United States Department of the Interior

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

IN REPLY REFER TO:

JUN 01 2012

1792(ORM060)

Dear Interested Public:

The *Environmental Assessment* (EA) for the Heppsie Forest Management Project is now available for public review. The EA is available in its entirety online for public review at http://www.blm.gov/or/districts/medford/plans/index.php. A hard copy is available for review at the Medford District Office. The Bureau of Land Management (BLM), Ashland Resource Area, proposes to implement the Heppsie Forest Management Project, designed to implement specific Management Objectives consistent with the 1995 Medford District Resource Management Plan (RMP). The Heppsie project involves harvesting trees in conifer forest stands on BLM-administered lands in the North Fork Little Butte Creek and South Fork Little Butte Creek subwatersheds of the Little Butte Creek Watershed.

Forest management would be accomplished using a combination of timber sale and service contracts. Forest thinning (or other 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 the maintenance of fire resilient species such as pine and incense cedar, and maintain northern spotted owl habitat.

Alternatives analyzed in detail in this EA would harvest timber on 316 to 392 acres utilizing tractor and cable logging systems. The alternatives also include unit-specific activity fuels treatments, tree planting, and pre-commercial thinning. A range of 0 to 1.24 miles of new road construction is proposed to access harvest units. An estimated 13 miles of existing roads would be used as haul routes and improved as needed to meet BLM standards.

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, (2) information or evidence of flawed or incomplete analysis; (3) BLM's determination that there are no significant impacts associated with the proposed action, and (4) alternatives to the Proposed Action that would respond to purpose and need. Specific comments are the most useful. **Although comments are welcome at any time, the comment period will close at 4:30 PM on July 5, 2012.**

Before including your address, telephone number, email address, or other personal identifying information in your comment, please be advised that your entire comment, including your personal identifying information, may be made publicly available at any time. While you can request that we withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

All comments should be made in writing and mailed or delivered to Ted Hass, Ashland Resource Area, 3040 Biddle Road, Medford, OR 97504. Further information on this proposed project is available at the Medford District Office, 3040 Biddle Road, Medford, Oregon 97504 or by calling Ted Hass, Ashland Assistant Field Manager, at (541) 618-2253.

Sincerely,

John Gerritsma
Field Manager
Ashland Resource Area

Enclosure

ENVIRONMENTAL ASSESSMENT

for the

HEPPSIE FOREST MANAGEMENT PROJECT

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

(DOI-BLM-OR-M060-2012-0017-EA)

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

EA COVER SHEET

RESOURCE AREA: Ashland

ACTION/TITLE: Heppsie Forest Management Project

EA NUMBER: DOI-BLM-OR-M060-2012-0017-EA

LOCATION: T. 36 S., R. 02 E., in section 35; T. 36 S., R. 03 E. in section 31; T. 37 S., R. 02 E., in section 1; and T. 37 S., R. 03 E., in sections 5, 6, 7 and 8, Willamette Meridian, Jackson County, Oregon.

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CHAPTER 1 - PURPOSE AND NEED

A. INTRODUCTION

The Bureau of Land Management (BLM), Ashland Resource Area, proposes to implement the Heppsie Project, a forest management project. The Heppsie Forest Management Project is designed to implement specific Management Objectives for lands allocated to the production of Timber Resources under the Bureau of Land Management's 1995 Medford District Resource Management Plan (RMP). 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 Heppsie 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 AND WHERE IS THE PROJECT LOCATED?

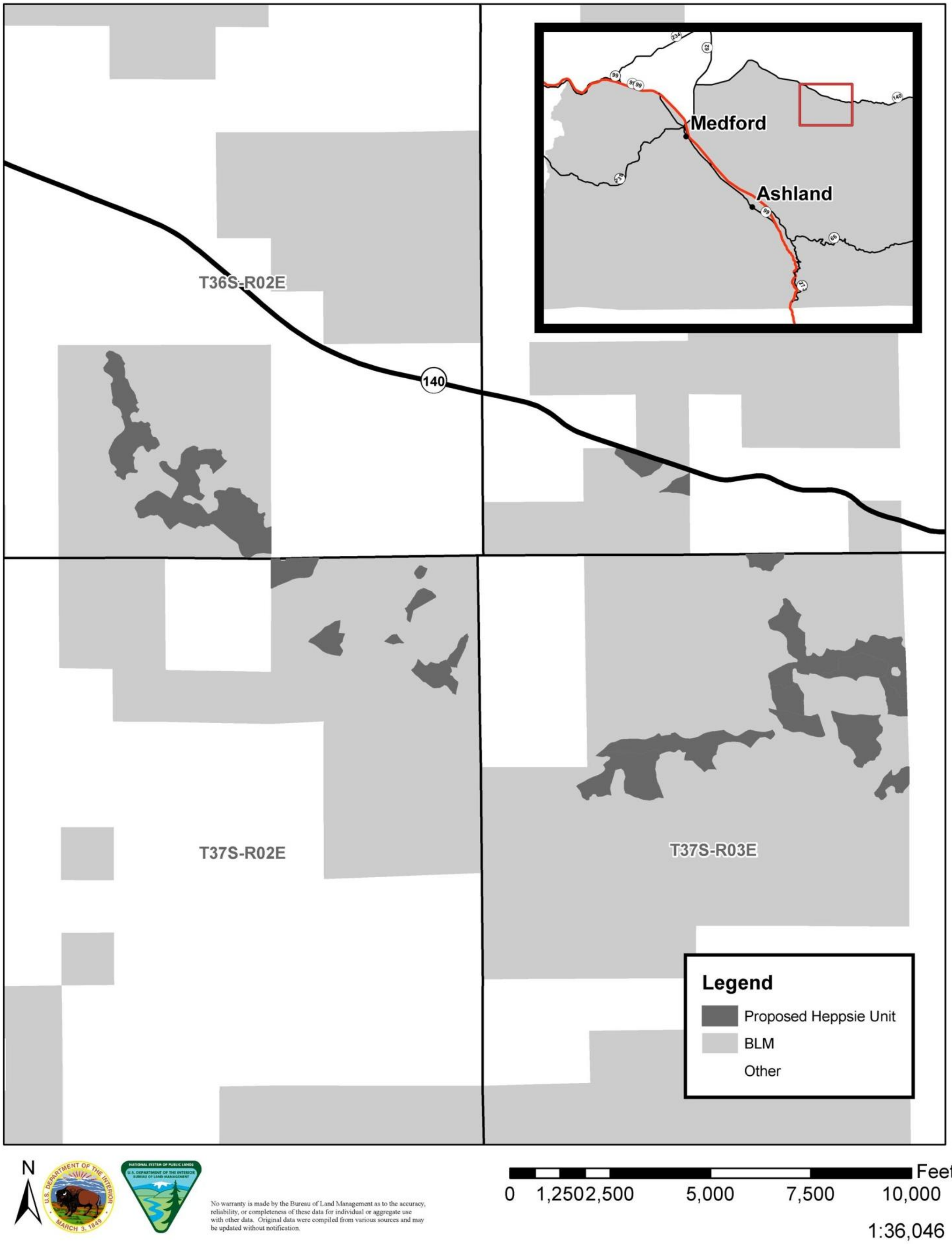
This section provides a brief summary of the BLM's proposal for forest management. A more detailed description of alternatives designed to implement forest management for timber production is included in Chapter 2, Alternatives: B. Components Common to the Action Alternatives. The proposed Heppsie Project would implement forest management activities in conifer forest stands on BLM-administered land in the North Fork Little Butte Creek and South Fork Little Butte Creek subwatersheds of the Little Butte Creek Watershed.

Forest management would be accomplished using a combination of timber sale and service contracts. Forest thinning (or other 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 pest and disease, and, in some cases, promote the maintenance of fire resilient species such as pine and incense cedar.

Alternatives analyzed in detail in this EA would harvest timber on 321-397 acres utilizing tractor and cable logging systems. The alternatives also include unit-specific activity fuels treatments, tree planting, and pre-commercial thinning. A range of 0 to 1.24 miles of new road construction is proposed to access harvest units. An estimated 14 miles of existing roads would be used as haul routes and improved as needed to meet BLM standards.

The project area is defined as the area where action is proposed. The Public Land Survey System description for the proposed Heppsie Timber Sale Project is: T. 36 S., R. 02 E., in section 35; T. 36 S., R. 03 E. in section 31; T. 37 S., R. 02 E., in section 1; and T. 37 S., R. 03 E., in sections 5, 6, 7 and 8, Willamette Meridian, Jackson County, Oregon (Map 1-1).

Map 1-1. Vicinity Map - Heppsie Project



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

The design and development of the Heppsie 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 (1995 RMP, pp. 72-73);
- Provide timber products from Matrix land allocations in accordance with the direction in the Medford District's 1995 Resource Management Plan (1995 RMP, pp. 72-73);
- Maintain a transportation system within the project area that serves the management of resource program areas including timber management (1995 RMP, pp. 84-88).

1. Need for the Proposed Heppsie Project

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

There is a need to maintain and promote vigorously growing conifer forests, reduce tree mortality, and provide timber resources, in accord with sustained yield principles, on BLM-Administered Matrix lands within the Heppsie Project Area.

One of the applicable laws governing the major portion of BLM-administered lands in the Heppsie 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 Heppsie Project Area are to produce a sustainable supply of timber and other forest commodities. Timber products produced from this area would be sold in support of the District's Allowable Sale Quantity (ASQ) declared in the RMP (1995 RMP, pp. 17, 72-73). The Heppsie 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.

There is a need to maintain existing nesting, roosting, foraging and dispersal habitat conditions in the Heppsie Forest Management Project Area to contribute to the conservation and recovery of species listed as Threatened or Endangered and their habitats in compliance with the BLM's RMP (USDI 1995, p. 50-51) and the Endangered Species Act (ESA).

In 2008, the U.S. Fish and Wildlife Service issued a Recovery Plan for the Northern Spotted Owl (NSO). The recovery plan was subsequently challenged in Court, and a revision was completed and finalized in 2011. Recovery plans are not regulatory documents; rather, they provide guidance to bring about recovery and establish criteria to be used in evaluating when recovery has been achieved. The BLM continues to work with the Service to incorporate Recovery Goals and Actions that are consistent with the BLM laws and regulations.

To contribute to the recovery and survival of the northern spotted owl, the responsible official must consider the extent to which the Heppsie Forest Management Project affects the current acreage and distribution of northern spotted owl habitat within the Analysis Area. A description of northern spotted owl habitat follows:

> **Nesting, roosting and foraging (NRF) habitat** is characterized by forested stands with older forest structure with characters such canopy closure of 60 percent 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.
>
> **Dispersal-only habitat** for spotted owls is defined as stands that typically have a canopy closure of 40 percent or greater, are greater than 40 years-old with an average tree diameter of 11 inches, and are open enough for flight and predator avoidance, but do not meet the habitat criteria of NRF habitat. Dispersal-only habitat is used throughout this document to refer to habitat that does not meet the criteria of NRF (nesting, roosting, or foraging) habitat, but has adequate cover to facilitate movement between blocks of suitable NRF habitat.
>
> **Capable Habitat** for the northern spotted owl is forest land that is currently not habitat but can become NRF or Dispersal habitat in the future, as trees mature and canopy fills in. Stands that are considered Habitat Capable generally exhibit a deteriorating stand condition (via low tree species diversity and forest disease) and are not currently providing a forest canopy cover greater than 40 percent.

There is a need to provide a transportation (road) system within the Heppsie Project Area that provides access for the management of resource program areas (1995 RMP p. 86) including timber resources, while reducing their effects on water, soils, fish, and wildlife.

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 are in need of maintenance to restore or improve road surfaces, cross drains, and roadside drainage ditches in order to reduce road related erosion and sedimentation to stream courses. Road construction is proposed to facilitate access to lands needing treatment; road construction and improvements are designed for the Heppsie Forest Management Project to reduce road related erosion and sedimentation to stream courses.

D. DECISION FRAMEWORK

This Environmental Assessment 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 Heppsie Forest Management Project. The Ashland Resource Area Field Manager must decide whether to implement action based on the action alternatives or whether to select the No-Action alternative, or a combination of components found within those Alternatives analyzed.

The decision will also include a determination whether or not the impacts of the action are significant to the human environment. If the impacts are determined to be within the range analyzed in the Medford District Resource Management Plan Environmental Impact Statement, 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 Heppsie Forest Management Projectis located on BLM-administered lands allocated to produce a sustainable supply of timber. Timber products removed to meet Timber Resource Objectives (ROD/RMP p.17, 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 Medford District Resource Management Plan

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

E. LAND USE CONFORMANCE AND LEGAL REQUIREMENTS

Conformance with Land Use Plans

Due to previous ongoing litigation, the Medford District initially designed this project to be consistent with both the 1995 RMP and the 2008 Western Oregon Plan Revision (WOPR). On May 16, 2012, U.S. District Court (Pacific Rivers Council et al v. Shepard) vacated the 2008 Records of Decision/Resource Management Plans for western Oregon BLM districts and reinstated the BLM's 1995 RODs/RMPs. As of May 16, 2012, the Medford District has reverted back to its 1995 ROD/RMP as the official land use plan record. The 1995 Medford District Resource Management Plan 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).

