional habitat (Tappeiner et al. 1997). Habitat conditions would remain generally unchanged in the short-term, unless a major disturbance such as fire, wind, insects, or disease occurs, with minimal effects to wildlife species as a result.

b. Alternative 2—Proposed Action

All of the prescriptions included under the Howard Forest Management Project were designed to achieve the following objectives:

- To increase resistance/resilience of forest stands and landscape to wildfire, drought, insects, etc. by reducing stand densities, ladder fuels, and shifting tree species composition. Emphasis toward reducing white fir densities.
- To accelerate development of structural complexity such as larger tree structures and decadence. Develop spatial heterogeneity within stands (e. g. fine-scale structural mosaic).
- To create conditions favorable for the initiation, creation, and retention of snags, down wood, large vigorous hardwoods, and understory vegetation diversity.
- To improve survivability of large and/or older trees to provide a unique habitat for wildlife and maintain the role of these components in the mixed conifer forest. Emphasis toward protecting drought-tolerant and fire-resilient species, like ponderosa pine.

NSO Habitat

Proposed actions that may affect NSOs to some degree (Likely to Adversely Affect or Not Likely to Adversely Affect), 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 BLM's *Biological Assessment for The Lower Grave, Howard and Mining Projects* (Grave_Howard_Mining FY13 Formal BA, USDI 2013). In their Biological Opinion (FWS Reference Number 01EOFW00-2013-F-0137), the USFWS determined that the proposed activities "may affect, but are Not Likely to Adversely Affect spotted owls" (USFWS 2013, p. 57).

With implementation of Alternative 2, approximately 244 acres of NRF habitat would be thinned, but would still function as NRF habitat because higher canopy cover and key habitat features would be retained. Even though treatments would occur in NRF habitat, the effects would be minimal because they would be short-term in nature, activities would be distributed spatially across the Wildlife Analysis Area, and seasonal restrictions incorporated as PDFs would avoid adverse disturbance to nesting NSOs within the Wildlife Analysis Area.

Alternative 2 would treat and maintain 394 acres of Dispersal-only habitat. These treatments would reduce the canopy cover within the stand, but would continue to function as NSO Dispersal-only habitat. Even though treatments would occur in Dispersal habitat, the effects would be minimal because they would be short-term in nature, activities would be distributed spatially across the Wildlife Analysis Area, and seasonal restrictions incorporated as PDFs would avoid adverse disturbance to nesting NSOs within the Wildlife Analysis Area.

The long-term (>10 year) effects of Alternative 2 are anticipated to increase the health and vigor of the residual stands, post-treatment. It is likely that the treated stands will develop into more complex, structurally diverse forests in the long-term when compared 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 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.

NSO Areas of Use

No harvest treatments are proposed in the Nest Patch of any NSO sites.

Under Alternative 2, within NSO cores, there are approximately 20 acres of proposed treat and maintain of NRF habitat and approximately 120 acres of proposed treat and maintain of Dispersal-only habitat in one historic NSO Core Area within the Wildlife Analysis Area.

This analysis considered new information presented in the 2011 Revised Recovery Plan for the Northern Spotted Owl (USFWS 2011). Specifically, the Revised Recovery Plan identified barred owls as one of the primary threats to the recovery of the spotted owl. Barred owls reportedly have reduced spotted owl site occupancy, reproduction, and survival (USFWS 2011). There is a perceived threat because barred owls use habitats typical of spotted owl habitat. They may be able to coexist through habitat segregation; however, whether this would occur is unclear (Courtney et al. 2004). Barred owls may be more of a habitat generalist and occupy a wider diversity of habitat types than spotted owls. Displacement of spotted owls by barred owls may be occurring, but the rate and extent of this are unknown; further, whether this effect is exacerbated by other confounding issues is uncertain (Courtney et al. 2004). One historic nest site located within the Analysis Area was occupied by a pair of barred owls in 2013.

The cause of the barred owl invasion is not clear and the BLM has no control over barred owls or their encroachment into NSO habitat. To what extent the barred owl range expansion is a result of humans altering the environment is unknown (Monahan and Hijmans 2007; Livezey et al. 2008). Currently, it is unclear whether forest management influences the outcome of interactions between barred and spotted owls (Courtney et al. 2004). The barred owl issue is being addressed at the range level by the Regional Barred Owl Working Group through research efforts, management strategies, and protocol revisions. However, at the local level, the Howard Forest Management Project meets Recovery Action 32, which is intended to not further exacerbate competitive interactions between spotted owls and barred, by retaining older and more complex multi-layered conifer forests. Additionally, all suitable NSO habitat would be maintained with implementation of the Proposed Action.

The Proposed Action would not incrementally affect the stability of the NSO population in southwestern Oregon because there would be no net loss of habitat due to treat and maintain prescriptions in NSO Core Areas in the Wildlife Analysis Area, and there is substantial in-growth of habitat. Newly identified threats (i.e. barred owl presence) are independent of the Proposed Action.

NSO Prey

Timber harvest and associated activity fuels reduction projects could impact foraging by changing habitat conditions for NSO prey. Some disturbance of habitat can improve forage conditions, provided some ground cover is retained or created. Removal of tree canopy would bring more light and resources into the stand, stimulating forbs, shrubs and other prey food. Once the initial impact of disturbance recovers (6 months to 2 years), the understory habitat conditions for prey forage would improve over the years, until shrubs and residual trees again close in the forest floor.

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 cavity density, large amounts of hypogeous fungi, and crown-class differentiation (Carey et al. 1999; Carey 2000).

Treatments associated with Alternative 2 that will maintain NSO habitat may have short-term impacts to foraging by changing habitat for spotted owl prey species (USFWS 2006). Residual trees, snags, and down wood retained in the thinned stands would provide some cover for prey species over time, and would help minimize harvest impacts to some prey species, such as woodrats and flying squirrels. Treatment implementation would be spread out spatially within the Wildlife Analysis Area, which would provide areas for NSO foraging during project implementation and reduce the impact of these short-term effects within the Project Area.

Bingham and Noon (1997) reported that a NSO Core Area (closest to the nest) is the area that provides the important habitat elements of nest sites, roost sites, and access to prey, benefiting NSO survival and reproduction. Rosenberg and McKelvey (1999) reported that NSOs 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 with implementation of Alternative 2 would be assessed by the amount of habitat treated within the Core Area. Due to the spatial distribution of the proposed treatments, adequate and sufficient prey habitat would remain within the Core Areas and would continue to provide suitable foraging opportunities within the home range. Therefore, effects to prey species are most critical at the Nest Patch and Core Areas. Within the Howard Project, there would be no treatment within Nest Patches, and all treatment within Core Areas would be treat and maintain.

Implementation of PDFs that would retain and/or place large down wood while also retaining snags in the treatment units will provide cover for prey species, and will help minimize harvest impacts to prey habitat. Therefore, the Proposed Action would have minimal short-term negative effects on NSO prey species, and a long-term positive effect. An adequate amount of NSO prey species would be available post-harvest in the Wildlife Analysis Area.

Noise Disturbance and NSOs

Mandatory PDFs are incorporated into Proposed Action activities. Nesting NSOs 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. Because the Howard Forest Management Project would implement PDFs that restrict activities to outside of the breeding season and beyond recommended disturbance distance thresholds, as established by the US Fish and Wildlife Service, no harm to nesting NSOs, or their young, is expected from Project-related noise or activities.

Fuels Reduction Treatments and NSOs

Alternative 2 proposes to treat slash created from harvest treatments. The handpiling and burning, as described in Chapter 2, would not alter the overstory forest structure or remove additional key habitat components related to NSO habitat. Within proposed Project units, these treatments reduce understory density and improve flight paths within stands, in turn increasing the accessibility for NSO to the forest floor and prey abundance or availability (Sakai and Noon 1993 and 1997).

Large down woody debris and some unburned slash piles would continue to provide ground cover habitat during and after treatments. These untreated areas and residual habitat features, along with the temporal staggering of treatments across the landscape, should minimize 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.

Fuels treatments do have the potential to impact the NSO prey base because some snags or coarse woody debris habitat that prey species utilize can be consumed during burning operations. However, these effects are expected to be limited and localized because not all the existing snags or CWM within a unit is lost during firing operations and every reasonable precaution is taken to prevent loss of wildlife habitat (Mason 2012). Activity-generated down woody material will be treated through pile burning; however, 10% of these piles will be retained for wildlife. Prey species such as woodrats utilize unburned piles for cover and nesting. In addition, while some prey species may be adversely affected from fuels treatments, a proportion of the prey are primarily arboreal in habit, and would remain largely unaffected by these treatments.

Road Maintenance, Construction, and Decommissioning and NSOs

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 process when designing a new road. The fact that there is an array of possible negative effects associated from building roads is well-documented. Roads affect movement patters, demographics, and spatial distribution of local species. They can adversely affect wildlife by fragmenting habitats, creating population sinks, and acting as conduits for the spread of invasive species (Forman et al. 2003; Fahrig and Rytwinski 2009; Taylor and Goldingay 2010).

In addition to habitat removal, there are a number of ways roads affect wildlife, including vehicular noise disturbance (which affects behavior patterns), increased potential for poaching, increased potential for over-hunting along roads due to easy access, habitat fragmentation, and microclimatic changes to the habitat adjacent to roads.

From a terrestrial wildlife standpoint, BLM Specialists have incorporated PDFs to limit some of the described negative effects. These PDFs include (but are not limited to) wildlife surveys, seasonal restrictions, the placement of temporary roads to miss large trees, and retention of snags and large woody material..

Road maintenance has the potential to impact NSOs through noise and displacement, but would be of short duration and subject to wildlife seasonal PDFs. Therefore, minimal negative direct and/or indirect effects to NSOs are anticipated as a result of road maintenance activities included in the Proposed Action.

Approximately 0.46 miles of temporary road would be constructed under Alternative 2. The majority of temporary road construction would be located in dispersal habitat. Any temporary roads in NRF habitat will be located in existing openings. Roads would be decommissioned after use. Seasonal restrictions incorporated as PDFs would avoid adverse disturbance to adjacent nesting NSOs during road construction. Additionally, all temporary roads would be built and decommissioned after use during the same dry season. Because the Project incorporates mandatory PDFs that restrict activities outside of the breeding season and beyond recommended disturbance distance thresholds, as established by the US Fish and Wildlife Service, no direct and/or indirect negative effects to nesting NSOs, or their young, is expected from proposed temporary road construction.

Approximately 1.87 miles of roads are proposed for decommissioning under Alternative 2. Reducing road densities benefits multiple wildlife species through the reduction of habitat fragmentation. Decommissioning these roads would contribute to the reduction of habitat fragmentation (i.e. beneficial direct effect) within the Wildlife Analysis Area. There would be no negative direct and/or indirect effects to NSOs as a result of implementing proposed road decommissioning.

NSO Critical Habitat

Alternative 2 is located outside of any critical habitat; therefore, there would be no effect to critical spotted owl habitat.

NSO Cumulative Effects

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). It is anticipated there would be some loss of NSO habitat on private lands, but the rate of loss, or the specific location of harvest cannot be predicted.

The Swinning Timber Sale occurred on BLM-administered lands within the Wildlife Analysis Area, with harvest operations completed in 2013, and was taken into consideration when determining the existing condition for the Affected Environment within the Wildlife Analysis Area. Swinning treatment units were located outside of any NSO home range circles. Several units are adjacent to proposed Howard Project treatment areas. Of the 467 acres treated under Swinning, 179 acres were a downgrade of NRF (to Dispersal), 90 acres of NRF habitat was maintained, and 198 acres of Dispersal habitat was maintained.

The Howard Prairie Fuels Reduction Project is ongoing within the Wildlife Analysis Area, with work slated to occur in the Spring and Fall of 2014. All treatments were designed to be treat and maintain prescriptions, and therefore, there would be no cumulative effects to NSO.

All other identified projects described in Chapter 3 as Recent, Ongoing, or Reasonably Foreseeable are located outside the Wildlife Analysis Area, or are not considered to have an effect on NSO (i.e. cattle grazing). Therefore, there would be no cumulative effect to NSO with the implementation of the Proposed Action, and these activities will not be further discussed in this NSO cumulative effects discussion.

When combined with the recent and ongoing projects within the Wildlife Analysis Area, the proposed treat and maintain treatments proposed in the Howard Forest Management Project would not preclude NSO. Existing total acres of NRF and Dispersal habitat within the Wildlife Analysis Area scale would not decrease. These areas would continue to provide suitable NSO NRF habitat, would provide habitat for late-successional forest habitat-dependent species, and would help maintain future connectivity throughout the Wildlife Analysis Area. As a result, the Howard Forest Management Project would have minimal negative direct, indirect or cumulative effects on the NSO.

NSO Summation

The long-term (>10 year) effects of the proposed action are anticipated to increase the health and vigor of the residual stands, post-treatment, and would likely result in more structurally complex and structurally diverse forest stands. 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 quality 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 area.

When combined with the effects of recent and ongoing projects within the Wildlife Analysis Area, the proposed treat and maintain prescriptions proposed in the Howard Project would not preclude NSOs or other late-successional species. Existing amounts of NRF and dispersal habitat within the Wildlife Analysis Area would not be decreased. These areas would continue to provide suitable spotted owl NRF habitat, provide habitat for late-successional forest habitat-dependent species, and would help maintain future connectivity throughout the Wildlife Analysis Area. As a result, the Howard Forest Management Project would have minimal negative direct, indirect, or cumulative effects on the NSO.

Pacific Fisher

Little research has been conducted on the effects forestry practices have on Pacific fishers. As previously mentioned, the best tool available for determining suitable Pacific fisher habitat, while not implying a level of fitness, is to use NSO habitat models. NSO NRF habitat contains similar decadent attributes or structural elements that Pacific fisher use for denning and rest sites. The proposed treatments in Alternative 2 would treat and maintain 244 acres out of 4,875 acres of NRF habitat located on Federally-administered lands in the Wildlife Analysis. The proposed treatments would retain 60% canopy cover and key habitat features (large overstory trees, snags, hardwoods, and CWD) essential for the lifecycle of the Pacific fishers. These units would still meet Pacific fisher habitat needs for resting and foraging, and Pacific fishers would still be expected to use these stands. No habitat would be downgraded.