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in *Conservation Northwest, et al. v. Sherman, et al.*, No. 08-1067-JCC (W.D. Wash.), granting Plaintiffs' motion for partial summary judgment and finding NEPA violations in the *Final Supplemental to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (USDA and USDI, June 2007). In response, parties entered into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011. Projects that are within the range of the northern spotted owl are subject to the survey and management standards and guidelines in the 2001 ROD, as modified by the 2011 Settlement Agreement.

The Heppsie Project is consistent with the Medford District Resource Management Plan/Forest Land and 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), as modified by the 2011 Settlement Agreement.

Statutes and Regulations

The Proposed Action is designed 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.

- **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

Watershed Analysis (USDI 1997)
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. Analysis teams of resource specialists identify and describe ecological processes of greatest concern in a particular "fifth field" watershed, and recommend restoration activities and conditions under which other management activities should occur. Watershed Analysis is not a decision making process. 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 Heppsie Project Area falls within the Little Butte Creek Watershed Analysis Area. The Watershed Analysis focused on the use of existing information available at the time the analysis was conducted, and provides baseline information. Additional information, determined to be necessary for completing an analysis of the Heppsie Forest Management Project, has been collected and is considered along with existing information provided by the 1997 Little Butte Creek Watershed Analysis. Management Objectives and Recommendations provided by the Watershed Analysis were considered and addressed as they applied to the Heppsie proposal.

The current condition of the lands affected in the Heppsie Project Area is the result from a multitude of natural processes and human actions that have taken place over many decades. The Little Butte Watershed Analysis reported that past road development throughout the watershed has increased surface erosion, contributed to slope instability, confined stream channels (leading to stream downcutting), aggregated the effects of natural flood events, and increased rates of sediment produced to streams above historical reference conditions (LBWA p. 60-61).

The Little Butte Watershed Analysis also reported the effects of past timber harvesting (primarily clear-cutting) and tractor yarding on soil compaction, slope stability, hydrologic processes, water quality, and aquatic and wildlife habitat (including coarse woody material and snags). The current condition of the land affected by the proposed action are described in Chapter 3 under the Affected Environment sections specific to each resource. The current conditions described in the Affected Environment, reflect both natural processes and human actions that have taken place over many decades in the Little Butte Creek

Watershed. This EA will address the effects of the Heppsie Project, which includes road construction and timber harvesting, by analyzing the potential for cumulative impacts that may result when adding the incremental effects of the Heppsie propose action together with the effects of past, current and reasonably foreseeable future actions (see Chapter 3: Considerations of Past, Ongoing, and Reasonably Foreseeable Actions in Effects Analysis).

Water Quality Restoration Plan – North and South Forks Little Butte Key Watershed (USDI 2006)
The BLM is recognized by Oregon Department of Environmental (DEQ) as a Designated Management Agency for implementing the Clean Water Act on BLM-administered lands in Oregon. The BLM has signed a Memorandum of Agreement (MOA) with the DEQ that defines the process by which the BLM will cooperatively meet State and Federal water quality rules and regulations.

To comply with the BLM-DEQ Memorandum of Agreement, the BLM completed the Water Quality Restoration Plan for the North and South Forks Little Butte Key Watershed. This document describes how the Bureau of Land Management (BLM) will meet Oregon water quality standards for 303(d) listed streams on BLM-administered lands within the North and South Forks Little Butte Creek Key Watershed. The organization of the Water Quality Restoration Plan is designed to be consistent with the DEQ's Rogue Basin Water Quality Management Plan (WQMP) and contains information that supports the Oregon Department of Environmental Quality’s (DEQ) Rogue Basin Total Maximum Daily Load (TMDL). A TMDL defines the amount of pollution that can be present in the waterbody without causing water quality standards to be violated. DEQ established the final Rogue Basin TMDL in 2008 for temperature and bacteria.

A WQMP is developed to describe a strategy for reducing water pollution to the level of the load allocations and waste load allocations prescribed in the TMDL. The approach is designed to restore the water quality and result in compliance with the water quality standards, thus protecting the designated beneficial uses of waters of the state. Through implementation of the RMP, Aquatic Conservation Strategy, and Best Management Practices, the proposed action and alternatives are designed towards attaining the recovery goals for listed streams on federal lands in the North and South Forks Little Butte Key Watershed. Recovery goals are identified in the Water Quality Restoration Plan for the North and South Forks Little Butte Key Watershed (USDI BLM 2006). The proposed action and alternatives draw upon the passive and active restoration management actions recommended for achieving federal recovery goals. Following the WQRP for the North Fork and South Forks Little Butte Creek Key Watershed assures that BLM’s management in the interim, between listing of the stream as water quality limited and the establishment of TMDL for the stream, will not violate the Clean Water Act.

U.S. Department of Interior, Bureau of Land Management, Western Oregon Districts, Transportation Management Plan (1996, updated 2002)
This transportation management plan, is not a decision document, rather it provides guidance for implementing applicable decisions of the Medford District Resource Management Plan (which incorporated the Northwest Forest Plan).

Southwest Oregon Fire Management Plan
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, and (3) 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 January 11, 2012. Three comment letters were received, one on the behalf of four separate parties.

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

- Colombaroli, D.C. and D.G. Gavin. 2010. Highly Episodic Fire and Erosion Regime Over the Past 2,000 Years in Siskiyou Mountains, Oregon. PNAS, 107 (2010), pp. 18909-18915.
- 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.
- Trombulack, S.C. and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. *Conservation Biology* 14(1): 18-30.

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 were determined to be out of the scope of analysis for the Heppsie Project; those issues are discussed below under subsection G, 2, Issues Considered but not Further Analyzed. 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 were identified by the interdisciplinary team based on internal and external scoping.

- There could be short-term increases in sediment from roadbed and drainage ditch disturbance associated with road maintenance activities.

- Some commenters expressed concerns regarding the potential presence of fragile soils in existing roadbeds in the project area and their possible contribution of sediments to the watershed.

- Some commenters expressed concern that logging and road building could contribute to upland erosion in the Little Butte Creek Watershed.

- 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.

- Proposed tractor logging and road construction would increase soil compaction, displacement, and reduce site productivity.

- 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 and associated organisms.

- Any increased sedimentation to streams from the implementation of the project proposal could potentially impact aquatic habitat and fish.
- Under the Medford District BLM's October 2006 Water Quality Restoration Plan (WQRP), some streams within the Heppsie Analysis Area do not meet water quality standards and are 303(d) listed.
- Timber harvest and road construction has the potential to affect northern spotted owl nesting, roosting, foraging, and dispersal habitat.
- Timber harvest and associated activity has the potential to affect rare bird species, Bureau Sensitive bat species, goshawks and Pacific fisher.
- Timber harvest activities, including (but not limited to) road construction and the treatment of Douglas-fir dwarf mistletoe infected trees, could reduce the complexity of forest structure including vertical and horizontal diversity, snags, and coarse woody material (CWM) 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.
- Lower volumes associated with light thinning in some project units could affect the overall economic feasibility of project implementation.
- Commenter suggested that appropriate harvesting systems, operations costs, road maintenance and the potential for winter hauling should be considered to achieve an economically viable sale.
- Some commenters stated that proposed new road construction should be built to function as permanent roads to allow future access into lands designated for timber production and to provide for meeting long-term objectives.
- Some commenters expressed concern that the project appeared (in the scoping letter maps) to be entering areas that are currently considered "low-density" road areas.
- Both existing roads and new roads proposed for construction need to be evaluated for stability, long-term necessity and placement with regard to road density per square mile, location with regard to riparian reserves, and potential for sediment delivery in the Little Butte Creek Key Watershed.
- 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 nonnative plants and noxious weeds.
- Some commenters expressed concern that harvest of large trees would contribute to habitat fragmentation for those species dependent on large-scale habitat patches.
- Some commenters expressed concern regarding untreated logging slash and increased wildfire behavior and risk that could result from even a temporary increase in ground-based fuels.

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, Alternatives Considered but not Analyzed in Detail for options and alternatives considered but not further analyzed.

Slope Instability in South Fork Little Butte Creek and Dead Indian Canyon: Comments were received stating concerns that the Little Butte Watershed Analysis (p. 59) identified numerous areas of instability in the South Fork Little Butte Creek and Dead Indian Canyon during slope stability mapping for the Shellick, Owens and Dead Indian timber sales.

Rationale for Eliminating from Detailed Analysis: These timber sale areas are located on Forest Service managed lands approximately 5 miles east and up-watershed from the Heppsie Timber Sale. Any activities in the Heppsie Project Area would have no influence on areas of slope instability located in the Shellick, Owens, and Dead Indian Timber Sale Areas located on Forest Service managed lands of Dead Indian Creek and South Fork Little Butte Creek drainages.

Foreseeable cumulative impact from treatment of future mistletoe infections: One commenter suggested that the BLM must consider future treatments of Douglas-fir dwarf mistletoe as a reasonable action for management to suppress the disease.

Rationale for Eliminating from Detailed Analysis: Silvicultural prescriptions proposed under this Heppsie Forest Management Project are assumed to be the extent of timber harvesting that would occur in proposed units for the next 15 to 30 years (average 20 years). The type of silvicultural treatment these stands may need in the future (approximately 20 years) would be determined at that time, based on stand conditions at a point in time in the future. To attempt to analyze future needs at this time would be speculative.

CHAPTER 2 - ALTERNATIVES

A. INTRODUCTION

This chapter describes the alternatives 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 (as modified by IM-OR-2010-074), are an essential part of proposed actions. The PDFs are included as features of action alternatives in the analysis of anticipated environmental impacts.

B. COMPONENTS COMMON TO THE ACTION ALTERNATIVES

1. Silvicultural Objectives and Prescriptions

The silvicultural objectives for treatment are as follows: 1) increase resistance/resilience of forests stands to wildfire, drought, insects, etc.; 2) restore more characteristic stand structure and composition for mixed conifer forest types; 3) accelerate development of structural complexity (e.g., increase growing space and decrease competition for large or legacy pine, oak, and cedar); and 4) maintain critical components of nesting, roosting, and foraging owl habitat.

Trees would be marked for thinning 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 will be marked to retain specific percent canopy cover by prescription (Figure 2-1).

Figure 2-1. Photographs Illustrating >60% Canopy Cover (left) and 40% Canopy Cover (right).

Northern Spotted Owl Nesting, Roosting, Foraging Habitat (NRF)
Forest stands that are currently providing northern spotted owl nesting, roosting, and foraging 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. However, southwest Oregon NRF habitat varies greatly, and one or more of these habitat components might be lacking or even absent. 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.

Selective Thinning:
Selective thinning in NRF habitat is designed to accelerate the growth of large trees while maintaining a minimum of 60% canopy cover at the stand level. Canopy cover is the proportion of the forest floor covered by the vertical projection of tree crowns. Canopy cover is usually estimated with devices like a 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 greater than 60% at the stand level[1]. Stands or portions of stands that have lower and mid canopy layers are integral with stand level canopy measurements and will be included as leave tree retention for canopy cover. Trees targeted for removal should 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 will be individually selected for removal that demonstrate these characteristics, unless removal compromises the required minimum canopy cover of 60%.

Maintain NSO Dispersal Habitat (DSP)
Forest stands that are currently providing for northern spotted owl Dispersal Habitat would be thinned to retain approximately 40% canopy cover to maintain the current distribution of Dispersal Habitat. Dispersal habitat is described as forested habitat greater than 40 years old with an average tree diameter of 11 inches, a canopy closure of 40% or more, and flying space for owls in the understory. The primary objective of thinning is to reduce stand densities and enhance stand level diversity, including hardwoods and desirable understory species. The silvicultural strategy here includes the use of density management.

Density Management:
Spacing of the residual (leave) trees would involve crown spacing of the healthiest dominant and co-dominant trees to achieve an average crown spacing range of 3-15 feet (dripline to dripline) at the stand level. Trees targeted for removal should 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 will be individually selected for removal that demonstrate these characteristics, unless removal compromises the required minimum canopy cover of 40%. Spacing of the residual trees would use the crown widths of the healthiest dominant and co-dominant trees to achieve an average relative density range of 0.25 to 0.45 (25% to 45%). Small gaps may be created around pine and cedar trees greater than 20-inches diameter at breast height (DBH) and/or where pockets of disease are present. Do not to exceed ¼-acre in size for gap openings and there must be a minimum distance of 350 feet between the edges of openings or gaps. Silvicultural prescriptions are based on site conditions that dictate forest types such as pine, dry Douglas-fir, and mixed conifer. Stands will be marked according to plant community or series indicated below.

Pine Site Thinning:
These stands may have developed a substantial component of Douglas-fir as a result of fire exclusion and stands have become overstocked with all condition classes of vegetation. These are areas with southerly or easterly aspects and shallow soils where pine species are best adapted. They are typically small in size and found on dry ridges and low elevations with Douglas-fir mortality occurring. The goal for these sites is the retention of existing large ponderosa pine and the subsequent development of young pine. The treatments would leave the best, healthiest pine trees and remove the majority of Douglas-fir trees to allow the pine to once again dominate the site.

- Leave 60-100 ft^2 basal area[2] per acre of the largest healthiest species.
- Reduce competing vegetation around healthy pines, oak, and incense cedar to ensure their survival.
- Protect exceptional hardwoods (oak trees 10-inches DBH and larger, madrone trees 16-inches DBH and larger with full live crown ratios of 30% or greater).
- Leave all codominant and dominant pine, cedar, and oak; suppressed individual trees can be cut.

Douglas-fir Thinning:
Dry Douglas-fir stands are typically found on west, southwest, east, and southeast aspects in Douglas-fir plant associations. Douglas-fir is the predominant conifer species and ponderosa pine is often present in the stands. Treatments proposed for these sites would be thinned to a basal area range of 80 to 120 ft^2 (average 100) per acre. The larger healthier trees would be favored as leave trees. On dry ridges and sites

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[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 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.

in the Douglas-fir-Incense Cedar-Pipers Oregon Grape (PS<E/CADE27-BEPI) plant association, especially where poison oak is found, trees would be thinned to retain no more than 80 ft^2 basal area per acre.

<u>Mixed Conifer Thinning</u>:
These stands are comprised of a mix of tree species that include Douglas fir, ponderosa pine, sugar pine, incense cedar, and white fir. Thinning objectives for mixed conifer stands are to improve tree vigor and growth, and to maintain a larger proportion of Douglas-fir species while maintaining the highest diversity of mixed conifer species for the stand. Treatments proposed for these sites are designed to thin sites to a basal area range of 100 to140 ft^2 (average 120) per acre. Species composition of the forest must be considered as well as individual tree physiology. A minimum of 20% early-seral species should be maintained in the mixed conifer forest stands as described by Franklin and Dyrness (1973). Therefore, selection of treatment trees would be based on 1) species; 2) tree dominance; 3) age class or diameter; and 4) individual tree characteristics. Suitable sugar pine, Douglas-fir, incense cedar, and ponderosa pine (disease free, non-chlorotic sugar pine, Douglas-fir, incense cedar, and ponderosa pine with crown ratios ≥ 30%) would be favored for leave over white fir.

Maintain NSO Capable Habitat (CAP)
Habitat Capable for the northern spotted owl are forest lands that are currently not habitat, but can become NRF or Dispersal Habitat in the future, as trees mature and canopy fills in. In forest stands that are not currently providing northern spotted owl NRF or Dispersal Habitat, the primary objective is to improve tree species diversity and to reduce the long-term effects of forest disease. These sites are exhibiting a deteriorating stand condition and are not currently providing a forest canopy cover greater than 40%. The silvicultural strategy here includes the use of insect and disease management.

<u>Insect and Disease Management</u>:
This prescription is typically for stands with less than 40% canopy cover that is currently not habitat, but can become NRF or Dispersal habitat in the future. Many of these stands developed in conjunction with disturbance (fire, insects, harvest, etc.) and lack species and structural diversity. The silvicultural strategy here includes the use of a single-tree selection method, whereby insect-damaged and diseased white fir and Douglas-fir trees would be removed, and non-diseased pine and cedar trees would be retained on drought-prone sites. Single-tree selection would be followed up with the reintroduction of drought tolerant and fire resilient tree species through tree planting. The Medford District RMP (USDI 1995) instructs to “design silvicultural treatments so that within-stand endemic levels do not increase.” The presence of mistletoe requires a variation in prescriptions with stand conditions in these areas requiring lower than 40% canopy cover (USDI 1995). This prescription applies to stands or parts of stands that already exhibit less than 40% canopy due to disease mortality. Those stands exhibiting a deteriorating condition due to disease would be harvested, leaving a residual overstory of 6-8 overstory trees per acre (TPA) greater than 20-inches DBH, or the largest available diameters.

<u>Precommercial Thin (PCT)</u>
This work consists of cutting surplus trees and shrubs to increase moisture, growing space and nutrient availability for selected conifer and hardwood leave trees. All sprouting hardwood stems not selected as leave trees and all surplus trees up to 7 inches DBH would be cut. Vigorous and well-formed conifer leave trees would be maintained at either 18-foot spacing (134 TPA) or 20-foot spacing (109 TPA) spacing and well-formed leave hardwoods would be maintained at either 30-foot spacing (48 TPA) or 35-foot spacing (36 TPA) spacing depending on the particular treatment unit. All tree species less than7 inches DBH are reserved from cutting except Douglas-fir, incense cedar, Pacific madrone, white fir, ponderosa pine, and black oak. All shrub species are reserved from cutting, except whiteleaf manzanita, greenleaf manzanita, deerbrush, and buckbrush.

<u>Tree Planting (TP)</u>
This includes the initial planting of nursery seedling stock after site preparation has been completed on a harvest unit. In some cases, the entire unit would be planted. In other cases, the inter-planting of nursery stock would occur in stands that need more seedlings between existing trees to raise stocking levels to

meet BLM's fully stocked standards. Often included with tree planting are maintenance treatments to enhance growth or increase the chance of seedling survival in the first years after planting. This would include hand-tool scalping a 2-foot radial circle of the competing grasses and forbs around the planting spot, and/or paper mulch or vispore installation to prevent soil moisture loss around the planting spot, and/or installation of tree netting to prevent browsing by wildlife, and/or an application of a delay release fertilizer packet with the seedling at the time of the planting.

General Guidance Applicable to all Silvicultural Prescriptions

Strive to 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.

Avoid the harvest of old-growth trees. Old-growth trees are defined to have the following characteristics:

- 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).
- 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.
- Douglas-fir will have thick bark with deep fissures and have a chocolate brown color. Second-growth trees have more gray color in the bark. Ponderosa pines will have thick bark, plate-like and yellow orange in color.

To encourage the maintenance and establishment of drought tolerant and fire resilient species, always favor leaving sugar pine, ponderosa pine, incense cedar, Douglas-fir, and white fir, respectively.

Leave trees that are associated with old trees (i.e. root grafts, shared crowns) or create a unique type of stand structure for wildlife habitat.

Strive to retain snags of various size and decay classes. Favor large, deformed or unique green trees in the stand for future snag recruitment. When available, leave green trees (any diameter) immediately adjacent to snags that are greater than 16-inches DBH. These trees will provide additional structural and habitat diversity. Leave a minimum of 3 snags per acre of decay class 1 and 2 for trees greater than 16-inch DBH and greater than16-feet in height if present.

When available, leave green trees (any diameter) immediately surrounding large (greater than 16 inches diameter and 8 feet in length) pieces of coarse woody debris. Retention of green trees would minimize coarse woody debris disturbance and maintain the functional integrity of the coarse woody debris. Leave 120 linear feet of decay class 1 and 2 down woody material equal to or greater than16 inch diameter and equal to or greater than16 feet in length per acre if present.

Do not mark large hardwoods greater than16 inches DBH for cut. Leave large hardwoods for stand diversity. Never mark a conifer with its crown entangled in a hardwood tree.

Thin around large (greater than18-inches DBH) or old-growth pine, oak and cedar trees. Protect these tree species by increasing growing space and decreasing competition around these trees. Mark all competing conifers around the leave or center tree twice the distance of the tree's dripline (distance from tree bole to dripline) if prescribed canopy cover retention for the stand is not compromised. Leave all trees in a group if they exhibit old-growth characteristics. Trees that exhibit old-growth characteristics should be preferred over tree size when selecting an individual or group to protect. Trees that are associated with old-growth trees and create a unique type of stand structure or wildlife habitat shall not be marked.

Where diseased trees are encountered, target heavily infected trees for removal first; secondly, focus on leaving resistant species, followed by uninfected or the least infected trees with infections confined to the lower third of the tree. Disease infected trees may be marked for treatment if prescribed canopy cover retention for the stand is not compromised.

2. Commercial Harvest Methods

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

(a) **Cable Yarding:** trees are end-lined to the corridor then in-hauled up the slope to a landing area on or near a road with one end suspended and one end on the ground. Corridors would be generally less than 15 feet wide, depending on the size of trees to be removed and the terrain; locations are approved by the BLM. Landings would be a minimum of 150 feet apart as operationally feasible. Guyline trees (approximately 3 per landing area), corridor trees and trees posing safety hazards would be removed when operationally required.

(b) **Tractor Skidding:** utilizes tractors to drag trees to landing locations. Tractor skidding only occurs on lands with less than 35% slopes. This method requires narrow skid trails (about 9- to 12-feet wide). Skid trail locations are approximately 150 feet apart and vary depending on the site-specific terrain, and are pre-designated by the purchaser and approved by the BLM sale administrator. Pre-located 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.

3. Fuels Reduction Treatments

Fuels reduction treatments involve cutting small trees (generally less than 8 inches diameter) and vegetation with chainsaws and disposing of the material by handpiling and burning.

To meet State air quality requirements, prescribed underburning would be implemented during periods of atmospheric instability (when weather disturbances are moving into or through the area) and air is not trapped by inversions on the valley floor. This allows smoke to be lofted up and away from the Rogue Valley. These atmospheric conditions are more frequent in late winter to spring.

Prescribed Fire Plans, also referred to as Burn Plans, must be completed prior to a planned fire ignition and approved by the Field Manager. Prescribed Fire Plans guide the implementation based on site-specific unit conditions (including fuel moisture and weather conditions) at the time of planned ignition, and provide for pre- and post-burn evaluation to monitor if the burn was carried out as planned and its effectiveness at meeting resource objectives. The Prescribed Fire Plan is an important tool for ensuring that project goals and objectives are met in a safe and carefully controlled manner.

C. ALTERNATIVES DESCRIBED IN DETAIL

1. Alternative 1 – No-Action

The No-Action Alternative describes a baseline against which the effects of the action alternatives 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 management would be implemented; there would be no commercial cutting of trees, no roads would be constructed or improved, and there would be no pre-commercial thinning or fuels reduction. The analysis of the No-Action Alternative answers the question: What would occur to the resources of concern if an 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 Heppsie Project 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 a subsequent NEPA document.

2. The Action Alternatives

This section describes the two action alternatives considered in detail. The narrative summary of each alternative is followed by a table of harvest units, a road use table, and a table detailing proposed new road construction (where applicable). The tables of harvest units provide the following information for each unit: unit number, acreage, harvest prescription, harvest method, and associated fuels or pre-commercial thinning treatments. The road use and road construction tables provide details for project roads (existing or proposed) by road number, approximate length, ownership, surface type, and seasonal restrictions. Components of the action alternatives that are common to both alternatives (i.e., project design features, silvicultural prescriptions, and fuels reduction treatments) are described in further detail under Subsection C., Components Common to the Action Alternatives.

a. Alternative 2

Alternative 2 was developed to achieve the needs described in Chapter 1for the Heppsie Forest Management Project. An estimated 392 acres of conifer forests would receive commercial forest thinning treatments; a summary of each prescription type proposed is described in detail under Subsection B. (1), Silvicultural Objectives and Prescriptions. An estimated 291 acres would be harvested using tractor yarding harvest method, and the remaining 101 acres would be harvested using cable yarding. Post-harvest in commercial harvest units, activity fuels (slash generated from harvest activities) would be handpiled. In units identified for pre-commercial thinning (Table 2-2), vegetation (generally 8-inches diameter and less) 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.

An estimated 13 miles of existing roads would be used as haul routes and improved as needed to meet BLM standards (Table 2-3). Road improvements could include such items as spot rocking, cleaning road drainage ditches and culvert basins, repairing and installing water dips, and grading and shaping road surfaces. BLM would renovate a portion of road 37-3E-5.3 to facilitate access to harvest Unit 5-11. Renovation of roads 37-3E-06.00B and 37-3E-06.08D would involve reshaping the road with a blade and restoring water drainage. Alternative 2 would construct approximately 1.2 miles of new road to provide access to proposed harvest units (Table 2-4).

Table 2-1 summarizes the Heppsie Forest Management Project by silvicultural prescription type, timber harvest method, and associated non-commercial treatment type. Unit specific information is displayed in Table 2-2 and Maps 2-1 and 2-2.