Additionally, no treatments are proposed that would reduce the existing canopy below 60% canopy cover in suitable denning and resting habitat (NRF habitat). The commercial treatments and fuels treatments proposed in Alternative 2 would have short-term minimal negative effects to habitat for some Pacific fisher prey species due to the reduced vegetation. These effects are relatively short-term, as understory vegetation typically returns within 5 years and some Pacific fisher prey species take advantage of early seral stages.

Disturbance from treatment activities would likely be the principal effect to Pacific fisher within the Wildlife Analysis Area. However, Pacific fishers are highly mobile, and with large home ranges, they would likely move to another part of their home range while the activity is ongoing, which would result in a minimal short-term impact. Disturbance from project activities would be temporally and geographically limited and would occupy a geographic area smaller than the average Pacific fisher home range. Telemetry studies have determined that fishers are wide-ranging animals (Zielinski et al. 2004). Seasonal restrictions incorporated as PDFs for other resources would benefit Pacific fishers by restricting Project activities until young are approximately six weeks old, approximately the age when Pacific fisher move young from natal dens and become more mobile. Because Pacific fishers have large home ranges they would be able to move away from the action area while the disturbance is occurring. Additionally, ongoing radio telemetry work in the

nearby Ashland watershed has shown that Pacific fishers are quick to respond to environmental changes (e.g. heavy snowfall) by moving to other parts of their home ranges (Clayton 2012a).

As indicated in the Affected Environment, surveys have detected Pacific fishers within the Wildlife Analysis Area. No surveys to locate denning sites have been conducted, and no incidental denning sites are known. Because denning sites are difficult to locate without conducting telemetry studies, the Project has incorporated PDFs that would minimize impacts to Pacific fishers and their habitat, which would not result in a need to further list this species (in the short-term), and would provide habitat for species recovery (in the long-term). These include the retention of key structural elements such as trees exhibiting old-growth characteristics, decadent trees, trees with mistletoe brooms, snags, CWD, and large hardwoods for denning. Also, treatments proposed under Alternative 2 are expected to increase areas of structural complexity within stands that have remained homogenous from previous treatments. Five percent of NRF habitat acres within the Wildlife Analysis Area are proposed for treatment; areas such as Riparian Reserves, NSO RA-32 habitat, 100-acre KSOAC owl cores, NSO Nest Patches, and other reserves will continue to provide undisturbed habitat for Pacific fishers in that Wildlife Analysis Area. Additionally, the USFS-administered LSR located to the north of the Wildlife Analysis Area would continue to provide habitat for Pacific fishers.

Alternative 2 would not further contribute to the need to Federally-list the Pacific fisher as Threatened or Endangered because suitable habitat would not be removed. Even when combined with recent projects located in the Wildlife Analysis Area, the Proposed Action would not preclude Pacific fishers from dispersing through or reproducing within the Upper Jenny Creek Watershed. The Proposed Action would not affect persistence of Pacific fishers within the Upper Jenny Creek Watershed due to relatively small amount of habitat.

Pacific Fisher Summary

NSO NRF habitat contains similar decadent attributes or structural elements that Pacific fisher use for denning and rest sites within the Wildlife Analysis Area, and therefore, was used as a surrogate for Pacific fisher habitat. The proposed treatments in Alternative 2 would treat and maintain 244 acres of 4,875 total acres of Federally-administered NRF habitat in the Wildlife Analysis Area.

The commercial treatments under Alternative 2 would have short-term negative effects to habitat for some Pacific fisher prey species due to the reduced vegetation. These effects are relatively short-term, as understory vegetation typically returns within 5 years and some Pacific fisher prey species take advantage of early seral stages. The immediate effects to Pacific fisher foraging opportunities would be minimal, because the large amount of untreated areas within the Wildlife Analysis Area would continue to provide hunting habitat. Additionally, treatments would retain key habitat characteristics such as large snags, trees with mistletoe brooms, and coarse woody debris (CWD) to provide existing and future habitat for Pacific fishers.

Alternative 2 incorporates PDFs that would minimize impacts to Pacific fishers. These include the retention of key structural elements such as trees exhibiting old-growth characteristics and decadent trees, snags, CWD, and large hardwoods for denning. Also, treatments proposed under Alternative 2 are expected to increase areas of structural complexity within stands that have remained homogenous from previous treatments. Five percent of Federally-administered NRF habitat acres in the Wildlife Analysis Area are proposed for treatments; areas such as Riparian Reserves, NSO RA-32 habitat, 100-acre KSOAC owl cores, NSO Nest Patches, and other reserves (including the USFS-administered LSR to the north of the Wildlife Analysis Area) will continue to provide undisturbed habitat for Pacific fishers.

Alternative 2 would not contribute to the need to Federally-list the Pacific fisher as Threatened or Endangered because suitable habitat would not be removed. Even when combined with recent or ongoing projects located in the Wildlife Analysis Area, the Proposed Action would not preclude fishers from dispersing through or reproducing within the Upper Jenny Creek Watershed, and would result in no dire

Survey and Manage Species

Great Gray Owls

There are approximately 4,875 acres of suitable habitat for great gray owls (GGOs) on Federally-administered lands within the Howard Wildlife Analysis Area. BLM surveys are ongoing for GGOs in the Project Area. There are five recorded historic nest site locations for GGOs within the Howard Project Area.

Alternative 2 proposes treatment in five units adjacent to GGO core sites. The prescriptions for these units are treat and maintain, and will benefit these stands in the long-term by increasing growth rates of the residual stand, and accelerating the development of late-successional structural complexity within the treated areas. Benefits to GGO habitat include proposed closure of roaded areas in two of the GGO core areas (T. 38 S. R. 3 E. Sections 13 and 23). Because surveys are ongoing, additional sites (if discovered) would be protected via standard protection buffers.

Implementation of the Proposed Action would result in minimal effects to great gray owls. The proposed actions would not cause this owl species to trend towards further listing. As a result, the Howard Forest Management Project would have minimal negative direct, indirect, or cumulative effects on this species.

Terrestrial Mollusks

In the short-term, thinning of the canopies could desiccate fine-scale habitats, but the canopy would eventually fill back in when shrubs and saplings re-establish on the forest floor.

Impacts from implementing treatments in proposed in Alternative 2 will not trend these species towards listing because:

- Impacts of the proposed treatments are dispersed in relation to the Wildlife Analysis Area and the proximate undisturbed habitat for species to recolonize the impacted areas;
- Very little of the key habitat attributes are found in the Project units, and riparian areas and water sources are buffered;
- Large coarse woody debris will be maintained. In some areas where it is determined to be lacking, cull material will be retained; and
- Any known locations will receive protection buffers.

As a result, the Howard Forest Management Project would have minimal negative direct, indirect, or cumulative effects on this species.

Bureau Sensitive Species

Bald Eagles

Bald eagles may be impacted by removal of large overstory trees favored for perches and nest sites, and through disturbance due to increased activity in the area. These impacts will be minimized through implementation of PDFs (see Chapter 2).

As a result, the Howard Forest Management Project would have minimal negative direct, indirect, or cumulative effects on this species.

Bats

The two Bureau Sensitive bat species (pallid and fringed myotis) utilize manmade structures, snags and rock outcroppings for roosting and hibernacula sites. No surveys have been conducted for these species and very few have been documented in the Project Area. Even though the proposed action may potentially adversely disrupt local bat populations in the short-term, 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 Project Area. PDFs and marking guidelines requiring the retention of snags and decadent wildlife trees would continue to provide roosting habitat, which would also help to minimize potential effects for other sensitive bat species

dependent on these roosting structures. No-treatment areas, such as Riparian Reserves, 100-acre spotted owl KSOAC cores, NSO Nest Patches and other reserves would continue to provide undisturbed habitat for these Sensitive bat species.

The Proposed Action would not cause bat species in the Project Area to trend towards further listing. The Howard Forest Management Project would have minimal negative direct, indirect, or cumulative effects on these species.

Johnson's Hairstreak

This species is not known to occur in the Wildlife Analysis Area. This butterfly may be impacted through removal of conifer trees and the mistletoe which may host them. However, because mistletoe trees will not be targeted for removal and mistletoe will not be eradicated from the area, suitable habitat will continue to persist in the Project Area. The Howard Forest Management Project would have minimal negative direct, indirect, or cumulative effects on this species.

Other Wildlife Species of Concern

Land Birds

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 small-scale habitat modifications in relation to the Wildlife Analysis Area. Adequate undisturbed areas adjacent to the Project Area would maintain habitat for displaced individuals. Overall, populations in the region would be unaffected due to this small amount of loss that would not be measurable at the regional scale. Analyzing bird populations at this scale, as appropriate, is supported by Partners in Flight (California Partners in Flight 2002).

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 in Alternative 2 will be beneficial to these species until the forest matures into a mid- to late-successional seral stage.

Golden Eagles

There are no known golden eagle nest sites in the Wildlife Analysis Area. Due to the habitat available within the Upper Jenny Creek Watershed suitable for use by golden eagles, any impact to the species from the Howard Forest Management Project is expected to be minimal because of the retention of over 97% of all habitat types within the Wildlife Analysis Area. Most large suitable nest trees would be retained, post-treatment. There are some grasslands suitable for foraging in the area, and those would not be treated and will remain usable by golden eagles to their present extent. The most suitable foraging habitat is found in the valleys outside the Project Area.

Direct and indirect effects to golden eagles are expected to be minimal with implementation of Howard Forest Management Project Proposed Action. No cumulative effects are anticipated to this species.

Road Construction and Special Status Species

In addition to habitat removal, there are a number of ways roads affect wildlife, including vehicular noise disturbance (which affects behavior patterns), increased potential for poaching, increased potential for over-hunting along roads due to easy access, habitat fragmentation, and microclimatic changes to the habitat adjacent to roads.

Road maintenance has the potential to impact wildlife species through noise and displacement, but would be of short-duration and subject to wildlife seasonal PDFs.

Seasonal restrictions incorporated as PDFs would avoid adverse disturbance to Special Status wildlife species during temporary road construction. Roads would be built and decommissioned in the same dry season of use.

Reducing road densities via proposed road decommissioning would benefit multiple wildlife species through the reduction of habitat fragmentation. Therefore, there would be a positive effect to wildlife through the proposed decommissioning of roads within the Wildlife Analysis Area.

I. BOTANY

1. Introduction

This section discloses the impacts to Threatened, Endangered, Bureau Special Status, and Survey and Manage plants (including fungi).

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the Proposed Action:

- Degrading habitat for Threatened, Endangered, 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 activities degrades 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).

Bureau Special Status Plants, Lichens, and Fungi (SSP) include species that are listed as Threatened or Endangered under the Endangered Species Act (ESA), proposed or candidates for listing, State listed, and designated Bureau Sensitive Species. 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 (USDI 2008). Project implementation will adhere to the requirements set forth in Section 6840.2.C.

Special Status Species are officially designated by the State director. The most recent Special Status Species list was effective on December 21, 2011 (IM-OR-2012-018) (USDI 2011b). This 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 Strategic species to ascertain if a status upgrade to Sensitive or removal as a common species is warranted.

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 Howard 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*.

2. Affected Environment

The Howard Project is located near Howard Prairie Reservoir in the northern portion of the Jenny Creek fifth field watershed (HUC5). The Planning Area is 12,970 acres of BLM-administered, private and Forest Service-administered lands. The Analysis Area for Federally Threatened, Endangered, Bureau Special Status, and Survey and Manage plant species consists of the 638 acres proposed for treatments and associated roads, as described in Chapter 2; this area is also referred to in this analysis as the Project Area. The forested areas in this area consist of four Plant Association Series: Douglas-fir, ponderosa pine, white fir and white oak. For a description of landscape scale vegetation patterns, see Section B: *Silviculture*.

The Howard Forest Management Project is entirely outside the range of all Federally Threatened or Endangered plant species found on the Medford District (*Arabis macdonaldiana*, *Limnanthes floccosa* ssp. *grandiflora*, and *Lomatium cookii*).

Survey Methods and Completion

All of the proposed treatment areas have been surveyed for Bureau Special Status and Survey and Manage vascular and nonvascular (lichens and bryophytes) plants. Surveys were conducted in 2000-2001 (fungi), 2006-2008, 2012 and 2013.

Surveys are conducted using the intuitive controlled survey method. This method includes a complete survey in habitats with the highest potential for locating Special Status Species. Surveys are completed by walking routes that cover a representative cross section (approximately 80%) of all major topographic (slopes, draws, benches ridges) and special features (wet areas, rock outcrops, riparian areas, serpentine areas, etc.) 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 BSS and SM 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.

a. Vascular and Non-Vascular Plants

Botanical surveys documented no occurrences of BSS or S&M plant species within the Project Area. Because these species do not occur in or near proposed units, they will not be addressed further.

b. 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 in age). For the Category B fungal species, the deadline for completion of Strategic Surveys was the beginning of fiscal year 2011. Because 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” (REIC 2012).

New fungi surveys were not conducted, due to stands within proposed unit areas not meeting the 180-year old stand requirement to trigger surveys. Stands are evaluated for age using the standardized Microstorms data in the Forest Operations Inventory (FOI) layer in GIS. 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).

Fourteen Bureau Sensitive fungi are documented or suspected of occurring on Medford District BLM-administered lands, and of those, 13 are Survey and Manage species whose status determines that pre-disturbance surveys are impractical and not required (Category B) (Table 3-23). Oregon State Office Information Bulletin No. OR-2004-145 reaffirmed this, stating that Bureau policy (BLM Manual Section 6840) would be met by known site protection and large-scale inventory work (strategic surveys) through fiscal year 2004.

Prior to the removal of pre-disturbance survey requirements for fungi, approximately 350 acres in the Planning Area were surveyed, which included three visits during the Fall and Spring of 2000-2001 during peak sporocarp fruiting time. One S&M B/BSS Sensitive fungi species was detected during surveys, *Boletus pulcherrimus*, and occurs 0.25 miles from a proposed unit. It is located across an existing road (i.e. protected by distance from unit) and would not be impacted by Project implementation.

Table 3-23. Medford District Sensitive Fungi Species

Scientific Name	Status	ORBIC List[1]	NWFP Sites[2]	Miles to nearest site
Arcangeliella camphorata	SEN, S&M B	1	6	90
Boletus pulcherrimus	SEN, S&M B	1	23	0.2
Chamonixia caespitosa	SEN	2	3	100
Dermocybe humboldtensis	SEN, S&M B	1	4	70
Gastroboletus vividus	SEN, S&M B	1	5	43
Gymnomyces fragrans	SEN, S&M B	3	2	~25
Helvella crassitunicata	SEN, S&M B	1	29	42
Phaeocollybia californica	SEN, S&M B	3	50	54
Phaeocollybia oregonensis	SEN, S&M B	1	15	67
Pseudorhizina californica	SEN, S&M B	3	42	9
Ramaria spinulosa var. *diminutiva*	SEN, S&M B	3	1	~70
Rhizopogon chamalelotinus	SEN, S&M B	1	1	64
Rhizopogon ellipsosporus	SEN, S&M B	2	5	36
Rhizopogon exiguus	SEN, S&M B	2	3	55

Status definitions:
SEN=Bureau Sensitive Species, per designation by the BLM State Director. Managed according to direction included in BLM Manual 6840 (Section 2C).
S&M B: Survey and Manage Category B – Rare, and all known sites are managed. Pre-disturbance surveys are not practical.
[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.
[2]BLM Database: Geographic Biological Observations (GeoBOB).

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 over 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 changes 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.

Burning activity 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. 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).

3. Environmental Effects

This section discusses the direct and indirect effects of implementing each of the alternatives and the impacts the proposed actions would have on botanical resources. This section also discusses any cumulative effects considering 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 Alternative

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 result in no direct or indirect impacts to BSS or S&M vascular or nonvascular plants or fungi. There would be "no effect" to T&E, BSS, or S&M plants or fungi.

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. Under Alternative 1, overstocked forested stands would not be thinned. Trees in these stands have reduced vigor; higher mortality of suppressed trees; and higher susceptibility to insects, disease, and severe fire behavior than untreated stands. Forest structure and species diversity would continue to decline in a negative trend. Pine and hardwoods would decline and white 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.

b. Alternative 2—Proposed Action

Under Alternative 2, tree falling, tractor yarding and treatment of activity fuels would occur on 638 acres in mid-seral to mature forest.

Because there are no known occurrences of BSS or S&M vascular or non-vascular plants in the proposed treatment units, there will be **no effect** on these species. The Project Area is outside the home range of any Federally-listed T&E plant species. There will **be no effect** on these species as a result of implementing Alternative 2.

Fungi

Construction of 0.5 miles of temporary roads would impact an estimated 3 acres, or less than 0.0002% of the Analysis Area. It is expected that this small of an area would not affect fungi in the Project or Analysis Areas. Decommissioning old roads would not impact fungi, as old compacted roads do not provide suitable habitat for Special Status or S&M fungi.

Under Alternative 2, the BLM would pile and burn activity fuels on up to 638 acres. The total area potentially impacted by burn piles would be 3-5% of the units (see Soil Resources section), an area totaling 19-32 acres that would be impacted within the Project Area. There would be no effect to the known site located near the Project Area, as it is protected by distance to units where disturbance would take place.

Cumulative Effects

The BLM has no data on the presence or abundance of rare plants in the Howard Project Area prior to botanical surveys that were conducted over the past 20 years. BLM projects prior to 1995 and actions on private lands may have adversely impacted rare plants. However, this information was incorporated into the Affected Environment (i.e. current condition).

Past, present, and reasonably foreseeable future activities in the Jenny Creek watershed include forest management projects, livestock use, and recreational use.

Because the one known site of Special Status/S&M fungi is protected by distance to Project activity and Project activity will result in no effect on this site, when other Watershed activities are considered, there will be no cumulative effect on this site.

J. NOXIOUS WEEDS AND INTRODUCED PLANTS

Issues related to noxious weeds and introduced plants associated with the Howard Forest Management Project have been identified through public scoping or interdisciplinary team specialists' input. These relevant issues are:

- 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.

Noxious weeds are generally nonnative plants that cause or are likely to cause economic or environmental harm or harm to human health. Introduced plants are species that are nonnative 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 2013).

1. Affected Environment

The Howard Project is located near Howard Prairie Reservoir in the northern portion of the Jenny Creek fifth field watershed (HUC5). The Planning Area is 12,970 acres of BLM-administered, private and Forest Service-administered lands. The Analysis Area for noxious weed species and introduced plant species consists of the 638 acres proposed for treatments and associated roads, as described in Chapter 2. This area is also referred to in this analysis as the Project Area.

a. Noxious Weeds

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 re-established. The disturbed soil is also a ready seed bed if weed seeds or other plant parts are transported 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.

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).

Noxious weed populations are treated on BLM-administered lands under the authority of the *Medford District Integrated Weed Management Plan and Environmental Assessment (EA) OR-110-98-14 Tiered to*

the Northwest Area Noxious Weed Control Program EIS (December 1985) and Supplement (March 1987) (USDI 1998). 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 1998, p. 1-2). The BLM also treats all categories of weed species located within high priority sites, such as Special Status plant sites, special areas (Areas of Critical Environmental Concern [ACECs]), contiguous blocks of BLM-administered land, Riparian Reserves, 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 an effective treatment method, the BLM treats weeds by manual, chemical, mechanical or biological means.

Adjacent private lands in the Jenny Creek Watershed are known to harbor infestations 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.

The Oregon Department of Agriculture designates and classifies noxious weeds according to their detrimental effects, reproductive strategies, distribution, and difficulty of control.

All proposed treatment areas and immediately adjacent lands were surveyed for noxious weeds by qualified botanists over a time period extending from 1998 through 2013. Surveys documented no occurrences of ODA listed noxious weeds in the proposed Project Area.

b. Introduced Plants

Introduced plants are species that are nonnative to the ecosystem under consideration. Introduced plants may adversely affect the proper functioning condition of the ecosystem. Although not listed on the ODA Noxious Weed list, introduced plants pose a threat to native plant communities in portions of the Howard Analysis Area.

Introduced plants including downy brome (*Bromus tectorum*), bulbous bluegrass (*Poa bulbosa*) and common hedge-parley (*Torilis arvensis*) occur in or near some of the proposed treatment units, primarily along existing roads.

2. Environmental Effects

a. Alternative 1—No Action Alternative

Under the No Action Alternative, the BLM would not implement new management actions that would result in ground disturbance, changes in canopy cover, or potential for introduction of noxious weed populations into the Project Area. Selection of Alternative 1 would result in no direct or indirect impacts to noxious weeds. The Project Area would remain a relatively low priority for weed control, other than areas with known rare plant sites, contiguous blocks of BLM-administered land, riparian reserves or special areas. (When the BLM decides to implement a project in a specific area, it raises the priority level for treating local infestations.)

Under Alternative 1, introduced plants will continue to increase over time along and directionally away from roads and streams. Existing populations would likely increase due to natural processes, inherent competition with native vegetation and other potential disturbances.

Under Alternative 1, there would be no increase in disturbed ground and no increase in forest and woodlands with lessened canopy cover. Both are conditions that would enhance the opportunities for noxious weed and introduced species' establishment. Populations would be limited to existing sites and spread would be limited to adjacent areas. Establishment of new noxious weed and introduced plant populations would be limited to existing disturbed areas and areas of open canopy. The mode of spread would be generally attributed to wind, water, wildlife, and vehicles where roadside populations currently exist.

Noxious weed inventory and treatment would continue to occur within the Planning Area. Treatments are scheduled by priority and occur based on the potential of the noxious weed population to cause economic or environmental harm or harm to human health, and as funding is available.

The potential remains for stand replacement fires in localized areas that would result in early-seral habitat conditions that are favorable for weed and introduced species establishment.

b. Alternative 2—Proposed Action

Timber harvest and the associated road work and fuels treatments could introduce or spread noxious weeds and introduced plants within the Project Area. Management activities which disturb the soil and remove existing vegetation leave areas open for possible invasion by noxious weeds and introduced plants. Burning post-harvest slash in hand piles would also remove ground cover under the piles, leaving those areas open to occupation by these species.

Seeds or plant parts could be transported from infested areas outside the Project Area to non-infested areas within the Project Area along the approximately 17 miles of haul routes on equipment or vehicles used for timber harvest or road work. However, implementing vehicle washing prior to deployment of equipment would mitigate this risk (see Chapter 2), and would result in no spread or introduction of noxious weeds or introduced species as a result of implementing Alternative 2.

In the short-term (approximately 1-5 years), proposed timber harvest activities within the Project Area would result in a low to moderate probability of introducing or spreading noxious weeds and introduced plants, due to the increase in disturbed ground. Beyond human-related methods of species introduction and spread, these species can be introduced via water, wind, or animals. Implementing PDFs and ongoing weed treatments within the Analysis Area (those treatments unrelated to the Howard Forest Management Project) would result in no introduction or spread of these species as a result of implementing Alternative 2.

New roads and landings are high disturbance areas at risk for the spread of existing introduced species or introducing noxious weed species. Implementation of PDFs would ensure that appropriate actions are taken (i.e. weed control, seeding with native plants) to prevent the introduction of noxious weeds and the spread of introduced species in the Project Area due to the construction of proposed temporary roads.

Cumulative Effects

Past, present, and reasonably foreseeable future activities in the Planning Area include forest management projects, livestock use and recreational use. These human-caused activities and natural processes will continue to present a risk of introducing new populations and the spreading of existing ones. However, it is not possible to quantify with a high degree of confidence the number of populations of introduced species, nor distinguish them from the background risk of introduction from ongoing activities or natural processes in the Planning Area.

The BLM has an ongoing program of inventory and treatment of noxious weeds on BLM-administered lands in the Planning Area. Treatments in recent years within the Planning Area have focused on infestations in/near quarries, road systems and Riparian Reserves.

Ongoing treatments and monitoring by the BLM and continued collaboration with outside groups, such as the Forest Capital Partners, the Jackson County Cooperative Weed Management Area, and The Nature Conservancy's Early Detection and Rapid Response (EDRR) program increase the chances of containing or reducing populations of noxious weed and introduced species in the Planning Area.

It is anticipated that ongoing activities on private lands will continue to facilitate the introduction and spread of noxious weeds and introduced species within the Planning Area.

Past, ongoing and reasonably foreseeable BLM activities in the Planning Area include PDFs to reduce the risk of introducing or spreading populations of noxious weeds or introduced species. With regard to the

spread of introduced species and possible introduction and spread of noxious weeds, implementation of PDFs for all BLM projects would result in no cumulative effects as a result of implementing the Proposed Action.

3. Weed Risk Assessment (Including Field Review and Field Reconnaissance Results)

Per BLM Manual 9015 (Section 9015.2.23) direction, the ground-disturbing activity proposed under the Howard Forest Management Project was assessed to determine the risk of introducing noxious weeds. Under this direction, projects that are determined to have a moderate or high risk of weed introduction or spread, the BLM is to "provide positive management measures as indicated in the Risk Assessment" (USDI 1992).The analysis of Howard proposed activities resulted in a **Low to Moderate** Weed Risk Rating; appropriate PDFs are included in Chapter 2 of this document to mitigate for the determined risk.

Surveys for all species on the Medford Weed list were conducted over several years, beginning in 1998.

Class A Weeds: Those noxious weeds that are exotic (not 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 proposed project resulted in detection of **zero sites** of Class A weeds.

Class B Weeds: Those noxious weeds that are non-native (exotic) 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. A records check and surveys of areas that may be affected by the proposed project resulted **zero sites** of Class B weeds in the Project Area.

Class C Weeds: Those noxious weed species (exotic or native) or undesirable plants not categorized in the previous categories. 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 are exotic, have a moderate frequency from recent survey lists in nearby stands, and have the potential to cause ecological damage. Class C species are not typically managed for control, due to widespread occurrences and unmanageable population sizes. A records check and surveys of areas that may be affected by the Howard Forest Management Project activities resulted in detection of 11 populations of Class C weeds.

Table 3-24. Class C Introduced Plant Species Located Within the Project Area

Species	Count	Cumulative area of infestation(s)
Downy brome (Cheatgrass)	4	~5 acres
Bulbous bluegrass	6	~7 acres
Spreading hedgeparsley	1	~1 acre

Forest management activities (timber harvest, road-building, activities fuels treatments) would create patchy, moderately intensive ground disturbance. PDFs are incorporated that would prevent the introduction and spread of noxious weeds due to implementation of the proposed project.

The Class C introduced plant species will be monitored by inspecting high disturbance areas such as new road construction areas, landings, yarding corridors and haul routes.

The budget to treat and monitor noxious weeds is not fixed for this project. There is no budget to treat Class C introduced plant species; also, it is not permitted to use herbicides to treat Class C species at this time. Manual removal, revegetation and mulching are treatments available to control Class C species.

The likelihood of noxious weed establishment in the Project Area is **low to moderate**, due to the presence of Class C introduced plant species. These populations in the affected areas vary by species and are primarily located along existing roads. These species can be competitive when exposed to an open canopy (i.e.

roadsides or disturbed, open gaps in canopy). Seeding with native species, spreading weed-free mulch in highly disturbed areas, and continued treatment of noxious weeds in the Analysis Area would prevent the displacement of native vegetation. Unrelated activities could transport weed seed (e.g. wind, water, wildlife, wildfire, hiking, OHV, etc.) into any newly disturbed areas.