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

Silvicultural Prescriptions	Est. Acres
Maintain NSO Nesting, Roosting, and Foraging Habitat (NRF)	51
Maintain NSO Dispersal Habitat	226
NSO Capable	44
Remove NSO Dispersal Habitat	68
NRF to Dispersal Habitat	8
Total	**397**
Density Management Units: Dry Douglas-fir Thinning	**356** 128

Silvicultural Prescriptions	Est. Acres
Mixed Conifer Thinning Pine Site Thinning	97 131
Insect and Disease Management	36
Pre-commercial thinning and planting	5
Total	**397**
Timber Harvest Method	**Est. Acres**
Cable Yarding	101
Tractor Yarding	291

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	14	Tractor	Insect/Disease Management	Capable	Activity Fuels, PCT
1-3	2	Tractor	Insect/Disease Management	Capable	Activity Fuels, PCT
1-4	5	N/A	No Harvest	Capable	PCT, Activity Fuels, Planting
1-6	4	Tractor	Douglas-fir thinning	Capable	Activity Fuels
1-7	10	Tractor	Insect/Disease Management	Capable	Activity Fuels
1-8	1	Tractor	Insect/Disease Management	Dispersal (R)	Activity Fuels
1-9	12	Tractor	Douglas-fir thinning	Dispersal (M)	Activity Fuels
5-1	6	Tractor	Douglas-fir thinning	NRF (M)	Activity Fuels, PCT
5-7	20	Cable	Douglas-fir thinning	Dispersal (M)	Activity Fuels
5-8	8	Tractor	Mixed Conifer thinning	Dispersal (M)	Activity Fuels
5-9	25	Tractor	Mixed Conifer thinning	Dispersal (M)	Activity Fuels, PCT
5-11	8	Tractor	Mixed Conifer thinning	Dispersal (M)	Activity Fuels
5-13	9	Tractor	Insect/Disease Management	Capable	Activity Fuels, PCT
5-14	12	Tractor	Mixed Conifer thinning	Dispersal (R)	Activity Fuels, PCT
5-15	45	Cable	Douglas-fir thinning	NRF (M)	Activity Fuels
6-1	36	Tractor	Mixed Conifer thinning	Dispersal (R)	Activity Fuels
7-1	19	Cable	Douglas-fir thinning	Dispersal (R)	Activity Fuels
7-2	17	Cable	Douglas-fir thinning	Dispersal (M)	Activity Fuels
8-1	8	Tractor	Mixed Conifer thinning	NRF (D)	Activity Fuels
31-1	10	Tractor	Pine Site thinning	Dispersal (M)	Activity Fuels, PCT
31-2	5	Tractor	Douglas-fir thinning	Dispersal (M)	Activity Fuels
35-3	38	Tractor	Pine Site thinning	Dispersal (M)	Activity Fuels
35-4	83	Tractor	Pine Site thinning	Dispersal (M)	Activity Fuels
TOTAL	**397**				

Abbreviations: M=Maintain R=Remove D=Downgrade
NRF=Nesting, Roosting, Foraging
PCT=Pre-Commercial Thin

Table 2-3 provides a detailed road-by-road listing of proposed road use and Table 2-4 provides details for road construction proposed under Alternative 2.

Table 2-3. Alternative 2 Road Use Table – Existing Roads

Road Number	Approximate Length (miles)	Existing Surface:	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)
36-2E-35.0	0.35	NAT	BLM	3	1
36-3E-31.00 A	0.63	BST	BLM	3	2
36-3E-31.00 B	0.46	ASC	BLM	3	1
36-3E-31.00 C	0.60	ASC	BLM	3	1
36-3E-31.00 D	1.53	ASC	BLM	3	1
36-3E-31.00 E	1.44	ASC	BLM	3	1
37-2E-01.00	1.24	ASC	BLM	3	1
37-2E-01.02 A	0.35	ASC	BLM	3	1
37-2E-01.02 B	0.19	NAT	BLM	3	1
37-2E-01.03 A	0.50	ASC	BLM	3	1
37-3E-05.01	1.03	ASC	BLM	3	1
37-3E-05.02	0.42	NAT	BLM	3	1
37-3E-05.03	0.15	NAT	BLM	3	1
37-3E-06.00 A	0.23	NAT	BLM	3	1
37-3E-06.00 B	0.12	NAT	BLM	Remove small trees from roadbed. Brush and blade.	1
37-3E-06.02	0.32	PRR	BLM	3	1
37-3E-06.06	0.93	ASC	BLM	3	1
37-3E-06.08 A	0.23	ASC	PVT	3	1
37-3E-06.08 B	0.47	ASC	BLM	3	1
37-3E-06.08 C1	0.20	ASC	BLM	3	1
37-3E-06.08 C2	1.08	ASC	BLM	3	1
37-3E-06.08 D	0.59	ASC	BLM	3	1
37-3E-06.08 D	0.12	NAT	BLM	Open closed road. Brush and blade. Improve drainage.	1
Total mileage	**13.18**				

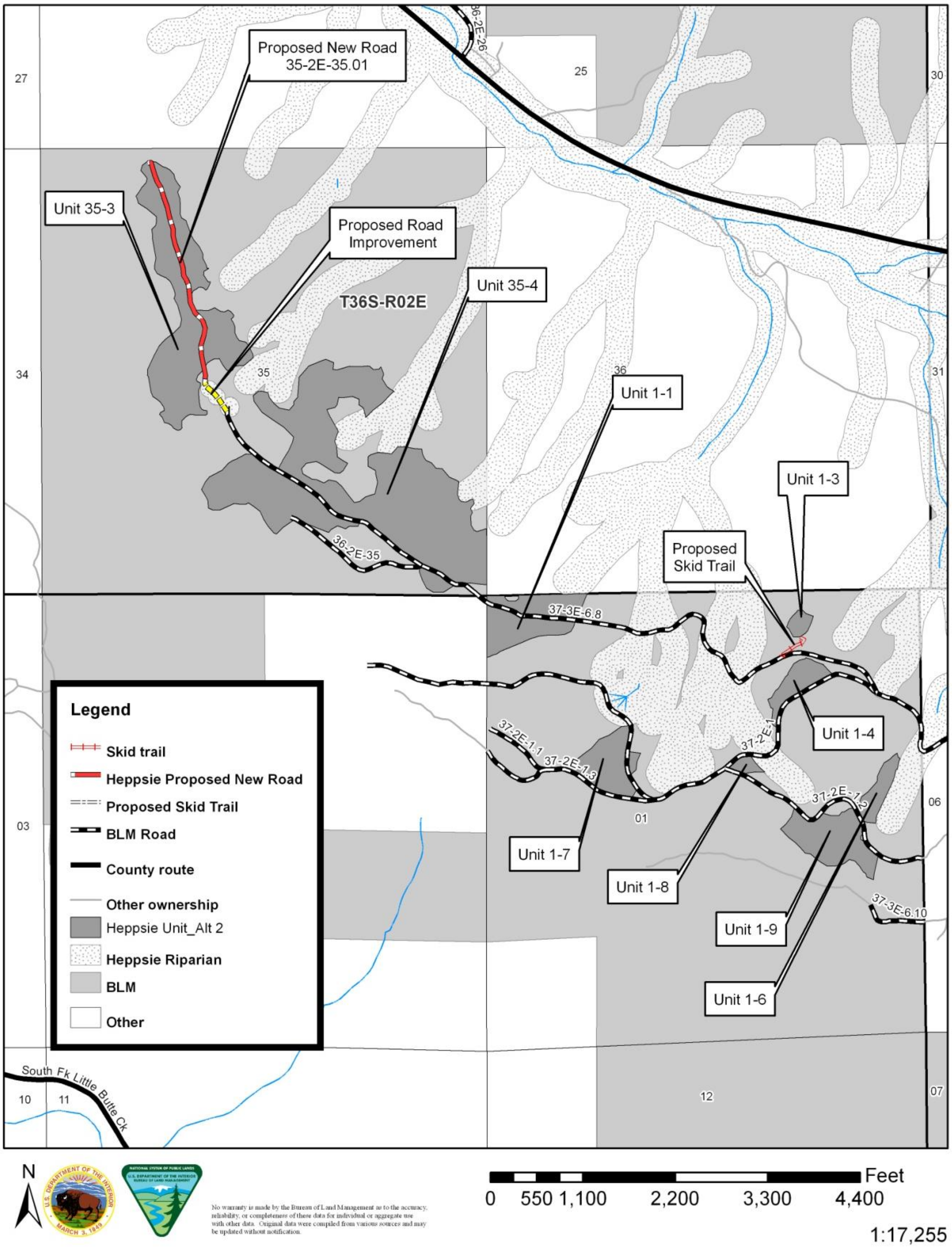
Abbreviations:
Existing Surface: NAT = natural, PRR = Pit Run Rock, ASC = Aggregate Surface Course, BST = Bituminous Surface Treatment
Control: BLM = Bureau of Land Management, PVT = Private
Seasonal Restrictions (for log hauling):
1 = hauling restricted between 10/15 and 6/1
2 = hauling restricted between 11/15 and 5/15
Note: If Purchaser furnishes and places additional rock. Seasonal restrictions could be modified as approved by the Authorized Officer

Table 2-4. Alternative 2 – Proposed Road Construction

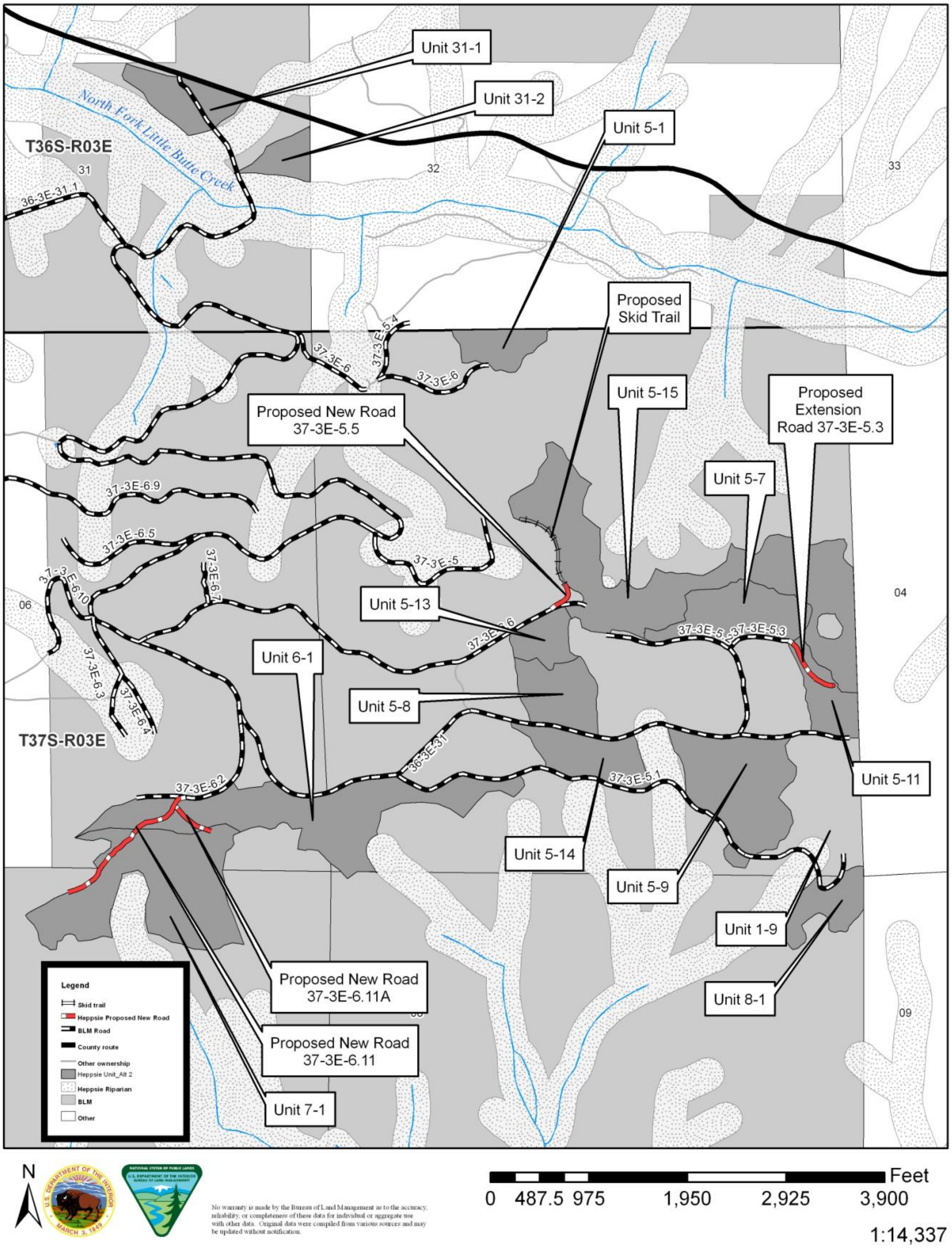
Road Number	Approximate Length (miles)	Existing Surface: Depth (inches) and Type	Control	Type
36-2E-35.01	0.61	NAT	BLM	
37-3E-05.03	0.13	NAT	BLM	Extend Existing Road
37-3E-05.05	0.11	NAT	BLM	
37-3E-06.11	0.30	NAT	BLM	
37-3E-06.11 Spur A	0.09	NAT	BLM	
Total mileage:	**1.24**			

Abbreviations:
Existing Surface: NAT=Natural
Control: BLM=Bureau of Land Management

Map 2-1. Heppsie Project Alternative 2



Map 2-2. Heppsie Project Alternative 2



b. Alternative 3

Alternative 3 is designed to achieve the needs described in Chapter 1 for the Heppsie Forest Management Project while eliminating new road construction. An estimated 316 acres of conifer forests would receive commercial forest thinning treatments; a summary of each prescription type proposed is described in detail under Subsection B.(1), Silvicultural Objectives and Prescriptions. An estimated 275 acres would be harvested using tractor yarding harvest method, and 41 acres would be harvested using cable yarding. Pre-commercial thinning (understory thinning) is also proposed on 78 of these 316 acres. All 316 acres would be treated for activity fuels reduction following the completion of harvest activity. There is 5 acres of pre-commercial thinning and planting not associated with commercial harvest.

Proposed haul routes would be the same as proposed under Alternative 2 (see Table 2-3). As in Alternative 2, haul routes would be improved as needed to meet BLM standards. Road improvements could include such items as spot rocking, cleaning road drainage ditches and culvert basins, repairing and installing water dips, and grading and shaping road surfaces. BLM would renovate an existing portion of road 37-3E-6.8 to facilitate access to harvest Unit 35-3, which would involve reshaping the road with a blade and restoring water drainage. Additionally, access into Unit 1-3 would be through an existing skid road. Upon completion of harvest activity, this skid road would be drained (via waterbar installation) and blocked at its intersection with road 37-3E-6.8. Table 2-7 provides a detailed road-by-road listing of proposed road use.

Table 2-5 summarizes the Heppsie Forest Management Project by silvicultural prescription type, timber harvest method, and associated non-commercial treatment types. Unit specific information, including fuels reduction treatments, is displayed in Table 2-6 and Maps 2-3 and 2-4.

Table 2-5. Summary of Acres for Alternative 3 by Silvicultural Prescription and Harvest Method

Silvicultural Prescriptions	Est. Acres
Maintain NSO Nesting, Roosting, and Foraging Habitat (NRF)	31
Maintain NSO Dispersal Habitat	189
NSO Capable	43
Remove NSO Dispersal Habitat	49
NRF to Dispersal Habitat	8
Total	**321**
Density Management Units: Dry Douglas-fir Thinning Mixed Conifer Thinning Pine Site Thinning	**289** 68 106 115
Insect and Disease Management	27
Pre-commercial thinning and planting	5
Total	**321**
Timber Harvest Method	**Est. Acres**
Cable Yarding	41
Tractor Yarding	275

Table 2-6. Alternative 3 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	14	Tractor	Disease Management	Capable	Activity Fuels, PCT
1-3	2	Tractor	Disease Management	Capable	Activity Fuels, PCT
1-4	5	N/A	No Harvest	Capable	PCT, Activity Fuels, Planting
1-6	4	Tractor	Douglas-fir	Capable	Activity Fuels
1-7	10	Tractor	Disease Management	Capable	Activity Fuels
1-8	1	Tractor	Disease Management	Dispersal (R)	Activity Fuels
1-9	12	Tractor	Douglas-fir	Dispersal (M)	Activity Fuels
5-1	6	Tractor	Douglas-fir	NRF (M)	Activity Fuels, PCT

Unit No.	Acres	Harvest Method	Silvicultural Prescription		Associated Treatments
			Harvest Prescription	NSO Habitat Type	
5-7	16	Cable	Douglas-fir	Dispersal (M)	Activity Fuels
5-8	8	Tractor	Mixed Conifer	Dispersal (M)	Activity Fuels
5-9	25	Tractor	Mixed Conifer	Dispersal (M)	Activity Fuels, PCT
5-11	8	Tractor	Mixed Conifer	Dispersal (M)	Activity Fuels
5-13	9	Tractor	Mixed Conifer	Capable	Activity Fuels, PCT
5-14	12	Tractor	Mixed Conifer	Dispersal (R)	Activity Fuels, PCT
5-15	25	Cable	Douglas-fir	NRF (M)	Activity Fuels
6-1	36	Tractor	Mixed Conifer	Dispersal (R)	Activity Fuels
8-1	8	Tractor	Mixed Conifer	NRF (D)	Activity Fuels
31-1	10	Tractor	Pine Site	Dispersal (M)	Activity Fuels, PCT
31-2	5	Tractor	Douglas-fir	Dispersal (M)	Activity Fuels
35-3	22	Tractor	Pine Site	Dispersal (M)	Activity Fuels
35-4	83	Tractor	Pine Site	Dispersal (M)	Activity Fuels
TOTAL	**321**				

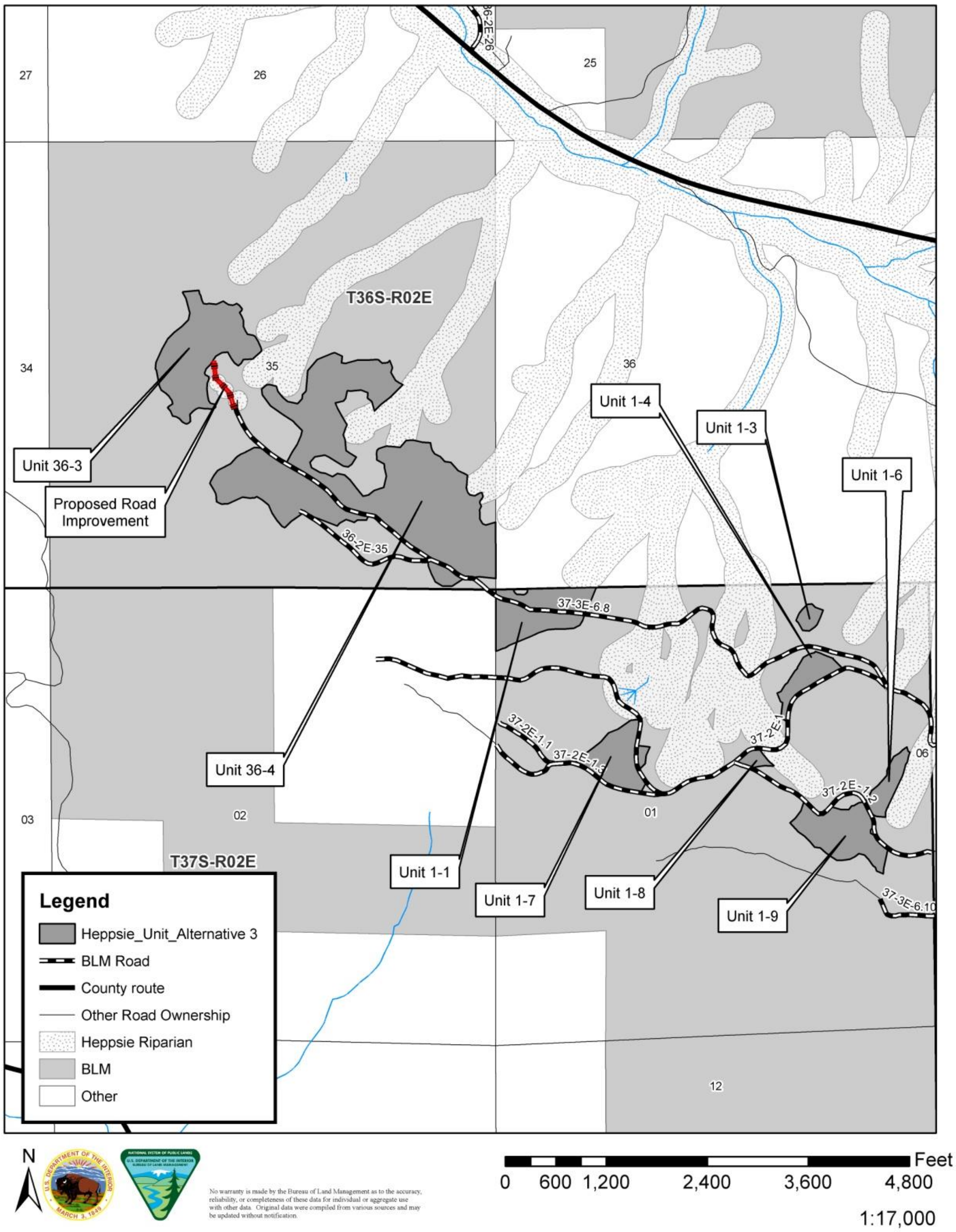
Table 2-7. Alternative 3 Road Use Table – Existing Roads

Road Number	Approximate Length (miles)	Existing Surface:	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)
36-2E-35.0	0.35	NAT	BLM	3	1
36-3E-31.00 A	0.63	BST	BLM	3	2
36-3E-31.00 B	0.46	ASC	BLM	3	1
36-3E-31.00 C	0.60	ASC	BLM	3	1
36-3E-31.00 D	1.53	ASC	BLM	3	1
36-3E-31.00 E	1.44	ASC	BLM	3	1
37-2E-01.00	1.24	ASC	BLM	3	1
37-2E-01.02 A	0.35	ASC	BLM	3	1
37-2E-01.02 B	0.19	NAT	BLM	3	1
37-2E-01.03 A	0.50	ASC	BLM	3	1
37-3E-05.01	1.03	ASC	BLM	3	1
37-3E-05.02	0.42	NAT	BLM	3	1
37-3E-05.03	0.15	NAT	BLM	3	1
37-3E-06.00 A	0.23	NAT	BLM	3	1
37-3E-06.00 B	0.12	NAT	BLM	Remove small trees from roadbed. Brush and blade.	1
37-3E-06.02	0.32	PRR	BLM	3	1
37-3E-06.06	0.93	ASC	BLM	3	1
37-3E-06.08 A	0.23	ASC	PVT	3	1
37-3E-06.08 B	0.47	ASC	BLM	3	1
37-3E-06.08 C1	0.20	ASC	BLM	3	1
37-3E-06.08 C2	1.08	ASC	BLM	3	1
37-3E-06.08 D	0.59	ASC	BLM	3	1
37-3E-06.08 D	0.12	NAT	BLM	Open closed road. Brush and blade. Improve drainage.	1

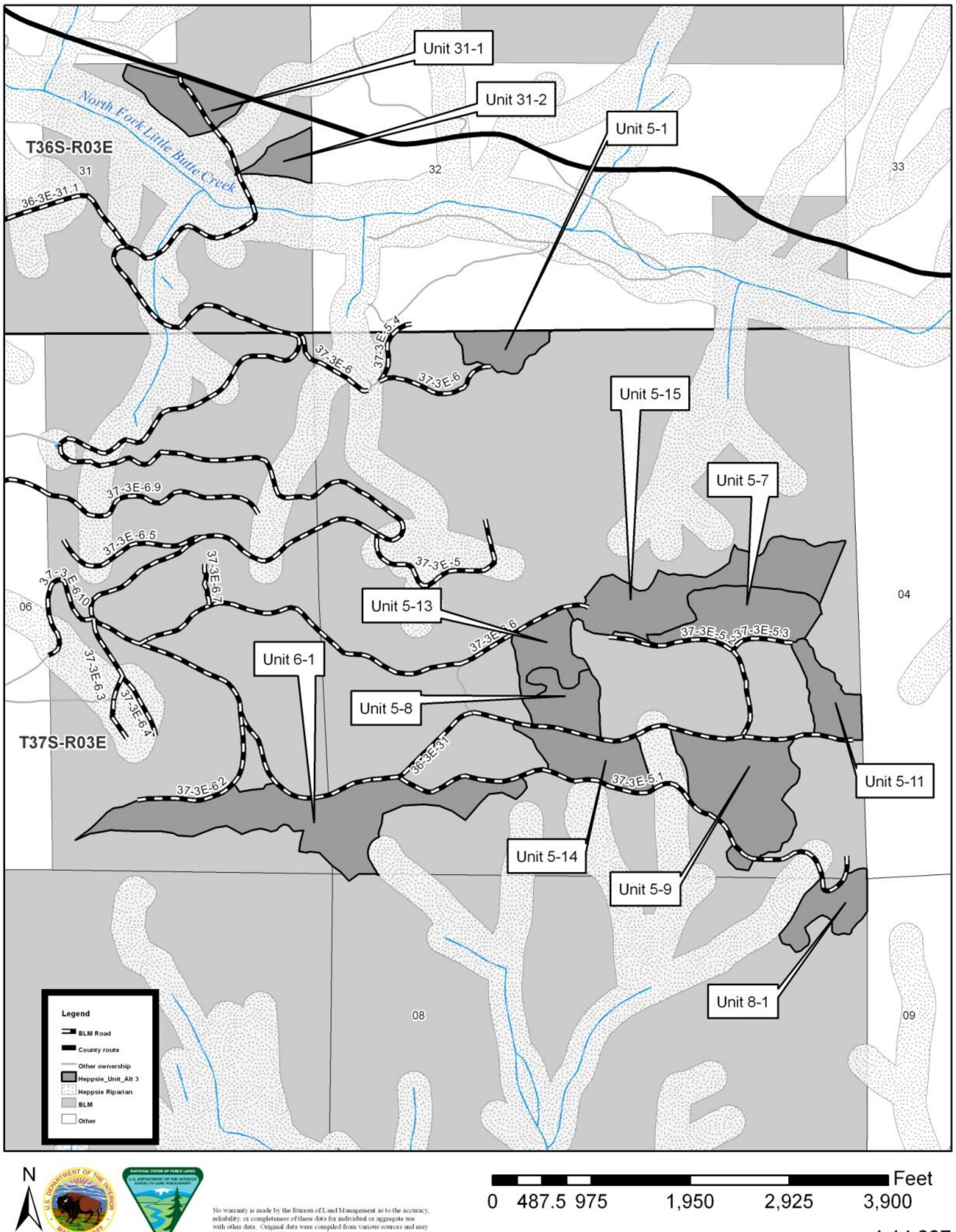
Road Number	Approximate Length (miles)	Existing Surface:	Control	Possible Road Stabilization or Drainage Improvements	Seasonal Restriction (for log hauling)
Total mileage	**13.18**				

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
Seasonal Restrictions (for log hauling):
1 = hauling restricted between 10/15 and 6/1
2 = hauling restricted between 11/15 and 5/15
Note: If Purchaser furnishes and places additional rock. Seasonal restrictions could be modified as approved by the Authorized Officer

Map 2-3. Heppsie Project Alternative 3



Map 2-4. Heppsie Project Alternative 3



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 most standard operating procedures.