The Medford District BLM 1995 Resource Management Plan directs the use of integrated pest management actions to contain and reduce noxious weed infestations. The Howard Forest Management Project incorporates PDFs as part of the proposed action intended to control noxious weeds and avoid new infestations. The PDFs include both preventive features and active control methods. The PDFs represent the most current and widely employed methodology for weed control and prevention currently available to the BLM. This EA analyzes effects to resources in the context of a project design that incorporates PDFs prescribed for the Howard Forest Management Project. Thus, the effects of PDF implementation 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, the potential for weed spread would be minimized and roadside weed populations would be controlled and reduced.

PDFs included in the Howard 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 1998); and the
- *BLM Vegetation Treatments Using Herbicides Final Programmatic EIS Record of Decision* (USDI 2007).

K. RECREATION

1. Affected Environment

Recreation use across the Medford District BLM is described in the 1995 Medford District Resource Management Plan. 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 1995 RMP (PRMP/EIS, p. 3-71) that provide for dispersed recreation opportunities across the Medford District BLM. An estimated 799,243 acres provide for dispersed recreation use across the Medford District (PRMP/EIS p. 3-84). SRMAs are those areas identified with high concentrations of recreation use and developed facilities. All of the Howard Project Area is described by the RMP as a SRMA recreation use area. Recreation in the Project Area includes hiking, horseback riding on Lily Glen trail, sightseeing, OHV activities, fishing, driving for pleasure, hunting, and winter recreation activities.

Hyatt-Howard SRMA

The entirety of the Howard Project Area (638 acres) 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, Oregon. 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.

Pacific Crest National Scenic Trail (PCNST)

The PCNST was established through the National Trails System Act (1968) "*in order to provide for the ever-increasing outdoor recreation needs of an expanding population and in order to promote the preservation of, public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the Nation*". The PCNST passes through California, Oregon and Washington from Mexico to Canada. Use of the PCNST is limited to hiking and stock use.

The Medford District BLM manages 42.5 miles of the PCNST. A portion of the boundaries of proposed Project Units 1-1, 1-2, 1-3 and 1-4 are within approximately 125- 400 feet of the PCNST.

On the Medford District BLM, the Recreation Area Management Plan for the Pacific Crest National Scenic Trail Special Recreation Management Area (1998) provides guidance for the management of the PCNST. The Recreation Area Management Plan for the PCNST calls for no timber harvest within the 100-foot wide Special Recreation Management Area corridor (50 feet from trail centerline on either side of the trail), except for the removal of safety hazard trees. As such, the boundaries for proposed Project units are outside of the PCNST 50-foot no-cut buffer. Equipment associated with the Project will not cross the PCNST, due to landings being constructed within, instead of outside, the units adjacent to the PCNST (Units 1-1, 1-2, 1-3, and 1-4).

2. Environmental Consequences

a. Alternative 1—No Action Alternative

In the No Action Alternative, recreation opportunities would remain unchanged. Dispersed recreational activities such as hiking, horseback riding, sightseeing, OHV activities, fishing, driving for pleasure, hunting, target practice, dispersed camping, and vegetative gathering would continue. Activities on the PCNST and within the Hyatt-Howard SRMA would remain unchanged.

b. Alternative 2—Proposed Action

Dispersed types of recreation within the Howard Project Area would receive adverse short-term intermittent impacts as a result of the Howard Proposed Action. Recreational users of the area would encounter log trucks, equipment, noise from machinery, and some traffic congestion. However, some of the safety risks associated with project activities would be minimized through increased signage on major travel routes. The types of prescriptions called for in each unit of the Howard Project would not change the overall character of the landscape from the point of view of the average recreationist, and therefore, would not impact the desirability of the area for dispersed recreation in the long-term. Creation of temporary roads and skid trails, along with the opening up of the forest canopy, could provide an opportunity for increased OHV use in the area; however, these opportunities would be minimized by decommissioning temporary roads, camouflaging and blocking skid trails where they intersect haul roads. The decommissioning of Road 38-3E-23.2 would also reduce the opportunity for increased OHV use. Short-term impacts to recreation use at the developed and designated trails (PCNST, Lily Glen, and Multi-Use Winter Trails within the Hyatt-Howard SRMA) near Project units would occur.

Hyatt-Howard SRMA

The entirety of the Howard Project Area (638 acres) is within the Hyatt-Howard Special Recreation Management Area (SRMA). Much of the SRMA has experienced timber harvest in the past, with historic harvest levels exceeding those proposed in the Howard Forest Management Project. Also, the spatial distribution of the removal of trees from past timber harvest is more noticeable on the landscape than what would result from the Howard Project. Visual evidence of these past harvests remains on the landscape and it is likely that the quality of recreation within the SRMA would not be diminished as realized by the average person recreating in the Hyatt-Howard SRMA in the long-term. Short-term effects to users of the SRMA would occur, as users of the SRMA will likely encounter machinery, noise from the projects, and visual evidence of the project (i.e. freshly cut stumps, log piles). As part of the Howard Forest Management Project, Road 38-3E-23.2, totaling 0.65 miles of road, will be decommissioned. This 0.65 mile of road proposed to be decommissioned serves as an access point for OHV use, leading into a riparian meadow

which has been significantly rutted. Decommissioning of this road complemented with a barricade would serve to limit OHV use. Following the project and over time, recreational use of the area will likely not be impacted as a result of implementation of the Howard Forest Management Project.

Pacific Crest National Scenic Trail

A portion of the boundaries of Units 1-1, 1-2, 1-3 and 1-4 are within approximately 125-400 feet of the (PCNST). The silvicultural prescription for these units would use selective thinning to improve tree growth and vigor while maintaining 40- 60% canopy cover. This type of thinning, which retains large trees and substantial canopy cover across the treatment areas, along with the no harvest 100 foot corridor along the trail, allows for the continuance of the existing landscape character as observed from the PCNST. Therefore, long-term impacts to the trail and the trail user would not be realized.

In the short-term, intermittent negative impacts as a result of the Howard Project would occur. PCNST users would encounter log trucks, equipment, and noise from machinery. In Unit 1-1, PCNST users could see and hear operations from across Willow Creek Road, but only for up to 500 meters. In Units 1-2, 1-3, and 1-4, PCNST users could hear operations, but due to the distance from the trail to the units, visual confirmation would be challenged. To improve the safety of PCNST users, a sign would be placed at the trail across Willow Creek Road from Unit 1-1.

L. VISUAL RESOURCES MANAGEMENT

1. Affected Environment

Medford District BLM-administered lands have been classified under a Visual Resource Management (VRM) Inventory Class system established by the BLM. Visual Resources are the land, water, vegetation, structures, and cultural modifications that make up the scenery of BLM-administered land (RMP/EIS p. 3-70). The criteria used to determine VRM classes are: scenery quality ratings, public sensitivity ratings, and distance zone-seen area mapping criteria.

Approximately 60% of the viewsheds in the Medford District RMP Planning Area have fragmented land ownership patterns, with private lands dominating the viewed landscape (PRMP/EIS p. 3-70). All the Project units are classified as VRM Class II.

> **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.

2. Environmental Consequences

a. Alternative 1—No Action Alternative

Visually, the units would remain the same. There would be no changes to the existing landscape.

b. Alternative 2—Proposed Action

Resource development patterns that disrupt the land surface (road construction) and vegetative patterns (vegetation thinning) can have adverse effects on visual resources (PRMP/EIS p. 4-86). Units of the Howard Forest Management Project are classified as VRM Class II (RMP Map 10; EA, Chapter 3, Visual Resource Management). The management objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

In accordance with the 1995 RMP, a visual resource contrast rating system analysis was completed for the Howard Forest Management Project. Six Known Observation Points (KOPs) on Howard Prairie Road, Keno Access Road, the Pacific Crest National Scenic Trail (PCNST), and Roads 38-3E-13.6 and 39-4E-6.3 in

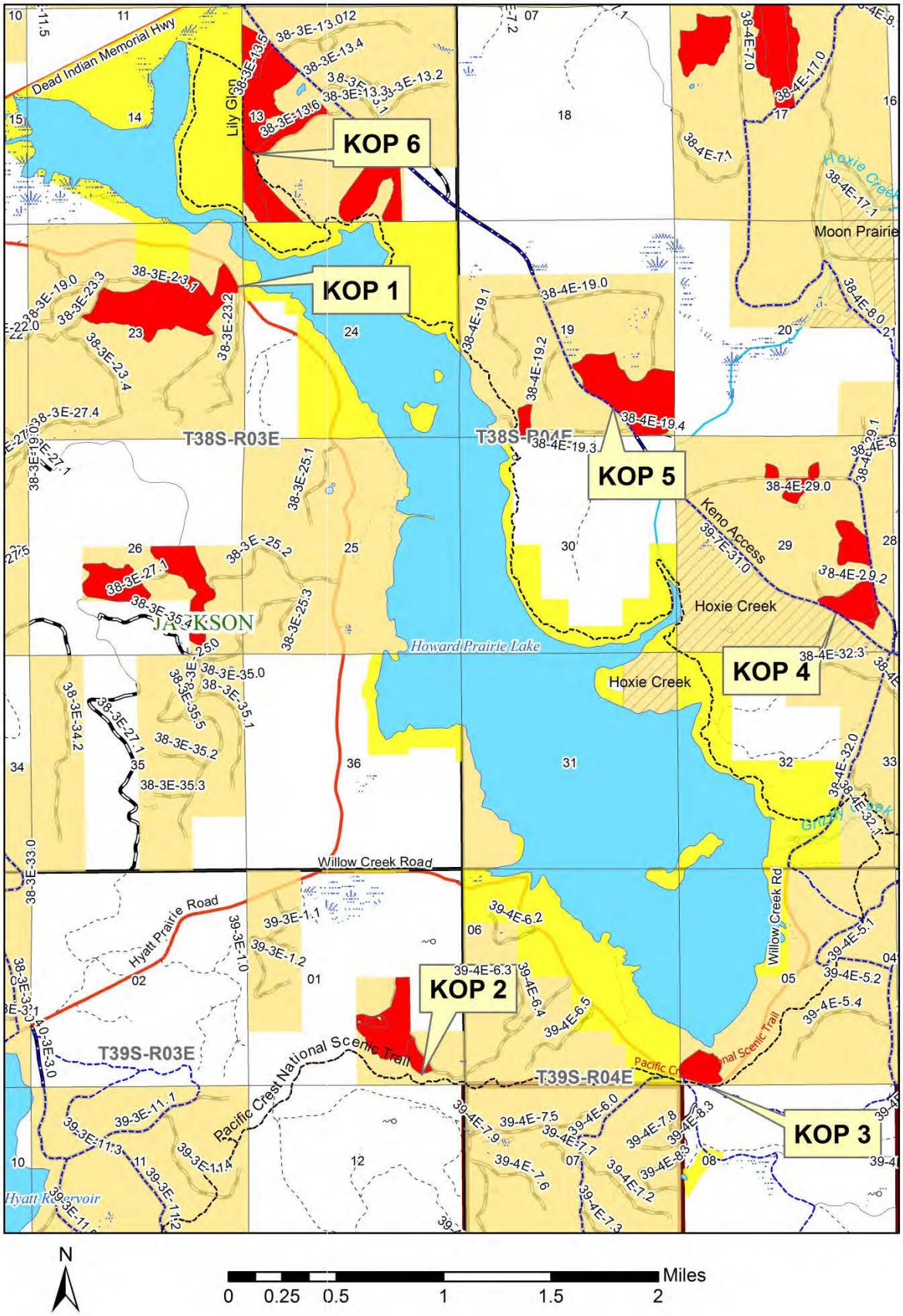
VRM Class II management areas were used to complete the visual resource contrast rating system analysis. Views of the landscape from these major travel routes adjacent to the Project Area were used to determine if any changes in landscape character from the point of a casual observer traveling these routes would occur. These routes were analyzed since they are the main arteries of travel adjacent to the Project units.

From these travel routes, most Project units will not be visible due to the dense vegetation in the foreground. Project units that may be visible or partially visible will be noticeable to the casual observer; however, because of the expected speed of travel, the overall character of the surrounding landscape, the limited exposure of project units to users on the PCNST, and the nature of the proposed Project, the units will not be the primary focus of the observer.

Unit 1-1 is directly adjacent to the PCNST. The thinning prescription for Unit 1-1 will be that of a pine and white fir site. The goal on this site is the retention of existing large ponderosa pine and the subsequent development of young pine. Users of the PCNST have ample foreground vegetation screening to the Project unit, except for a small opening for a limited exposure adjacent to the unit. The thinning prescription for Units 23-1, 29-5, and 19-2 will be that of a Douglas-fir site. The larger, healthier trees would be favored as leave trees, creating a more open understory. The thinning activity would be more obvious to observers who drive along Keno Access Road, due to the lower speeds of travel on this smaller road. The character of the landscape, however, would not affect VRM Class II management areas, since low changes in landscape character would occur. For the casual observer, the removal of the trees from these relatively small units would go relatively unnoticed and would be consistent with VRM II management objectives.

The six KOPs used for analysis are near Project Units 1-1, 1-4, 13-2, 19-2, 23-1, 29-5, and. 31-2. The six KOPs were chosen because these locations receive the most traffic counts, and would provide the best representation of the most frequently viewed portions of the Project Area (Map 3-5).

Map 3-5. Known Observation Points (KOPs) in the Howard Forest Management Project Area.



KOP 1

From KOP 1 on Howard Prairie Road, looking towards Unit 23-1, the thinning activity would have a weak degree of contrast to the landscape character elements of form, line, color, and texture, when compared to landscape character prior to the proposed project. The level of change to the landscape would be low and would not attract the attention of the casual observer from the highway. Lands across the highway are densely vegetated and contain numerous downed trees. An observer living in the area or more familiar with the landscape than the casual observer may notice the slight changes in character of the landscape as a result of the Howard Forest Management Project. However, the Project would meet visual resource management objectives with implementation of Alternative 2.