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 Proposed Action Alternatives 2 and 3.

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 Heppsie project 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 site-specifically using the NWFP Standards and Guidelines (USDA and USDI 1994, pp. C-30-31) and the *Little Butte Creek Watershed Analysis* (USDI and USDA 1997, pp. 181, 195). See Maps 2-1 to 2-4 for Riparian Reserve locations for the Heppsie Project Area. Site specific widths for each Riparian Reserve have been mapped in GIS and would be implemented under the action alternatives. Riparian Reserve widths in the Heppsie project area are as follows:

(1) Fish streams: 330-foot distance on each side of the stream.
(2) Perennial non-fish-bearing streams: 165 feet slope-distance on each side of the stream.
(3) Intermittent non-fish-bearing streams: 165 feet 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-durations.
    - ***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. For this project, a buffer of 100 feet is being implemented to meet this requirement.
(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. For this project, a buffer of 165 feet, the height of one site potential tree, is being implemented to meet this requirement.

b. Harvest and Yarding

<u>*Objective 1: Protect Riparian Reserves*</u>

(1) No commercial harvest or pre-commercial thinning 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.

<u>*Objective 2: Prevent Offsite Soil Erosion and Soil Productivity Loss*</u>

(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.
(3) All tractor skid trail locations would be approved by the BLM Contract Administrator. Maximum area in skid trails used would be less than 12% of the harvest unit. Existing skid trails would be utilized when possible. Tractors would be equipped with integral arches to obtain one end log suspension during log skidding. Skid trail locations would avoid ground with slopes over 35% and areas with high water tables, although tractor operations on short pitches exceeding 35% would be permitted. 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. *
(4) All skid trails would be waterbarred according to BLM standards. Main tractor skid trails where they intersect haul roads and at landings would be blocked with an approved barricade and/or slash scattered to preclude OHV use. The intent is to minimize erosion and routing of overland flow to streams by decreasing disturbance (e.g., unauthorized use by OHVs). *
(5) Tractor yarding on designated skid trails would occur between June 1 to October 15 or on approval by the Contract Administrator. Some variations in these dates would be permitted dependent upon weather and soil moisture conditions. Operations involving a harvester-forwarder system, the harvester would not be limited to designated yarding trails but the forwarder would remain on designated trails. Harvester-forwarder operations would be limited to soil moisture conditions less than or equal to 18% by weight at a three inch depth. The intent is to minimize compaction and off-site erosion and sedimentation to local waterways.
(6) Tractor yarding or harvester-forwarder operations would be allowed on snow only when the snowpack is sufficient to protect the soil. Tractor yarding or harvester-forwarder operations would be allowed to start when there is a minimum of eighteen (18) inches of snow. No logging would be allowed once the snow depth deteriorates below eighteen inches of snow to protect soil from compaction (USDI 1995, p. 166)*. Skid trail spacing and soil moisture requirements would be waived if tractor yarding on snow occurs.
(7) 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.
(8) In Disease Management units, coarse woody debris requirements (NWFP p. C-40) would be met post-harvest.

c. Manual Pre-Commercial Thinning

Objective 1: Prevent Offsite Soil Erosion and Soil Productivity Loss

(1) Vegetation would be thinned using manual techniques. Slash created by the project would be handpiled or lopped and scattered.
(2) Old skid trails would not be opened or driven on without the approval of the authorized officer. Cut material would be placed on the running surface of old skid trails or jeep roads that are authorized to be used. *
(3) Old skid roads would not be treated near the intersections with system roads in order to provide a visual screen and discourage vehicular access.
(4) Crossings through dry draws would be limited and approved by authorized officer; vehicles or equipment would not drive up the draw bottoms. *

d. Prescribed Fire

Objective1: Prevent Offsite Soil Erosion and Soil Productivity Loss

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

(2) Any containment lines constructed for fuels projects shall be sufficiently blocked along their entire length to preclude use by OHVs. This would include such measures as placing logs and slash, falling trees less than 8 inches DBH (excluding riparian reserves) or other actions as necessary.

e. 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) Existing landings within Riparian Reserves used during project implementation would be treated to reduce soil erosion. Treatment of the running surface would be dependent on site conditions and would include subsoiling to lift and fracture the compacted surface in place to a depth of 18 inches. Mulching and seeding with native grasses or other approved material would be required. Where feasible, the landings would then be blocked sufficiently to preclude vehicular use.

Objective 2: Prevent Offsite Soil Erosion

(1) Road and 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 a specific erosion control plan (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 road and 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 roads and landings would be seeded with native or approved seed.

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

(5) Temporary routes, also referred to as short operator spurs (100 to 500 feet), would be obliterated at the completion of log haul and within the same season as constructed/opened. Obliteration will include the placing of logs, slash, boulders, berms, and other material so the entrance is camouflaged and vehicle use is precluded throughout its length.

(6) Work would be done between June 1st to October 15th. *

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

(8) Previously closed roads that have been identified and analyzed for use and all newly constructed native surface roads will be adequately blocked at the entrance and, if applicable, along its length to preclude vehicle use.

(9) No side-casting of material is permitted. Extra material not needed for fill will be end-hauled to a stable location.

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.

f. Applicable Culvert Installation/Replacement

Objective 1: Reducing or Eliminating Surface Soil Erosion

(1) Fill material over stream crossing structures would be stabilized as soon as possible after construction/decommissioning has been completed, before October 15th. Exposed soils would be seeded and mulched with native materials or weed free straw. Work would be temporarily suspended if rain saturates soils to the extent that there is potential for environmental damage, including movement of sediment from the road to the stream. *

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

(3) Where surface water is present, sediment and erosion controls would be used during construction to minimize stream sedimentation. Sediment control techniques may include, but are not limited to, settling ponds, silt fences, straw wattles, straw bales, or geotextile fabric or coconut fiber bales. Sediment and erosion controls would be placed immediately (within 10 feet) downstream of the instream work to reduce sediment movement downstream from the project site. *

g. Hauling

Objective 1: Prevent Offsite Soil Erosion

(1) No hauling would occur on natural surfaced roads during the wet season (October 15th to June 1st). This would protect the road from damage and decrease the potential for off-site sediment movement. Some 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 road 36-3E-31.00A, as it is surfaced with at least 6 inches of pit-run rock or 8 inches of crushed rock. Some variations in these dates would be permitted dependent upon weather and soil moisture conditions of the roads.

(3) Dust abatement would include water or lignin.

h. 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.

i. Oil and Hazardous Materials and Emergency Response

During operations described in action alternatives, 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.

j. Silviculture

Objective 1: Protect Residual Leave Trees

(1) In pine site forests, logging slash should be handpiled outside of the driplines of individual pine trees and burned.

(2) Prescribed burns should be performed when moisture conditions are high enough and prescription windows are at a level so that no more than 50% of the mound depth/duff layer around pine trees is consumed during burning.

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

(1) After timber harvest, non-merchantable trees with undesirable silvicultural characteristics should be slashed to reduce hazardous fuels and overall stand density. When thinning understory conifers, select leave trees based on the following criteria to meet silvicultural objectives:
   - (a) Minimum 4-inch terminal leader with at least the top 40 % of the tree containing live limbs.
   - (b) Non-chlorotic, light or dark green with very little or no yellowish tint.
   - (c) Undamaged top.
   - (d) Free of visible disease, cankers, fire damage, or blister rust.
   - (e) Demonstrates good form and vigor.
   - (f) No multiple tops or ramiforms.
   - (g) In the absence of conifers that meet the above definition for an acceptable crop tree, include any live conifer seedling that is at least three (3) feet tall that falls within the spacing guidelines.
   - (h) In the absence of conifer trees, hardwoods will be considered acceptable leave trees. The order of preference will be bigleaf maple, Oregon ash, willow species, any oak species, and Pacific madrone.

(2) Throughout the entire project area, all saplings through pole-sized trees (trees with 7 inches DBH and smaller) should be slashed within the dripline of the old-growth trees.

(3) To reduce the probability of mechanical damage to white fir leave trees, avoid leaving white fir along haul routes, designated skid roads, or adjacent to major landings where mechanical injury can occur during harvest operations.

k. 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.

Objective 2: Reduce Disturbance (noise & habitat) Impacts to Northern Spotted Owl (2008 RMP, pp. 63-64)

(1) Work activities that produce loud noises above ambient levels would not occur within specified distances (Table 2-8) of any documented or generated owl site during the critical early nesting period, March 1 through June 30, or until two weeks after the fledging period. This seasonal restriction may be waived if protocol surveys have determined the activity center is not occupied, owls are non-nesting, or owls failed in their nesting attempt. The distances listed in Table 2-8 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 second nesting attempt).

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

Table 2-8. 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

Activity	Zone of Restricted Operation
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) Reserve from harvest a minimum of 3 snags per acre greater than 17-inches DBH, where available. Retention of snags greater than 17-inches DBH within the interior of the stands would mitigate impacts to cavity-dependent species.
(2) Retain and protect where possible (if not jeopardizing public or worker safety) large, broken-top trees and large snags with loose bark.

Objective 4: Protect Wildlife Species which have mandated protections

(1) A variety of raptors occur across the landscape within the project area. Any nest sites located prior to or during harvest activity would be protected from human disturbances that may disturb or interfere with nesting using a ¼-mile seasonal buffer between approximately March 1st and July 15th (USDI 1995, p. 48).
(2) The Siskiyou Short-horned Grasshopper, a Bureau Sensitive species, is known to occur within the project area and is associated with natural meadows and open areas. Natural meadows are identified as special habitats and receive protection from disturbance as directed in the RMP (USDI 1995, p. 45).
(3) Bald and Golden Eagles, protected by the Bald and Golden Eagle Protection Act and by BLM RMP direction, are known to nest within 5 and 2 miles (respectively) of the Heppsie Project Area. Known nest locations would be protected with a 30-acre buffer. (USDI 1995, p. 49)

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

(1) Known Great Gray Owl nests would be protected with a 30-acre management area and a ¼ mile protection zone (approximately 100 acres).
    a. Within the 30-acre management area, management treatments are limited to protection or improvement of nesting habitat.
    b. Within the ¼-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. Prohibit disturbance from management activities within 300 feet of nesting habitat (1-mile radius for blasting) from March 1st-July 31st, 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 a no-treatment buffer.
(3) Survey and Manage and Bureau Sensitive snails, *Monadenia chaceana*, *Helminthoglypta hertleini*, *Monadenia fidelis celeuthia*, *Vespericola sierranus* would be protected through the combination of no treatment buffers and the protection of high-quality habitat. Buffer size would vary by species, site, condition, directed guidance, and professional judgment.

Objective 6: Manage for Deer and Elk Winter Range (RMP p.48)

(1) All roads, except major collectors and arterials, will be closed between November 15th and April 1st;
(2) Maintain at least 20% of these areas in thermal cover, 70% canopy closure, canopy height of at least 40 feet, and large enough to avoid edge effects; and

(3) Restrict activities to avoid disturbance between approximately November 15th and April 1st.

l. Botanical Resources

Objective 1: Minimize the Spread of Noxious Weeds

(1) Vehicle and equipment use off of existing roads in the Project Area is limited to the dry 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. Equipment moving from a weed infested work site to or through a non-infested area would be field-washed before moving. The field washing station would include a system to contain all weed waste for subsequent landfill disposal.
(3) Seeding of native grasses and/or an approved seed mix on highly disturbed soil (e.g. landings, new road cut and fill slopes, etc.) would occur.
(4) Roadside noxious weed populations would be treated prior to timber sale activity with subsequent treatments as necessary and as funding is available.
(5) Noxious weed populations in existing quarries and stockpiles would be treated prior to use.
(6) On roads with known weed populations, road grading and ditch-pulling would not occur during periods of weed seed production and dissemination, approximately from July 15th to September 1st.

Objective 2: Protection of Special Status Plant Species

(1) Bureau Special Status Plant species (includes Survey and Manage and Bureau-designated species) would be protected by one, or a combination of the following: a) no-treatment buffered areas, or b) distance from proposed units, as needed (Table 2-9).
(2) Other timber sale-associated operations are not allowed in no-treatment buffers, unless specified. These operations include pre-commercial thinning, slash treatment, tailhold trees, intermediate lift trees, etc.
(3) Trees would be directionally felled away from botany reserves.
(4) No landings within 100 feet of any known Special Status Plant species would be used or constructed without approval of the Field Manager in consultation with a Resource Area Botanist. Landings extending beyond the project unit boundaries in undisturbed habitat (e.g. outside existing road prism) must have botany review prior to BLM approval of landing location.
(5) No fuels treatment activity is to take place within no-treatment buffers.

Table 2-9. Protection Measures for Special Status and Survey & Manage Plant Species

T_R_S	SPECIES CODE	SITE NO.	PROPOSED TREATMENT	HARVEST METHOD	PROTECTION	RATIONALE FOR PROTECTION
T37S R03E S06	CYMO2	**12912**	N/A	N/A	None	Site protected by distance to unit.
T37S R03E S07	CASE2	**TBD**	**RX:** Unit 7-1	Cable	**RX:** 100' radius buffer, no activity within buffer.	**RX:** Maintain moisture regime, soil filtration, and microhabitat.

m. 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 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.

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.

n. 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 alternatives are implemented through a timber sale, service, or stewardship contract. Implementation monitoring is accomplished through BLMs 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 Purpose and Need for this project.

Treatment of forest stands identified as RA-32

This action would have treated stands identified by resource area biologists as Recovery Action 32 (RA 32) forest stands. In 2008, the U.S. Fish and Wildlife Service issued a Recovery Plan for the Northern Spotted Owl (NSO). The Recovery Plan includes Recovery Actions, which are recommendations to guide activities that would help to further the recovery objectives for the northern spotted owl. Recovery Action 32 recommends maintaining substantially all of the older and more structurally complex multi-layered conifer forests on Federal lands outside of Managed Owl Conservation Areas. The purpose of RA 32 is to provide refugia for northern spotted owls as they adapt to competitive pressures from an increasing population of barred owls.

Rationale for Elimination: The Ashland Resource Area BLM 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 Heppsie Forest Management Project that met the intent of Recovery Action 32. Stands identified as RA 32 forest stands were removed from consideration for timber harvest and detailed analysis under the Proposed Action.

Project was designed for economic practicality, utilizing all silvicultural systems

The RMP directs that all silvicultural systems (forest thinning strategies) applied to achieve forest stand objectives would be economically practical (USDI 1995, p. 180).

Rationale for Elimination: Helicopter yarding was eliminated as a viable economic method due to the high cost associated with helicopter yarding, low volume associated with light thinning (60% canopy retention) in many units, and current economic conditions affecting the value of timber removed (see Chapter 2, Alternatives, Section C).

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 Heppsie Forest Management Project.

1. Project Area and Analysis area

The terms **project 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 Heppsie Forest Management Proposed Action.
>
> **Analysis areas** vary by resource and include those areas that could potentially be affected by the Proposed Action. 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 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.)

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 Heppsie 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.

Pacific Connector Gas Pipeline (PCGP)

The PCGP Project is a proposed interstate natural gas transmission line designed to transport natural gas from the Jackson County Energy Producers Liquid Natural Gas (JCEP LNG) terminal to markets. The proposed pipeline right-of-way (ROW) crosses through (or is adjacent to) approximately 5 miles of the Heppsie Project area, through the following sections: T. 36 S., R. 02 E., in section 35; T. 37 S., R. 02 E., in sections 1and 2; and T. 37 S., R. 03 E., in sections 5 and 6, Willamette Meridian, Jackson County, Oregon.

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

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

Plans for the installation of the pipeline are still being developed, with a Draft Supplemental Environmental Impact Statement (DSEIS) anticipated for completion in January 2014. Because the plan has not been finalized and additional NEPA analysis is anticipated, the eventual effects of the project are largely unknown at this time, as is the anticipated mitigation plan. Therefore, it would be speculative to attempt to anticipate the potential cumulative effects of the Heppsie Forest Management Project when combined with the effects of the PCGP project. The cumulative effects of both projects will be addressed in the forthcoming PCGP project NEPA analysis.

Down Wind Blowdown Salvage

In the Down Wind Salvage project (CE OR116-08-41), the BLM salvaged approximately 170 acres of timber blown down in a 2008 wind and snow storm event. The storm resulted in widespread wind-thrown trees throughout the Ashland and Butte Falls Resource Areas. The project resulted in the removal of commercial-sized trees via tractor harvesting in areas accessible from existing roads and designated skid trails on lands designated as Matrix lands in the 1995 *Medford District Record of Decision and Resource Management Plan*. Harvest included wind-thrown trees, trees partially uprooted or leaning, and others considered hazardous to the public and/or workers. Removal of trees, while widespread (170 acres), was patchy and not continuous, and was completed in Fall 2011.

B. SILVICULTURE

1. Affected Environment

The Heppsie Forest Management Project proposal is located in the Little Butte Creek watershed, which is a tributary of the Rogue River. For purposes of analyzing the affected environment and the proposed project; the Analysis area for silvicultural analysis considers BLM lands within the Lower North Fork and portions of the Lower South Fork Little Butte Creek sub-watersheds, or 6th field hydrologic units (HUC6s). The total size of the Planning Area is 9,034 acres, or approximately 14 square miles. BLM administered lands comprise 4,213 acres within this area (Table 3-1).

a. Landscape Pattern

The Heppsie Analysis area lies within the Mixed Conifer Zone as described by Franklin and Dyrness (1973). The Heppsie Analysis area lies between 1,840 and 4,431 feet in elevation. The vegetation native to the watershed is a result of time, the unique geology of the area, and anthropogenic influences. Over the course of thousands of years, native inhabitants regularly used fire on the landscape for a wide variety of purposes (USDI 1997). Natural disturbance such as lightning fires, windstorms, and drought contributed to the variation. The lower elevation areas would have been dominated by grassland, oak savanna, and open oak/pine woodland. In the upper valley/canyon area, prime black oak woodland probably existed. Many mixed-conifer stands of the canyon and high plateau sections were comparatively open, with a higher proportion of mature ponderosa and sugar pine than at present (USDI 1997). Infrequent, stand-replacing natural fires on the high plateau may have played a dominant role overall. There is a natural diversity of vegetation condition classes[1] within stands and between stands whose patterns and boundaries are generally dictated by soils, aspect, past disturbance, and fire suppression. The present day vegetation pattern across the watershed landscape results from the dynamic processes of nature and human influences over time. As a consequence, the variation and scales of landscape components are innumerable (USDI 1997). Vegetation disturbance mechanisms (abiotic and biotic) that influence the watershed's forest stand structure are logging, fire and fire suppression, bark beetles, pathogens, and dwarf mistletoe species associated with Douglas-fir and true fir species (USDI 1997).

Table 3-1. Vegetation Condition Classes – Heppsie Analysis area (BLM-administered lands)

Vegetation Condition Class	Acres
Grassland, Shrubs	825

[1] Vegetation Condition Class - The BLM Medford District Watershed Analysis Committee designated 8 vegetation condition classes to

Hardwood/Woodlands	1025
Early (0-5 years) and Seedlings/Saplings (0-4.9 inches DBH)	450
Poles (5-11 inches DBH)	132
Mid (11-21 inches DBH)	1330
Mature (21+ inches DBH)	451
TOTAL ACRES	**4,213**
TOTAL FOREST LAND ACRES	**2,363**

Many trees with old-growth characteristics are dying as a result of increased competition for limited resources with second-growth trees. Douglas-fir (DF) and white fir (WF) are replacing ponderosa pine (PP), sugar pine (SP), and incense cedar (IC) because of their more shade-tolerant nature. Douglas-fir and white fir are encroaching into oak woodlands, and meadows are slowly shifting to shrub-dominated sites. Shade-intolerant shrub and hardwood species that once thrived in open canopy conditions are now limited in growing space opportunities and are relegated only to the edges of closed canopy stands. White oak and black oak have dropped out of some conifer stands where light and water have become limited.

Since landscape vegetative patterns are in constant development, current observations of the landscape vegetation are a snapshot at one single point in time. Although current vegetation stem densities are high and are mostly in the mid- and mature-seral stages, the vegetation condition classes of today are atypical when compared to historic patterns. With or without silvicultural management, the vegetation will continually change because of natural succession. Natural succession is a process where 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.

b. Plant Series and Associations

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

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

Abbreviations:

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

Douglas-fir plant associations comprise 67% of forestland in the analysis area. These associations are predominantly found in warm and dry site conditions. Ponderosa pine is commonly found in the drier and warmer Douglas-fir sites; however, Douglas-fir dominates the understory component of these associations. These dry forest sites comprise 55% of the total land in the Analysis area and include the Ponderosa Pine Series. Of the total forestland acreage in the Analysis area, 80% of the Ponderosa Pine and Douglas-fir Series are in the understory re-initiation stage of forest development. In the understory re-initiation stage, forest canopy begins to differentiate and the understory is exposed to more direct sunlight. Understory re-initiation occurs sooner on droughty sites than on mesic (moist) ones. Trees of most species retain less of their lower foliage on droughty sites, possibly a physiological mechanism for retaining each tree's internal water balance. With less foliage, more light penetrates through the canopy to the forest floor (Oliver and Larson 1996). Due to fire suppression, understory species that once dominated during this stage of development such as ponderosa pine and California black oak are now being outcompeted for sunlight by more shade-tolerant fir species. Shade-tolerant trees such as white fir and Douglas fir thrive in these conditions without a disturbance mechanism to reduce stand density. This occurrence allows for suitable growing conditions for shade-intolerant species. Pine and other shade-intolerant species become outcompeted for resources and eventually are excluded from the stand, giving way to a pure (or nearly so) fir forest. In the absence of any natural disturbance, shade-intolerant species such as pine continue to decline in number, reducing stand-level species diversity.

In acreage, the PSME-CADE27/BEPI plant association is the largest represented forestland plant association in the analysis area (40%). According to the Field Guide to the Forested Plant Associations of Southwestern Oregon (USDA 1996), this is a drier, cooler Douglas-fir association. White fir is frequently present in the understory without a disturbance mechanism, such as fire. Douglas-fir, ponderosa pine, sugar pine, and incense-cedar are the dominant conifers observed. The QUGA4-PSME/RHDI6 plant association is the second-largest represented plant association in the analysis area (25%). This association is dominated by Oregon white oak and is restricted to islands of shallow soils and hot, dry microclimates. Oregon white oak, ponderosa pine, Douglas-fir, and California black oak are generally observed in this association.

c. Forest Stand Condition and Fire Hazard

Approximately 2,363 acres of forestland were initially reviewed for commercial treatment in the Heppsie analysis area. Grasslands, shrublands, and woodlands comprise 44% of the total analysis area. Some of the forest lands within the analysis area have been previously harvested and most commercial forest stands originated between 1800 and 1900. The historical fire cycle in southwest Oregon's low-elevation mixed-conifer forests occurred every 20 years or less. As a result of fire suppression, the analysis area has missed approximately five fire cycles over the last 100 years (USDI 1997). The absence of fire has converted open savannahs and grasslands to hardwood woodlands and initiated the recruitment of conifers. As hardwoods and shrubs encroach into open savannahs and grasslands, over time, shade tolerant conifers begin proliferating through the understory converting the site to a mixed hardwood/conifer woodland condition. As a result, Oregon white oak is now a declining species largely due to fire suppression and encroachment by Douglas-fir and white fir on most sites (USDI 1997). These sites generally do not support shade tolerant conifers in terms of stocking densities, soil composition, moisture, and aspect. Douglas-fir and white fir, therefore, do not grow to normal size, form, and vigor. Conversions from pine to fir are also evident and occur in the same sequence as the conversion from hardwoods to conifers. The conversion from pine to fir has created stands that are stressed. These non-vigorous conifers become susceptible to insect and disease mortality or prematurely die off due to overstocked conditions. The absence of fire due to suppression efforts has changed the composition of the local forests to fire-intolerant, shade-tolerant conifers and has decreased abundance of species such as ponderosa pine and sugar pine (USDI 1997).

Competition in a stand has been directly correlated with stand density. The more stems (i.e., plants) that exist per acre on a site, the fewer resources are available per stem to sustain it. Each stem draws water and nutrients from the soil and occupies a place in the stand that captures sunlight. Without a disturbance regime, these sites become occupied by shade-tolerant species capable of outlasting their shade-intolerant neighbor trees. Various scientific methods have been developed that can predict or identify a threshold when a forest stand will decline in production and health due to factors such as competition. Relative

Density Index (RDI: the ratio of actual stand density to the maximum stand density attainable in a stand with the same mean tree volume) and the Waring Tree Vigor Index are two such measures of both stand and tree level health and productivity.

A productive forest stand absent of natural or human-influenced density control will continue growing until it reaches a condition where the vegetation in the stand occupies all available growing space. The resulting forest exhibits widespread competition and declining productivity as evident in dense stem exclusion stands. A decrease in stand vigor is expected and considered forthcoming with continued overstocking and increasing stand age. Undisturbed populations eventually compete for growing space and gradually thin the population as individuals die in a self-thinning process (Barbour et al. 1987). Drew and Flewelling (1979) concluded that the correlative density index rating of 0.55 for any given stand marks the initial point of imminent mortality and suppression. Of the forested stands inventoried in the Heppsie analysis area, 88% have relative density indices between 0.56 and 0.80, which bounds the zone of imminent competition-mortality (Drew and Flewelling 1979). Currently, the relative densities of stands throughout the analysis area are high. The overall average relative density for forested stands in the Heppsie analysis area inventoried is 0.65, indicating that physiologically, the trees have entered the zone of imminent competition induced suppression and mortality.