KOP 2

From KOP 2, on Road 39-4E-6.3, Unit 1-4 is slightly visible and would have a weak degree of contrast to the landscape character elements of form, line, color, and texture when compared to landscape character prior to the proposed activities. The level of change to the landscape would be low, and would not attract the attention of the casual observer from the road, as this is an infrequently used route. The PCNST is within 450 feet of this unit. However, the foreground vegetation screening will prohibit users of the trail from seeing the Project units. An observer living in the area or more familiar with the landscape than the casual observer may notice the slight changes in character of the landscape as a result of the Howard Forest Management Project; however, the project would meet visual resource management objectives with implementation of Alternative 2.

KOP 3

From KOP 3, on the PCNST, Unit 1-1 is visible from the trail. From this KOP, the PCNST has ample foreground vegetative screening, except at the actual KOP. The actual and visual no-cut buffer will be met at this location. This location already has a wide and open old gravel storage area adjacent to the trail where it intersects Willow Creek Road. From this KOP, the trail itself is only 60 feet off of Willow Creek Road, which will serve as a buffer to the Howard Forest Management Project. The relatively small size of this unit (15 acres), combined with the limited exposure adjacent to the PCNST, will result in low visual changes in the character of the landscape. An observer living in the area or more familiar with the landscape than the casual observer may notice the slight changes in character of the landscape as a result of the project; however, the Howard Forest Management Project would meet visual resource management objectives with implementation of Alternative 2.

KOP 4

From KOP 4, on Keno Access Road and looking towards Unit 29-5, the thinning activity would have a weak degree of contrast to the landscape character elements of form, line, color, and texture when compared to landscape character prior to implementation of the proposed project activity. The level of change to the landscape would be low, and would not attract the attention of the casual observer from the road. While the unit is visible for 10-15 seconds at this road's speeds, the unit should have sufficient foreground cover as to not attract the attention of the casual observer. An observer who lives in the foreground of KOP 4 would be more familiar with the landscape than the casual observer, and may notice the minor short-term changes in character of the landscape. The Howard Forest Management Project would meet visual resource management objectives for VRM Class II objectives.

KOP 5

KOP 5 is on Keno Access Road, looking towards the western most tip of the Project Area. Unit 19-2 is approximately 68 acres, and the westernmost edge of the unit comes within a couple hundred feet of Keno Access Road. The largest portion of the unit, which is not visible from KOP 5, is well off of the road, reducing the visible area of Unit 19-2. While the unit is visible for 10-15 seconds at road speeds, the majority of this unit is in the background of the view from this KOP. The dense roadside vegetation along this unit serves as a natural foreground visual barrier. The level of change to the landscape would be low, and would not attract the attention of the casual observer from the road. From the casual observer's point of view, with the dense foreground vegetation, the results of the thinning of this stand would not be a predominant feature. An observer living in the area or someone more familiar with the landscape than the casual observer may

notice the slight changes in character of the landscape as a result of the project. However, the project would meet visual resource management objectives with implementation of Alternative 2.

KOP 6

KOP 6 is located on Road 38-3E-13.6, approximately 0.5 mile west of Keno Access Road, adjacent to Unit 13-2, which is approximately 10 acres in size. This is predominantly a pine site, with an understory of white fir. The prescription in this unit is to leave the large pine trees, and conduct thinning activities on the smaller white firs. This is a very narrow road leading back to this unit, not frequently used and overgrown with vegetation. There are two other units located behind 13-2, Units 13-3 and 13-4 which would not be visible from this location. The level of change to the landscape would be low and would not attract the attention of the casual observer from the road. From the casual observer's point of view, with the dense foreground vegetation, the results of the thinning of this stand would not be a predominant feature. An observer living in the area or someone more familiar with the landscape than the casual observer may notice the slight changes in character of the landscape as a result of the Project; however, the project would meet visual resource management objectives for VRM Class II with implementation of Alternative 2.

Summary

It was determined the Howard Forest Management Project would meet visual resource management objectives with implementation of Alternative 2. The Project treatments consist of various forms of thinning, and the level of change to the landscape character would be low. The casual observer would likely not notice the changes in landscape character as a result of the thinning projects. The changes would repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

M. RANGELAND RESOURCES/GRAZING

The Howard Forest Management Project overlaps with the Deadwood grazing allotment. The Deadwood grazing lease authorizes 393 cattle from June 16-August 15 in years ending in even numbers, and from August 16 to October 15 in years ending in odd numbers. The alternating rotational use pattern coincides with objectives of the Deadwood/Deadwood USFS Cooperative Resource Management Plan to reduce grazing impacts and increase recovery time from the temporary, renewable effects of grazing. A total of 789 Animal Unit Months (AUMs) of grazing is authorized on the BLM-administered portion of the Deadwood Allotment, which totals 7,896 acres. An AUM is the amount of forage needed to support a cow/calf pair, or the equivalent, for one month. The remainder of the Project Area is outside grazing allotment boundaries. The grazing authorization renewal process is currently underway for the Deadwood Allotment.

The Howard Prairie Allotment is located on BOR-administered land and the grazing lease is managed by the Bureau of Land Management under a Memorandum of Agreement (MOA No. 83-168) dated March 31, 1983. Current lease terms and conditions authorize grazing of 60 AUMs from October 16th to November 15th over the 320-acre allotment area.

There are approximately 423 acres spread across 17 treatment areas associated with the Howard Forest Management Project that occur within the 7,896 acre Deadwood grazing allotment. While grazing continues on the Howard Prairie grazing allotment, no treatment areas occur within its boundaries. As such, no further analysis regarding this allotment will be conducted.

1. Affected Environment

Cattle grazing commences annually at lower elevations (approximately 4,400 feet) on the generally south-facing slopes of the Deadwood allotment and progresses to higher elevations as summer temperatures stimulate forage growth. The vegetation is a mosaic of conifer communities with grass species such as blue wild rye (*Elymus glaucus*), and Alaska oniongrass (*Melica subulata*) and forb species such as insideout flower (*Vancouveria hexandra*), broadleaf starflower (*Trientalis latifolia*), and prince's pine (*Chimaphila menziesii*) create a landscape matrix within which riparian areas and permanent and transitory grasslands and meadows, preferred by livestock, are embedded. Riparian areas include lake shore access to Howard Prairie Lake along unfenced borders of BOR-administered and private lands, and open and enclosed willow thickets,

as well as more open wetland areas of the allotment incorporating sedges such as (*Carex eucarex sp.*) and (*Carex vignea sp.*). Drier grasslands include grass species such as meadow barley (*Hordeum brachyantherum*), colonial bentgrass (*Agrostis capillaris*), and tufted hairgrass (*Deschampsia caespitosa*). Shallow soils define open meadows that may be dominated by California oatgrass (*Danthonia* californica) on clayey sites or Idaho fescue (*Festuca idahoensis*), Secund's bluegrass (*Poa secunda*) and Lemmon's needlegrass (*Achnatherum lemmonii*) on soils with more sand or silt. Seasonally inundated soils may host California false hellebore (*veratrum californicum*), cone flower (*Rudbeckia sp.*), and other forbs. Other open meadows may be dominated by shrubs such as common snowberry (*Symphoricarpus albus)*. Annual and short-lived perennial weedy grasses, including medusahead (*Taeniatherum caput-medusae*), smooth brome (*Bromus hordeaceous*), dogstail (*Cynosurus echinatus*), and bulbous bluegrass (*Poa bulbosa*) grow throughout the allotment.

2. Environmental Consequences

a. Alternative 1—No Action Alternative

Under the No Action Alternative (Alternative 1), grazing activities would continue as currently scheduled with no expected change. The forested portions of the Deadwood grazing allotment are seldom accessed by livestock, resulting in utilization levels that are generally none to slight (0-20%) within the forested plant communities. Forest stands would remain at current levels, with little forage production and, in some cases, impenetrable to livestock. There would be no effect to rangeland resources with the selection of the No Action alternative.

b. Alternative 2—Proposed Action

Alternative 2 of the Howard Forest Management Project would decrease stand density, opening the forest canopy and increasing understory forage production (i.e. herbaceous vegetation growth) by allowing more sunlight to reach the forest floor. While range improvements may occur near or adjacent to Project units, implemented silvicultural prescriptions are not expected to change use patterns or damage rangeland improvements. Implementation of PDFs would both protect rangeland improvements and prevent livestock trespass during Project activity. There would be no direct, indirect, or cumulative effect to rangeland resources with the selection of Alternative 2.

N. CARBON STORAGE

1. Background

The purpose of the this section is to provide a basis for the decision maker to determine whether the Proposed Actions are likely to significantly impact the human environment with respect to greenhouse gas levels (i.e. atmospheric carbon levels). Changes in greenhouse gas levels affect global climate. Forster et al. (2007, pp. 129-234) reviewed scientific information on greenhouse gas emissions and climate change, and concluded that human-caused increases in greenhouse gas emissions are extremely likely to have exerted a substantial warming effect on global climate. Because forests store carbon, they affect the atmospheric concentrations of carbon dioxide, a greenhouse gas. Forest management can change the amount of carbon stored in a forest.

Scientific knowledge on the interrelationship between greenhouse gas levels and climate change is rapidly changing, and substantial uncertainties and several key limitations remain. One limitation is the inability of current science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. This limitation was identified by the U.S. Geological Survey in a May 14, 2008 memorandum to the U.S. Fish and Wildlife Service, which summarized the latest science on greenhouse gases. That memorandum is incorporated here by reference.

Treatments proposed in the Howard Forest Management Project Action Alternative were compared to treatments in the Cottonwood Forest Management Project and found to be similar. Carbon storage and carbon emissions of the Project Action Alternatives were compared to similar units that have calculations to determine the net contributions of greenhouse gases resulting from the treatments. Those carbon calculations

were based on assumptions in the 2008 FEIS (USDI/BLM 2008 Appendix C) and subsequent improvements to those assumptions, as set forth in R. Hardt, personal communication, November 6, 2009 (on file in the Medford District BLM Office, and incorporated here by reference). Carbon storage is analyzed by quantifying the change in carbon storage in live trees, storage in forests other than live trees (dead wood and roots, non-tree vegetation, litter and soil organic matter), and storage in harvested wood products. Changes in forest ecosystem carbon over time are calculated using site specific data and the ORGANON Growth Model (Hann 2012). Stand volume in cubic feet per acre per year is used to calculate tonnes of carbon stored per year. Carbon emissions (carbon dioxide) are calculated from timber harvest activities (including fuel consumption) and post-harvest fuel treatments. Net carbon storage is calculated by subtracting carbon emitted from carbon stored.

The 2008 FEIS described current information on predicted changes in regional climate (pp. 488-490). That description concluded that the regional climate has become warmer and wetter with reduced snowpack, and continued change is likely. That description also concluded that changes in resource impacts as a result of climate change would be highly sensitive to specific changes in the amount and timing of precipitation, but specific changes in the amount and timing of precipitation are too uncertain to predict at this time. Because of this uncertainty about changes in precipitation, it is not possible to predict changes in vegetation types and condition, wildfire frequency and intensity, stream flow, and wildlife habitat. Therefore, the analysis in this EA does not attempt to predict changes in the Project Area due to existing or potential future changes in regional climate.

2. Affected Environment

In the Howard Forest Management Project Area, mixed conifer stands that are 70 to 170 years old are proposed for treatment. Within these forests, the quantity of stored carbon varies from stand to stand, and is influenced by site quality and the amount, type and size of vegetation present. The current amount of vegetation defines the existing levels of on-site carbon, and is considered the baseline amount that would be affected by management actions.

3. Environmental Consequences

a. Alternative 1—No Action Alternative

This alternative would not implement the Medford District RMP management direction for general forest and riparian management areas. No timber management actions would occur.

No forest vegetation would be removed; the current amount of on-site carbon would not be affected. In the long-term, it is expected that continued growth of forest vegetation would result in the increase of stored carbon. Limited reductions in carbon would happen as periodic mortality or decomposition from natural processes occurs. In the absence of catastrophic disturbance events, it is expected that continued forest growth would capture and store more carbon than would be lost from natural processes.

b. Alternatives 2—Proposed Action

Live Tree Carbon Storage

Similar to treatments in the Cottonwood Project, Howard Timber Project treatments would reduce carbon stores temporarily, but would result in net increases over time. In the Cottonwood Project, Selective Thinning/DSP units would be similar to the Density Management units in the Howard Project. Continued forest growth following management is predicted to increase carbon storage approximately 1168 cubic feet per acre per decade (Hann 2012) which is equal to about 14.3 tonnes of stored carbon per acre per decade, or 1.4 tonnes per year. Within two years after thinning, the carbon emission level (2.3 tonnes/acre) for the 20 year analysis period would be offset by carbon storage in tree growth (Cottonwood EA pp. 3-113). Total live tree carbon would equal pre-treatment levels after approximately 12 years of tree growth.

The Selective Thinning units would be similar to the Selective Thinning/NRF units in the Cottonwood Project. Continued forest growth following treatment would increase carbon storage approximately 1244

cubic feet per acre per decade (Hann 2012), which is equal to approximately15.2 tonnes of stored carbon per acre per decade, or 1.5 tonnes per year. Within two years after thinning, the carbon emission level (1.6 tonnes/acre) for the 20 year analysis period would be offset by carbon storage in tree growth (Cottonwood EA pp. 3-113). Total live tree carbon would equal pre-treatment levels after approximately eight years of tree growth.

Carbon Dioxide Emission

Density Management treatments would result in the emission of about 2.3 tonnes of carbon per acre, or about 8 tonnes of carbon dioxide per acre, during the 20 year analysis period. With implementation of Alternative 2, thinning 394 acres would result in the emission of 3,152 tonnes of carbon dioxide. The carbon dioxide emissions from Alternative 2 implementation would represent 0.0000005% of current U.S. emissions.

Selective Thinning treatments would result in the emission of about 1.6 tonnes of carbon per acre or about 6 tonnes of carbon dioxide per acre during the 20 year analysis period. For Alternative 2, thinning 240 acres would result in the emission of 1,440 tonnes of carbon dioxide. The carbon dioxide emissions from Alternative 2 implementation would represent 0.0000002% of current U.S. emissions.

The total carbon dioxide emitted during the 20 year analysis periods is considered negligible in the context of total U.S. carbon dioxide emissions of 6 billion metric tons (USDE 2009).

O. OTHER EFFECTS

1. Cultural Resources

In accordance with the 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 Howard Forest Management Project area. The Howard Forest Management Project Area was reviewed for the potential for adverse impacts to cultural resources. No new sites were located during the Cultural Resource Survey and no previously recorded sites are located within the Area of Potential Effect (APE).

Proposed management direction includes protecting and managing the integrity of all historic/prehistoric sites identified in the cultural survey. The minimum level of protection for sites is avoidance. This includes timber removal and road building. Other activities that might damage cultural resources include controlled burning, fuel hazard reduction methods, and restoration projects.

No cultural sites have been identified within the units proposed for treatment. 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. Therefore, no direct, indirect, or cumulative impacts on cultural resources are anticipated.

2. Air Quality

Prescribed burns are conducted within the limits of a Burn Plan, which describes prescription parameters so that acceptable and desired effects are obtained. Smoke produced from prescribed burning is the major air pollutant of concern.

Fuels management activities generate particulate pollutants in the process of treating natural and activity related fuels. Smoke from prescribed fire has the potential to effect air quality within the Project Area as well as the surrounding area. The use of prescribed fire for ecosystem restoration can produce enough fine particulate matter to be a public health and/or welfare concern.

Fine particulates in smoke can travel many miles downwind impacting air quality in local communities, causing a safety hazard on public roads, impairing visibility in Class I areas, and/or causing a general nuisance to the public. If properly managed, most negative effects of prescribed fire smoke can be minimized or eliminated.

The National Ambient Air Quality Standards (NAAQS), set by the authority of the Clean Air Act (CAA), cover six "criteria" airborne pollutants: lead, sulfur dioxide, carbon monoxide, nitrogen oxides, ozone and particulate matter. The lead and sulfur content of forest fuels is negligible, so these two forms of air pollution are not a consideration in prescribed burning.

Prescribed burning does emit some carbon monoxide (CO), from 20 to 500 pounds per ton of fuel consumed. This would be a concern if there were other persistent large CO sources in the immediate vicinity. CO is such a reactive pollutant, however, that its impact is quickly dissipated by oxidation to carbon dioxide where emissions are moderate and irregular and there is no atmospheric confinement.

Burning also emits moderate amounts of volatile organic compounds (VOC) and minor amounts of nitrogen oxides (NOx). These are precursors to formation of ground level ozone. Here, fire-related emissions may be seen as important only when other persistent and much larger pollution sources already cause substantial nonattainment of NAAQS.

Particulate matter smaller than 10 micrometers (PM 10) is a term used to describe airborne solid and liquid particles. Because of its small size, PM 10 readily lodges in the lungs, thus increasing levels of respiratory infections, cardiac disease, bronchitis, asthma, pneumonia, and emphysema.

The fate of PM emissions from prescribed burning is twofold. Most (usually more than 60%) of the emissions are 'lifted" by convection into the atmosphere where they are dissipated by horizontal and downward dispersion. The "unlifted" balance of the emissions (less than 40%) remains in intermittent contact with the ground. This impact is dissipated by dispersion, surface wind turbulence and particle deposition on vegetation and the ground. The risk of impact on the human environment differs between the two portions of smoke plume.

Smoke Aloft

Until recent decades, the impact of the lifted portion of smoke was ignored because it seemed to "just go away." These impacts are generally not realized until the mechanisms of dispersal bring the dispersed smoke back to ground level. Because the smoke has already dispersed over a broad area, the intensity of ground-level exposure is minimal. The duration of exposure may include the better part of a day, however, and the area of exposure may be large.

Ground Level Smoke

Unlike smoke aloft, the potential for ground level smoke to create a nuisance is immediate. This part of the smoke plume does not have enough heat to rise into the atmosphere. It stays in intermittent contact with the human environment and turbulent surface winds move it erratically. Also in comparison to smoke aloft, human exposure is more intense, relatively brief (a few hours) and limited to a smaller area. Smoke aloft is already dispersed before it returns to the human environment while ground level smoke must dissipate within that environment. Dissipation of ground level smoke is accomplished through dispersion and deposition of smoke particles on vegetation, soil and other objects.

Smoke Sensitive Receptor Area (SSRA)

The population centers of Grants Pass, Medford/Ashland (including Central Point and Eagle Point), and Klamath Falls in the past were in violation of the national ambient air quality standards for PM 10 and are classified as non-attainment for this pollutant. The nonattainment status of these communities was not attributable to prescribed burning. Major sources of particulate matter within the Medford/Ashland SSRA are smoke from woodstoves and dust and industrial sources.

The contribution to the nonattainment status of particulate matter from prescribed burning is less than 4% of the annual total for the Medford/Ashland air quality management area. Over the past ten years the

population centers of Grants Pass and Medford/Ashland have been in compliance for the national ambient air quality standards for PM 10.

The pollutant most associated with the Medford District's resource management activities is PM 10 found in smoke produced by prescribed fire. Monitoring in southwest Oregon consists of nephelometers (instruments designed to measure changes in visibility) in Grants Pass, Provolt, Illinois Valley, Ruch and eventually in Shady Cove. One medium volume sampler is co-located with the nephelometer at the Provolt site. The medium volume sampler measures the amount of PM 10 and smaller at ground level.

Administration of Smoke-Producing Projects

The operational guidance for the Oregon Smoke Management Program is managed by the Oregon State Forester. The policy of the State Forester is to:

1. Regulate prescribed burning operations on forest land;
2. Achieve strict compliance with the smoke management plan; and
3. Minimize emissions from prescribed burning

For the purpose of maintaining air quality, the State Forester and the Department of Environmental Quality shall approve a plan for the purpose of managing smoke in areas they designate. The authority for the State administration is ORS 477.513(3)(a).

ORS468A.005 through 468A.085 provides the authority to DEQ to establish air quality standards including emission standards for the entire State or an area of the State. Under this authority the State Forester coordinates the administration and operation of the plan. The Forester also issues additional restrictions on prescribed burning in situations where air quality of the entire State or part thereof is, or would likely become adversely affected by smoke.

In compliance with the Oregon Smoke Management Plan, prescribed burning activities on the Medford District require pre-burn registration of all prescribed burn locations with the Oregon State Forester. Registration includes specific location, size of burn, topographic and fuel characteristics. Advisories or restrictions are received from the Forester on a daily basis concerning.

3. 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 Proposed Action and inviting comments was mailed to adjacent landowners, interested individuals, organizations, and other agencies on February 12, 2013. The scoping letter requested that people contact the BLM using an attached Interest Response Form, or by sending a comment letter if they wanted to be updated as the project progressed.

This Howard Forest Management Project EA will be made available online and at the Medford District BLM office to all individuals. Paper copies will be sent to those parties who submitted an Interest Response Form or provided scoping comments, and to the Organizations and Agencies listed below.

Organizations and Agencies

American Forest Resource Council
Bureau of Reclamation: Bend Field Office
Bureau of Reclamation: Columbia-Cascades Area Office
Talent Irrigation District
Bureau of Land Management: Klamath Falls Field Office
Klamath Siskiyou Wildlands Center
Cascadia Wildlands Project
Oregon Wild
Soda Mountain Wilderness Council

Aerial Insect and Disease Survey Map Data. 2007-2008. Oregon Department of Forestry and USDA Forest Service. Available at http://www.fs.fed.us/r6/nr/fid/as/quad08/quad3nfinal2008.pdf

Agee, J.K. 1993. Fire Ecology of Pacific Northwest Forests. Island Press, Washington, DC.

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

Agee, J.K. 1998. The landscape of 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. and M.H. Huff. 1986. Structure and process goals for vegetation in wilderness areas. Pages 17-25 in R.C. Lucas, compiler. Proceedings of the national wilderness research conference: current research 1985. General technical report INT-212. U.S. Department of Agriculture Forest Service Intermountain Research Station, Ogden, Utah.

Agee, J.K. and C.N. Skinner. 2005. Basic principles of forest fuel reduction treatments. Forest Ecology and Management. Elsevier B.V.

Agee, J.K., C.S. Wright, N. Williamson, and M.H. Huff. 2002. Foliar moisture content of Pacific Northwest vegetation and its relation to wildland fire behavior. Forest Ecology Management **167:**57-66.

Alexander, M.E. and R.F. Yancik. 1977. The effect of precommercial thinning on fire potential in a lodgepole pine stand. Fire Management Notes. **38(3):**7-9, 20.

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.

Arno, S.F., J.H. Scott and M.G. Hartwell. 1995. Age-class structure of old growth ponderosa pine/Douglas-fir stands and its relationship to fire history. Research paper INT-RP-481. U.S. Department of Agriculture Forest Service Rocky Mountain Research Station, Fort Collins, Colorado.

Atzet, T. 2008. Personal communication. Area 5 Ecologist. Preliminary Plant

Associations of the Siskiyou Mountain Province; Technical Coordinator - Field Guide to the Forested Plant Associations of Southwestern Oregon. March 10, 2008.

Atzet, T. and D.L. Wheeler. 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.

Atzet, T. and D.L. Wheeler. 1984. Preliminary Plant Associations of the Siskiyou Mountain Province. USDA Forest Service, Siskiyou National Forest, Grants Pass, OR.

Atzet, T., R.F. Powers, D.H. McNabb, M.P. Amaranthus, and E.R. Gross. 1987. Maintaining Long-Term Forest Productivity in Southwest Oregon and Northern California. In: D.A Perry, R. Meurisse, B. Thomas, R. Miller, J. Boyle, J.Means, C.R. Perry, and R.F. Powers. Maintaining the Long-Term Productivity of Pacific Northwest Forest Ecosystems. Timber Press, Portland, Oregon. 1989 pp.193.

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.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., S. Wisely, C. Raley, and S. Buskirk. 2004. Zoogeography, spacing patterns, and dispersal in fishers: insights gained from combining field and genetic data. *In*: Martens and Fishers (*Martes*) in Human-Altered Environments: An International Perspective. Harrison D.J., A.K. Fuller, and G. Proulx. Springer Academic+Business Media. New York, NY. 201- 220.

Aubry, K., and C. Raley. 2006. Ecological characteristics of fishers (*Martes pennanti*) 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.

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* **20(2):** 436-452.

Beschta, R. n.d. Cumulative Effects of Forest Practices in Oregon. Prepared for the Oregon Department of Forestry. Available at: http://www.cof.orst.edu/cof/teach/for341/Cumulative%20Effects%20of%20Forestry%20on%20Soils/CHAPT6Soils.htm

Beschta, R.L. 1978. Long-Term Patterns of Sediment Production Following Road Construction and Logging in the Oregon Coast Range. Water Resources Research. **14(6):** 1011-1016.

Beschta, R.L., M.R. Pyles, A.E. Skaugset, and C.G. Surfleet. 2000. Peakflow responses to forest practices in the western cascades of Oregon, USA. *Journal of Hydrology*. **233(222):** 102-120.

Beyer, L. and S.H. Black. 2006. Site Utilization by Adults and Larvae of Mardon Skipper Butterfly (*Polites mardon*). Report to the Forest Service and BLM from the Xerces Society. October 2006.

Bingham, B. and B.R. Noon. 1997. Mitigation of Habitat Take: Application to Habitat Conservation Planning. *Conservation Biology* **11(1):**127-139.

Bradshaw, G. 1979. Preplanned skid trails and winching versus conventional harvesting on a partial cut. Forest Research Lab Research Note 62. Oregon State University School of Forestry. Corvallis, Oregon. December 1979.

Brown, E. R. (ed). 1985. Management of Wildlife and Fish Habitats in Forest of Western Oregon and Washington (two volumes). USDA Forest Service, Pacific Northwest Region. R6-F&WL-192-1985. Pacific Northwest Region. Portland, Oregon.

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.

Buskirk, S. and R.A. Powell. 1994. Habitat ecology of fishers and American martens. *In:* S.W. Buskirk, A.S. Harestad, M.G. Raphael, and R.A. Powell (editors). Martens, Sables and Fisher: Biology and Conservation. Pages 283-296.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. 2000. Effects of New Forest Management Strategies on Squirrel Populations. Ecological Applications. **10(1):**248-257.

Carey, A.B., J. Kershner, B. Biswell, and L.S. Dominguez de Toledo. 1999. Ecological scale and forest development: squirrels, dietary fungi, and vascular plants in managed and unmanaged forests. *Wildlife Monographs* **142**:1-71.

Care, A.B., S.P. Horton, and B.L. Biswell. 1992. Northern Spotted Owls: Influence of Prey Base and Landscape Character. Ecological Monographs **62(2):**223-250.

Chadwick, Kristen L. and A. Eglitis. 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.

Childs, S.W., S.P. Shade, D.W.R. Miles, E. Shepard, and H.A. Froehlich. 1989. Soil physical properties: importance to long-term forest productivity. In: Perry, D.A., R. Meurisse, B. Thomas, R. Miller, J. Boyle, J. Means, C.R. Perry, and R.F. Powers. Maintaining the Long-Term Productivity of Pacific Northwest Forest Ecosystems. Pp. 53-66. Timber Press, Portland, Oregon.

Christensen, N.L. 1988. Succession and natural disturbance: paradigms, problems, and preservation of natural ecosystems. Pages 62-86 in J.K. Agee and D.R. Johnson, editors. Ecosystem management for parks and wilderness. University of Washington Press, Seattle.

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.

Clayton, D. 2012. Personal Communication. Wildlife Biologist for the Rogue Siskiyou National Forest. Medford, Oregon.

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.

Cochran, P.H. 1998. USDA Forest Service, Pacific Northwest Research Station. Research Note PNW-RN-525, March 1998.

Cohen, J.D. 2000. Preventing disaster: home ignitability in the Wildland-Urban Interface. *Journal of Forestry* **98:**15-21.

Countryman, C.M. 1955. Old-Growth Conversion Also Converts Fire Climate. Fire Control Notes: 15-19.

Countryman, C. M. 1972. The Fire Environment Concept. Pacific Southwest Forest and Range Experiment Station. U.S. Department of Agriculture, Forest Service. Berkeley, California.

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.

Dahlberg, A. and J. Stenlid. 1995. Spatiotemporal patterns in ectomychorrhizal populations. *Canadian Journal of Botany 73 (Supplement*). Pp. S1222-S1230.

Davis, R.J.,K.M. Dugger, S. Mohoric, L. Evers, and W.C. Aney. 2011. Northwest Forest Plan—the first 15 years (1994-2008): status and trends of northern spotted owl populations and habitats. General Technical Report PNWGTR-850. Portland, Oregon: US Department of Agriculture, Forest Service, Pacific Northwest Research Station. 147 pp.

DellaSala, D.A. and E.J. 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.

Dolph, Robert E. 1985. Growth and vigor information in thinned second-growth ponderosa pine stands on the Deschutes and Ochoco National Forests. 10pp.

Drew, T.J. and J.W. Flewelling. 1979. Stand density management: an alternative approach and its application to Douglas-fir plantations. *Forest Science*. **25(3):** 518-532.

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.

Dugger, K. 2012. Demographic Characteristics and Ecology of Northern Spotted Owls (*Strix occidentalis caurina*) in the Southern Oregon Cascades. Annual Research Report: Southern Oregon Cascades Study Area. January 2012.

Dugger, K. 2014. Demographic Characteristics and Ecology of Northern Spotted Owls (*Strix occidentalis caurina*) in the Southern Oregon Cascades. Annual Research Report: Southern Oregon Cascades Study Area. January 2014.

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, S.H., R.E. Bilby, J.W. Ward, and J.T. Heffner. 1987. Transport of road-surface sediment through ephemeral stream channels. American Water Resources Association: Water Resources Bulletin. Vol. 23, No. 1. February 1987.

Fahrig, L. and T. Rytwinski. 2009. Effects of roads on animal abundance: an empirical review and synthesis. *Ecology and Society*. **14(1):**1-20.

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 pp.

Forsman, E.D., R.G. Anthony, E.C. Meslow, and C.J. Zabel. 2004. Diets and Foraging Behavior of Northern Spotted Owls in Oregon. *Journal of Raptor Research*. **38(3):**214-230.

Forsman, E.D., R.G. Anthony, K.M. Dugger, E.M. Glenn, A.B. Franklin, G.C. White, C.J. Schwarz, K.P. Burnham, D.R. Anderson, J.D. Nichols, J.E. Hines, J.B. Lint, R.J. Davis, S.H. Ackers, L.S. Andrews, B.L. Biswell, P.C. Carlson, L.V. Diller, S.A. Gremel, D.R. Herter, J.M. Higley, R.B. Horn, J.A. Reid, J. Rockweit, J. Schaberl, T.J. Snetsinger, S.G. Sovern. 2011. Population demography of northern spotted owls. Studies in Avian Biology 40. Berkeley, CA: University of California Press. 106 pp.

Forster, P., V. Ramaswamy, P. Artaxo, T. Berntsen, R. Betts, D.W. Fahey, J. Haywood, J. Lean, D.C. Lowe, G. Myhre, J. Nganga, R. Prinn, G. Raga, M. Schulz, R. Van Dorland, G. Bodeker, O. Boucher, W.D. Collins, T.J. Conway, E. Dlugokencky, J.W. Elkins, D. Etheridge, P. Foukal, P. Fraser, M. Geller, F. Joos, C.D. Keeling, S. Kinne, K. Lassey, U. Lohmann, A.C. Manning, S. Montzka, D. Oram, K. O'Shaughnessy, S. Piper, G.K. Plattner, M. Ponater, N. Ramankutty, G. Reid, D. Rind, K. Rosenlof, R. Sausen, D. Schwarzkopf, S.K. Solanki, G. Stenchikov, N. Stuber, T. Takemura, C. Textor, R. Wang, R. Weiss, T. Whorf. 2007. Changes in Atmospheric Constituents and in Radiative Forcing. Chap. 2 in *Climate Change 2007 - The Physical Science Basis*, edited by S. Solomon, et al. Pages 129-234. Cambridge, United Kingdom and New York, NY: Cambridge University Press.

Franklin, J.F. and J.K. Agee. 2003. Forging a Science-Based National Forest Fire Policy; from: Issues in Science and Technology.

Franklin, J.F. and C.T. Dyrness. 1973. Natural vegetation of Oregon and Washington. USDA Forest Service Pacific Northwest Forest Range Experimental Station. General Technical Report PNW-8, 417 pp.

Fule, P.Z., W. Wallace Covington, and A.M. Moore. 1997. Determining Reference Conditions for Ecosystem Management of Southwestern Ponderosa Pine Forests. Ecological Applications **7(3):**895-908.

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, M.J., B.P. Staab, S. Hazelhurst, C.F. Clifton, K.B. Roby, B.L. Ilhardt, E.B. Larry, A.H. Todd, L.M. Reid, S.J. Hines, K.A. Bennett, C.H. Luce and P.J. Edwards. 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, A.N., M.M. Esperanza, and R. Font. 2003. Comparison between product yields in the pyrolysis and combustion of different refuse. *Journal of Analytical and Applied Pyrolysis* **68(69):**577-598.

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.

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.

Greacen, E.L, and R. Sands. 1980. Compaction of Forest Soils: A Review. *Australian Journal of Soil Resources.* Glen Osmond, Australia. Pp. 163-189.

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., S.L. Lewis, F.J. Swanson, J.H. Cissel, and J.J. McDonnell. 2008. *Effects of Forest Practices on Peak Flows and Consequent Channel Response: A State-of-Science Report for Western Oregon and Washington*. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, OR. General Technical Report PNW-GTR-760

Hall, F. 1995. Personal Communication. U.S. Forest Service, Region-6 Office. Portland, OR.

Hann, David W. 2012. ORGANON User Manual. Edition 9.1. southwest Oregon version. Department of Forest Resources, Oregon State University. Corvallis, Oregon.

Harr, R.D. 1976. Forest Practices and Streamflow in Western Oregon. Pacific Northwest Forest and Range Experiment Station. USDA Forest Service, Portland, Oregon.

Harr, R.D., R. Fredriksen, and J. Rothacher. 1979. *Changes in streamflow following timber harvest in southwestern Oregon.* Res. Pap. PNW-249. USDA Forest Service, Pacific Northwest Forest and Range Experimental Station, Portland, OR. 22 pp.

Hayes, J.P., S.S. Chan, W. H. Emmingham, J. C. Tappeiner, L.D. Kellog, and J.D. Bailey. 1997. Wildlife Responses to Thinning Young Forests in the Pacific Northwest. *Journal of Forestry*, Vol. 95, No. 8.

Hessl, A. E. 2004. Drought and Pacific Decadal Oscillation Linked to Fire Occurrence in the Inland Pacific Northwest. *Ecological Applications*, **14(2):** 425-442.

Holloway, G.L. and W.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.

Huff, M.H. and J.K. Agee. 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 Director's Office—Northwest Forest Plan Issue.

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.

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, H., D. Cocker, W. Miller, S. Hosseini, and M. Sharivastava. 2009. Final Report: Influence of Polyethylene Cover of Silvicultural Burn Piles on Emissions. University of California, Riverside.

Kattelmann, R. 1996. *Sierra Nevada Ecosystem Project: Final Report to Congress. Assessment and Scientific Basis for Management Options.* University of California Centers for Water and Wildland Resources. Vol. II, p.871.

King, J. G. and L.C. Tennyson. 1984. Alteration of Streamflow Characteristics Following Road Construction in North Central Idaho. *Water Resources Research*. **20(8):** 1159-1163.

Landsberg, J.D., R.E. Miller, H.W. Anderson and J.S. Tepp. 2003. Bulk Density and Soil Resistance to Penetration as Affected by Commercial Thinning in Northeastern Washington. Research Paper PNW-RP-551. Pacific Northwest Research Station. April 2003.

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*. **29(2):** 395-402.

Lint, J. 2005. Northwest Forest Plan—The First Ten Years (1994-2003): Status and Trends of Northern Spotted Owl Populations and Habitat. General Technical Report, PNW-GTR-648. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Lint, J., B. Noon, R. Anthony, E. Forsman, M. Raphael, M. Collopy, and E. Starkey. 1999. Northern spotted owl effectiveness monitoring plan for the Northwest Forest Plan. General Technical Report PNW-GTR-440. Portland, Oregon: USDA Forest Service, Pacific Northwest Research Station. 43 pp.

Livezey, K.B., T.L. Root, S.A. Gremel, and C. Johnson. 2008. Natural range expansion of Barred Owls? A critique of Monahan and Hijmans (2007). *The Auk*. **125(1):**230-232.

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. 1999. Sediment Production from Forest Roads in Western Oregon. Water Resources Research 35, 2561-2570.

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.

Lucklow, K.R. and J.M.Guldin. 2004. Soil Compaction Study of 20 Timber-Harvest Units on the Ouachita National Forest. *Advancing the Fundamental Sciences: Proceedings of the Forest Service National Earth Sciences Conference.* San Diego: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Pp.18-22.

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.

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 Pp.

Mason, A. 2012. Retention of snags and coarse woody material during underburning operations. Personal Communication in February, 2012. Medford Bureau of Land Management Fuels Specialist.

McNabb, D.H. and H.A Froehlich. 1983. Conceptual model for predicting forest product losses from soil compaction. *Society of American Foresters National Convention* (Preceedings of the Society of American Foresters National Convention). Pp. 261-265.

Meehan, W.R., Editor. 1991. Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats. American Fisheries Society. Special Publication 19.

Megahan, W.F. 1974. *Erosion over Time: A Model*, Research Paper INT 156, 14 pp. USDA Forest Service, Intermountain Research Station, Ogden Utah.

Miller, R.E., S.R. Colbert, and L.A. Morris. 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.* Pp. 1-76.

Miller, G.S., R.J. Small, and E.C. Meslow. 1997. Habitat Selection by Spotted Owls during Natal Dispersal in Western Oregon. *The Journal of Wildlife Management*, **61(1):**140-150.

Minore, Don. 1978. The Dead Indian Plateau: A Historical Summary of Forestry Observations and Research in a Severe Southwestern Oregon Environment. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, General Technical Report PNW-72 1978.

Mitchell, Allen. 2012. Personal communication. Fire Management Officer, Medford District BLM.

Monahan, W.B. and R.J. Hijmans. 2007. Distributional dynamics of invasion and hybridization by *Strix* spp. in western North America. Pages 55-66 *In*: Festschrift for Ned K. Johnson. Geographic Variation and

Evolution in Birds. Cicero, C. and J.V. Remsen Jr., editors. *Ornithological Monographs*, **2007(63):** 55-66.

Moore, M.M., W.W. Covington, and P.Z. Fulé. 1999. Reference conditions and ecological restoration: a southwestern ponderosa pine perspective. *Ecological Applications*. **9**:1266-1277.

Moore, R.D. and S.M. Wondzell. 2005. Physical Hydrology and the Effects of Forest Harvesting in the Pacific Northwest: A Review. *Journal of the American Water Resources Association*. August 2005.

Mote, P. and Contributors. 2003. Impacts of Climate Variability and Change in the Pacific Northwest. The JISAO Climate Impacts Group. Contribution #715

National Resource Conservation Service (NRCS). 1993. *Soil Survey of Jackson County Area, Oregon.* Government Printing Office.

Odion, D.C., E.J. Frost, J.R. Strittholt, H. Jiang, D.A. 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. August 2004.

Odion, D.C., M.A. Moritz, and D.A. DellaSala. 2010. Alternative Community States Maintained by Fire in the Klamath Mountains, USA. *Journal of Ecology*. **98**:96-105.

Odion, D.C. and Klamath Siskiyou Wildlands Center. 2013. Personal Communication (between Odion and KSW, and between Odion and Medford BLM). February 5, 2013.

Oliver, C.D. and B.C. Larson. 1996. Forest Stand Dynamics. Update Edition. John Wiley and Sons, New York. p. 141.

Omi, P.N. and E.J. Martinson. 2002. Effects of fuels treatments on wildfire severity. Western Forest Fire Research Center, Colorado State University.

Oregon Biodiversity Information Center (ORBIC). 2012. Available online at: http://orbic.pdx.edu/

Oregon Climate Service. 2008. Climate of Klamath County.

Oregon Department of Agriculture. 2013. Noxious Weed Policy and Classification System. Available online at: http://www.oregon.gov/ODA/PLANT/WEEDS/docs/pdf/Policy2013.pdf

Oregon Department of Environmental Quality (ODEQ), Water Quality Division. 2006. Assessment Methodology for Oregon's 2004/2006 Integrated Report on Water Quality Status. State of Oregon. April 27, 2006.

Oregon Department of Environmental Quality (ODEQ). 2010. Upper Klamath and Lost River Subbasins Total Maximum Daily Load. DEQ, Medford, Oregon.

Penn State College of Agricultural Sciences. 2014. Soil Compaction: Part 1, Section 1: Soil Management. Available online at http://extension.psu.edu/agronomy-guide/cm/sec1/sec11f

Perkins, J.P. 2000. Land cover at northern spotted owl nest and non-nest sites, east-central coast ranges, Oregon. M.S. thesis. Department of Forest Resources, Oregon State University, Corvallis, OR.

Pollet, J. and P.N. 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

Pollet, J. and P.N. Omi. 2002. Effects of thinning and prescribed burning on crown fire severity in ponderosa pine forests. *Journal of Wildland Fire*. **11**:1-10.

Powell, R. A. and W. J. Zielinski. 1994. Fisher, in the scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine. Pp. 38-73. Fort Collins, Colorado, USA: USDA Forest Service, Rocky Mountain Forest and Range Experimental Station.

Powers, R.F., F. G. Sanchez, D.A. Scott, D. Page-Dumroese. 2004. The North American long-term soil productivity experiment: coast-to-coast findings from the first decade. In: Proceedings, National Silvicultural Workshop. USDA Forest Service General Technical Report RM. Pp. 191-206.

Prichard S.J., D.L. Peterson, and K. Jacobson. 2010. Fuel treatments reduce the severity of wildfire effects in dry mixed conifer forest, Washington, USA. *Canadian Journal of Forest Research*. **40**: 1615-1626.

Pullen, Reg. 1996. Overview of the Environment of Native Inhabitants of Southwest Oregon, Late Prehistoric Era. Report prepared for the USDA Forest Service Rogue River and Siskiyou National Forests and the USDI Medford District 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, D.B., P.W.F. Lingren, D.S. Sullivan, and T. 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. *Forest Ecology and Management* **202 (2004):** 355-367.

Rashin, E.B., Clishe, C.J., Loch, A.T., and Bell, J. M. 2006. Effectiveness of Timber Harvest Practices for Controlling Sediment Related Water Quality Impacts. *Journal of the American Water Resources Association*. **42(5):**1307-1327.

Regional Interagency Executive Committee (REIC). 2012. Memorandum: Equivalent-Effort Survey Protocol for Survey and Manage Category B Fungi. April 11, 2012. Portland, Oregon.

Reid, L.M. and T. Dunne. 1984. *Sediment Production from Forest Road Surfaces*. Water Resources Research. **20(11):** 1753-1761.

Rice, R.M., J.S. Rothcatcher, and W.F. Megahan. 1972. Erosional consquences of timber harvesting: an appraisal. National Symposium on Watersheds in Transition.

Rodnick, M.J., A.K. Gamperl, K.R. Lizars, M.T. Bennett, R.N. Rausch, and E.R. Keeley. 2004. Thermal tolerance and metabolic physiology among redband trout populations in south-eastern Oregon. *Journal of Fish Biology* **2004(64):** 310-335.

Rosenberg, D.K. and K.S. McKelvey. 1999. Estimation of habitat selection for central-place foraging animals. *Journal of Wildlife Management* **63(3)**:1028-1038.

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., J.P. Manakis, C.C. Hardy, W.J. Hann, and D.L. Brunnell. 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 Cascade, Siskiyou and Mid-Coast Mountains of Southwestern Oregon. On file at Medford District BLM.

SNEP. 1996. Summary of the Sierra Nevada Ecosystem Project report. Davis: University of California, Centers for Water and Wildland Resources.

Southwest Oregon Forest Insect and Disease Service Center (SWOFIDSC). Available at http://www.fs.fed.us/r6/rogue/swofidsc/index.html

Swanson, F.J. and C.T. Dyrness. 1975. Impact of clear-cutting and road construction on soil erosion by landslides in the western Cascade Range, Oregon. *Geology*. July 1975 **3(7):** 393-396.

Swift, L.W. Jr. 1988. Forest Access Roads: Design, Maintenance, and Soil Loss. In: Swank, W.T., D.A. Crossley Jr. *Ecological Studies*. Vol. 66: Forest Hydrology and Ecology at Coweeta. New York: Springer-Verlag. Pp. 313-324.

Tappeiner, J.C., D. Huffman, D. Marshall, T. A. Spies and J.D. Bailey. 1997. Density, Ages, and Growth Rates in Old-Growth and Young-Growth Forests in Costal Oregon. *Canadian Journal of Forest Research.* **27**: 638-648.

Taylor, B.D. and R.L. Goldingay. 2010. Roads and wildlife: impacts, mitigation and implications for wildlife management in Australia. **2010(37):** 1-12.

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.

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.

USDA Forest Service. 1996. Field Guide to the Forested Plant Associations of Southwestern Oregon. PNW Region, Technical Paper R6-NR-ECOL-TP-17-96.

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.

USDA Forest Service. 2012. Large Airtanker Modernization Strategy. Final Version, released February 10, 2012.

USDA Forest Service and University of Washington. 1995. Stand Visualization System. Pacific Northwest Research Station.

USDA Forest Service and 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.

USDA Forest Service and 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.

USDA Forest Service and 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.

USDA Forest Service and USDI Bureau of Land Management. 2003. Survey protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan. Version 3.0. BLM Instruction Memorandum No. OR-2003-44.

USDA Forest Service and 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.

USDA Forest Service and 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.

USDE Energy Information Administration. 2009. Emissions of Greenhouse Gases in the United States 2008. Washington, D.C. p. 58.

USDI Bureau of Land Management, Medford District. 1988. Timber Production Capability Classification (TPCC). Medford District Handbook Update M.2.0. 5251-1.

USDI Bureau of Land Management. 1992. Manual 9015: Integrated Weed Management. Release 9-321.

USDI Bureau of Land Management, Medford District. 1995. *Final EIS and Record of Decision Medford District Resource Management Plan.* Medford, Oregon.

USDI Bureau of Land Management, Medford District. 1995b. Jenny Creek Watershed Analysis. Version 1.1. Medford, OR.

USDI Bureau of Land Management. 1997. *Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the States of Oregon and Washington*. Portland, Oregon.

USDI Bureau of Land Management. 1998. *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.

USDI Bureau of Land Management, Medford District, Ashland Resource Area. 2002 and 2006. Unpublished data, Stream Surveys.

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.

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*. Available at: http://www.fs.fed.us/r6/sfpnw/issssp/documents/ag-policy/6840-im-or-2008-038.pdf

USDI Bureau of Land Management. 2008b. Instruction Memorandum No. OR-2008-050. Migratory Bird Treaty Act – Interim Management Guidance.

USDI Bureau of Land Management. 2010. Western Oregon Transportation Management Plan: Western Oregon Districts. Updated from 1996 and 2002 versions.

USDI Bureau of Land Management. 2011. Water Quality Restoration Plan: Klamath Basin—Jenny Creek Watershed. Medford District BLM, Ashland Resource Area and Lakeview District BLM, Klamath Falls Resource Area.

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. 2013. Biological Assessment for The Lower Grave, Howard and Mining Projects. Medford District BLM. Medford, Oregon.

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.

USDI US Fish and Wildlife Service. 1999. Federal Register. *Designated Critical Habitat; Central California Coast and Southern Oregon/Northern California Coasts Coho Salmon.* Vol. 64, No. 86. 24049.

USDI Fish and Wildlife Service. 2003. Endangered and Threatened Wildlife and Plants; 90-day Finding for a Petition To List a Distinct Population Segment of the Fisher in Its West Coast Range as Endangered and To Designate Critical Habitat. Federal Register July 10, 2003, Vol. 68 (132) 41169-41174. Washington, DC.

USDI Fish and Wildlife Service. 2004. Endangered and Threatened Wildlife and Plants; 12-month Finding for a Petition to List the West Coast Distinct Population Segment of the Fisher (*Martes pennanti*). Federal Register April 8, 2004, Vol. 69 (68) 18769-18792. Washington, DC.

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.

USDI Fish and Wildlife Service. 2007. *National Bald Eagle Management Guidelines*. Retrieved online at: http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B008.

USDI Fish and Wildlife Service. 2008. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Northern Spotted Owl. Federal Register August 13, 2008, Vol. 73 (157) 47326-47522. Washington, DC.

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

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.

USDI Fish and Wildlife Service. 2012b. Endangered and Threatened Wildlife and Plants: Designation of Revised Critical Habitat for the Northern Spotted Owl; Final Rule. Federal Register. December 4, 2012, Vol. 77 (233) 71876-72068. 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, University of California, 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, Department of Fisheries and Wildlife, Oregon State University. 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):**889-897.

Waring, R. H., W.G. Thies, and D. Muscato. 1980. Stem growth per unit of leaf area: a measure of tree vigor. *Forest Science* **26(1):**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.

Wemple, B.C., J. Jones, and G. Grant. 1996. Channel Network Extension by Logging Roads in Two Basins, Western Cascades, Oregon. *Water Resources Bulletin*. **32(6):** 1195-1206.

Wemple, B.C., F.J. Swanson, and J.A. Jones. 2001. Forest Roads and Geomorphic Process Interactions, Cascade Range, Oregon. *Earth Surface Processes and Landforms* **26:**191-204.

White, Diane. 2001. Guidelines for snag and down wood prescriptions in Southwestern Oregon. U.S.D.A. Forest Service, Umpqua N.F.

Wilson, T.M. 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, C. and T. Reinhart. 2003. Final Report: Review of potential air emissions from burning polyethylene plastic sheeting with piled forest debris. Prepared by URS Corporation for USDA Forest Service Pacific Northwest Research Station. Seattle, WA.

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.

Zielinski, W. J., R. L. Truex, G.A. Schmidt, F.V. Schlexer, K. N. Schmidt, and R.H. Barrett. 2004. Home Range Characteristics of Fishers in California. *Journal of Mammalogy* **85(4):** 649-657.

APPENDIX A – SURVEY AND MANAGE COMPLIANCE

Survey & Manage Tracking Form: Wildlife Species Survey and Site Management Summary

Medford District BLM –Ashland Resource Area

Project Name: Howard Project **Prepared By:** Ginelle O'Connor

Project Type: Forest Management **Date:** 10 June 2013

Location: T. 38 S., R. 03 E., in sections 11-13, 23, and 26; T. 38 S., R. 04 E. in sections 7, 17, 19, and 29; T. 39 S., R. 03 E., in section 1; and T. 39 S., R. 04 E., in sections 5; Willamette Meridian, Jackson County, Oregon

S&M List Date: 2001 (No Annual Species Reviews)

Survey & Manage Wildlife Species

The Medford BLM District compiled the species listed below from the *2001 Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines* (excluding subsequent Annual Species Reviews [ASRs]). The list includes those vertebrate and invertebrate species with pre-disturbance survey requirements (Category A, B, or C species), whose known or suspected range includes the Medford BLM according to:

- *Survey protocol for the Great Grey Owl within the Range of the Northwest Forest Plan v3.0* (January 2004)
- *Survey Protocols for Amphibians under the Survey & Manage Provision of the Northwest Forest Plan v3.0* (October 1999)
- *Survey Protocol for the Red Tree Vole v2.1* (October 2002)
- *Survey Protocol for S&M Terrestrial Mollusk Species v3.0* (Duncan et al. 2003)

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.

This list also includes any Category D, E, or F species with known sites located within the Howard Forest Management Project Area. Management recommendations are based on professional judgment in accordance with site-specific conditions and proposed treatments.

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								
Great Gray Owl (*Strix nebulosa*)	C	Yes	Yes	Yes	Yes	1997/1998 2013/2014	6	Yes
Mollusks								
Chase Sideband (*Monadenia chaceana*)	B[1]	Yes	Yes	Yes	Yes	2008 2013	TBD[4]	TBD[4]

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?	
Evening Fieldslug (*Deroceras hesperium*)	B[1]	Yes	Yes	No	No[2]	NA[2]	TBD[4]	TBD[4]
Crater Lake Tightcoil (*Pristiloma arcticum crateris*)	A	Yes	Yes	No	No[3]	N/A	N/A	N/A
Oregon Shoulderband (*Helminthoglypta hertleini*)	B[1]	Yes	Yes	Yes	Yes	2008 2013	TBD[4]	TBD[4]

Acronyms: N/A = Not Applicable TBD=To Be Determined

*"Habitat disturbing" and thereby a trigger for surveys as defined in the 2001 ROD S&Gs (p. 22).

[1]Equivalent-effort pre-disturbance surveys are required for this species.

[2]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.

[3]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.

[4] 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 BLM, Ashland Resource Area applied the 2001 Species List (excluding subsequent Annual Species Reviews) to the Howard Forest Management Project, completing pre-disturbance surveys and management of known sites required by Survey Protocols and Management Recommendations to comply with the *2001 Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines*.

Summary of Survey Results

Project surveys located sites for the following Survey and Manage wildlife species:

- Great Gray Owls (six sites): all sites will receive appropriate management protections.
- 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.

_s:/ Ginelle O'Connor_____ _____1/13/14_____
Ginelle O'Connor, Wildlife Biologist Date
Medford BLM District, Ashland Resource Area

Survey & Manage Tracking Form: Botany Species Survey and Site Management Summary

Medford District—Ashland Resource Area

Project Name: Howard Forest Management Project **Prepared By:** Armand Rebischke
Project Type: Forest Management Project **Date:** January 13, 2014

Location: T. 38 S., R. 03 E., in sections 11-13, 23, and 26; T. 38 S., R. 04 E. in sections 7, 17, 19, and 29; T. 39 S., R. 03 E., in section 1; and T. 39 S., R. 04 E., in sections 5; Willamette Meridian, Jackson County, Oregon

S&M List Date: 2001 (No ASRs)

Survey & Manage Botany Species

No Survey and Manage species were detected during surveys in the Project Area. No known Survey and Manage species sites from historic surveys exist in the Project Area.

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* species list to the Howard project, completing the pre-disturbance surveys required by Survey Protocols and Management Recommendations to comply with the 2001 Record of Decision.

_s:/ Armand Rebischke_____ _____1/13/14_____
Armand Rebischke, Botanist Date
Medford BLM District, Ashland Resource Area

APPENDIX B – 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

Decommission: To remove those elements of a road that reroute hillslope drainage and present slope stability hazards. This usually involves removing the culverts, ripping the road prism, installing drainage facilities (i.e. waterbars, waterdips, etc.) and replanting the road surface with grasses, legumes, shrubs, and trees.

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.

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): 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.

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.