Higher tree densities and increased ground fuels in stands have escalated the threat of stand-replacing crown fires, which were historically rare (USDI 1997). The absence of fire due to suppression efforts has changed the forest composition from a fire dependent ecosystem to a densely forested, fire-intolerant condition. Shade-tolerant conifers have decreased the numbers of ponderosa pine, Oregon white oak, and sugar pine. The absence of natural disturbance can alter the structural complexity, health, and fire resiliency of the forest. Throughout southwestern Oregon and most of the western United States, fire is no longer a natural agent of ecosystem stability as it now creates major shifts in forest structure and function.

The current fire regime has transitioned from low to high severity (USDI 1997). The low severity fire regime historically prevalent in the analysis area was one of frequent (1-20 years) and widespread fires resulting from the hot, dry summers (USDI 1997). These frequent fires favored ponderosa pine as a dominant species and white fir as the least dominant. Without disturbance, Douglas-fir now dominates most sites with a higher tolerance to shade and understory competition than pine species. These long-lived shade-tolerant species accumulate to abnormally high densities, and combined with an increase of dead material, can easily transmit fire to the upper canopies. Of the forestland acreage of vegetation series exhibited in the analysis area, stands in the Douglas-fir Series comprised 67 percent compared to stands in the Ponderosa Pine Series at 33 percent.

Frequent fires prevent fuel from accumulating and prepare a seedbed favorable for perpetuating pine species (Waring and Schlesinger 1985). High severity fire regimes, on the other hand, exhibit infrequent, intense, large, stand-replacing fires. These occur when tree densities and surface and ladder fuels build up to a level where fire resiliency is compromised and the entire stand is threatened by intensified burning conditions.

Most of the forest stands became established within 10 years after a fire, although some sites may have taken 30 to 40 years to become forested. The vegetation condition within the total analysis area comprises 24% hardwood/woodland, 20% grassland /shrubland. Plantations comprise 11% of the analysis area (450 acres). Plantations are not considered commercial or natural stands and are not targeted for treatment with this proposal. The oldest trees sampled in the analysis area were 163 years old (DF). The average age of the trees sampled was 100 years old for the analysis area. Individual sample trees greater than 130 years old made up 9% of the total 160-tree sample.

The average canopy cover for sampled stands in the Heppsie analysis area is 81%and ranges from 28-100% (Hann 2003). Only 12% of the forested stands that were inventoried were less than 75% canopy cover. Some forested stands have been selectively logged, underburned by fire, commercially thinned, or have suffered mortality from natural processes. These stands tend to be more diverse in species composition and vertical structure as a result of disturbance. The silvicultural activities proposed resemble natural disturbances that are inherent to forests in which the forest canopy is reduced. Such a modification is similar to a moderate forest ecosystem disturbance regime (Oliver and Larson 1996; Waring and Schlesinger 1985), with moderate and frequent fires and moderate insect and disease-induced mortality pockets.

Older stands or patches of older trees are in the understory re-initiation stage of forest development and vertical stand structure is diverse. In the understory re-initiation stage, natural mortality to the overstory creates canopy openings. Structural complexity begins to develop as new conifers, hardwoods, shrubs and forbs establish in these openings (Oliver and Larson 1996). Natural mortality is a result of openings in the forest canopy caused by Douglas-fir dwarf mistletoe, root diseases, branch abrasion, and wind throw. The understory of these stands consists of dense pockets of conifer regeneration and shrubs. Regeneration ranges from seedling to small pole-size trees, with many of these suppressed. These stands would benefit from pre-commercial or understory thinning.

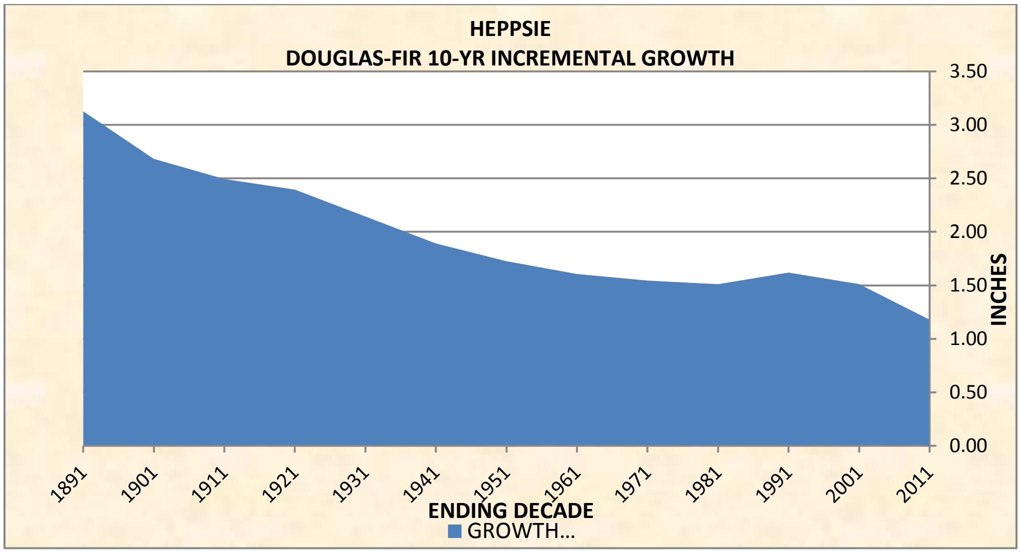
d. Tree Vigor

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). 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 consequently more photosynthetic capacity, subsequently increasing carbohydrate production for storage, seed production, and stem wood growth. Vigorous trees can also fight off beetle attacks with greater success. Waring and Pitman (1985) concluded that trees attacked and killed by bark beetles had such low carbohydrate reserves that they lacked the ability to produce sufficient oleoresins, which protect the tree against beetles.

Vigor rating index numbers are calculations of stem growth per unit of leaf area expressed as grams of stem growth per meter squared per year (g/m^2/year). Trees with vigor ratings below 30 g/m^2/year 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).

For all inventory stands, sample cores were taken from 160 trees representing all vegetation condition classes, major conifer species, and plant association groups across the analysis area. Each core was measured to determine individual tree age and growth rates. Individual tree vigor of Douglas-fir and ponderosa pine were also determined from these measurements. Vigor ratings were derived using the Waring Tree Vigor Index and growth rates were tabulated by decade. Figure 3-1 illustrates the 10-year growth rate (DBH inches per 10-year period) of all 160 sample trees in a variety of plant associations and stand conditions, spanning years 1891 to 2011.

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



e. Pathogens and Insects

Most conifers have an associated bark beetle that is capable of killing the tree under the right conditions (The Southwest Oregon Forest Insect and Disease Service Center). Western pine beetles *(Dendroctonus brevicomis*) and pine engraver beetles (*Ips* spp.) in southwestern Oregon attack the pines, while the flatheaded 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 are less prone to pine bark beetle attack. Stands on south and east aspects below 3,500 foot elevations are particularly vulnerable when their densities are high (USDA 1998).

Western pine beetle (*Dendroctonus brevicomis)* is attacking ponderosa pine in the analysis area, particularly in Unit 35-4. 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.

The susceptibility of trees to damage by bark beetles can be mitigated by stocking control, which is tied closely to 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 improve tree vigor. Trees with vigor ratings above 70 can emit sufficient oleoresins to repel invading beetles and survive even relatively heavy insect attacks. Beetle infestations are occurring in the analysis area and causing mortality in small pockets. Although there is not a current widespread beetle infestation, treatments are designed to improve the vigor of trees to withstand potential outbreaks. Treatments primarily bring the vigor of ponderosa pine to a level where they can withstand attacks of any intensity in order to ensure the survival and perpetuation of pine in the analysis area. DeMars and Roettgering (1982) recommend that "reducing stand stocking to 55 to 70 percent of the basal area needed for full site utilization will relieve the competitive stress among the remaining trees, improve their vigor, and make them less prone to successful bark beetle attack."

Waring and Schlesinger (1985) establish that a reduction in canopy leaf area following a disturbance such as a silvicultural system, fire, insect, or disease induced mortality increases the penetration of radiation and precipitation to the forest floor, thereby increasing soil temperature and available water supply. The overall rate of decomposition in a forest ecosystem is largely determined by temperature and moisture with temperature of primary importance; increasing the soil temperature and moisture stimulates microbial activity and mineralization (Waring and Schlesinger 1985). As forests recover, nutrient and water uptake per unit of leaf area increases as well as the rate of wood production per unit of leaf area.

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 Heppsie analysis area for Douglas-fir was 1.18 inches/decade. As a general rule, stands with growth rates equal to or greater than 1.5 inches of diameter growth per decade are less prone to bark beetle attack (USDA 1998). This growth rate falls short of the 1.5 inches of diameter growth per decade required to withstand bark beetle attack. In addition, the growth trend over the last 20 years for all sampled trees exhibits a declining curve (Figure 3-11). Since 1891, Douglas-fir tree growth in the analysis area has been declining. If all influencing variables (i.e. temperature, precipitation, soils, elevation, and densities) remain constant or worsen with regard to optimal forest productivity, diameter growth within the analysis area will continue to decline.

Douglas-fir tree core samples were taken from 160 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 (grams of annual wood production per square meter of foliage) is 57 for Douglas-fir. Trees with vigor indices from 30-70 can withstand progressively higher attacks but are still in danger of mortality from infestation (Christiansen et al. 1987; Waring and Pitman 1985). Based on Waring's vigor rating index, the data indicates that Douglas-fir in the analysis area can withstand progressively higher attacks but are still in danger of mortality from infestation. In addition, the 10-year diameter growth of 1.18 average inches in the last decade indicates that Douglas-fir is predisposed to bark beetle attack.

Western dwarf mistletoe (*Arceuthobium campylopodum*) and Douglas-fir dwarf mistletoe (*A. douglasii*) infections are widespread throughout the analysis area. Infections are usually systemic and form bunched globose growths of branches called "witches' brooms." These brooms, occurring mostly in the lower third of the tree canopy, are produced by local physiological changes induced by the parasite to get the tree to transport food to the mistletoe. Heavy infections result in growth loss, wood quality reduction, top-killing, and mortality. Food needed for healthy tree growth becomes diverted to the brooms, significantly draining the host (Hull and Leonard 1964). Although the spread of the infection is slow, infected trees lose vigor and become increasingly susceptible to other infectious diseases and insect attack. Weakened trees emit a different chemical signature than healthy trees. Bark beetles consequently are drawn to trees in a weakened state and eventually kill the infected tree.

Forest pathogens and subsequent beetle kill contribute to changing the forest stand structure and forest development pattern by creating openings of varied sizes and allowing light to reach the forest floor and the understory re-initiation stage to begin. If disease susceptible trees continue to recolonize infected sites, they, too, will become infected. The likelihood of infected trees to attain large sizes will be low and the pathogen will survive on the site unless immune species occupy the mortality gaps – an unlikely scenario without management intervention.

f. 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) states that amounts of coarse woody material across landscapes are highly variable and should vary over time with stand development. Amounts of CWM are influenced by forest stand history, soils and respective plant associations, climate, and topography. Measurements of coarse woody material were taken in a variety of sampled stands in the Heppsie Analysis area, totaling 14,800 feet of transect line. The average amount of coarse woody material (CWM) equaled 12.4 tons per acre. CWM ranged from 6.0 to 31.0 tons per acre. The coarse woody material stems were mostly concentrated in the 8-11 inch classes at the large end, although some sites contained pieces from >48 inches large end-diameter. The average total length per acre equaled 1,702 feet. CWM was distributed across all decay classes, although decomposition classes 2 and 3 were most common (Table 3-3).

Table 3-3. Coarse Woody Material Decay Classes

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

Douglas-fir and ponderosa pine tree mortality resulting from bark beetles and wind throw are the primary sources of CWM in the Heppsie Analysis area. Stands prescribed for Insect and Disease Management have a substantial number of trees killed by dwarf mistletoe. The average amount of CWM decay class 1 and 2 wood that is 16 inches or larger at the large end and 16 feet or longer in length averaged 253 linear feet/acre in selected stands prescribed for Disease Management. Measurements of coarse woody material were taken in all units prescribed for Disease Management (1-1, 1-3, 1-7, 1-8, and 5-13) across 36 acres. Table 3-4 displays the amounts of CWM catalogued during stand examinations. The present amounts of CWM in unit(s) 1-1, 1-3, 1-8, and 5-13 fall within the ranges discussed in White's (2001) publication for respective plant association groups (PAG) and complies with section C-40 of the Northwest Forest Plan for CWM retention requirements (120 linear feet of decay class 1 and 2 wood that is 16 inches or larger at the large end, and 16 feet or longer in length per acre). However, CWM measurements in unit 1-7 revealed a deficit in the amount of CWM. In unit 1-7, trees will be designated and reserved to meet the coarse woody material requirements stated above.

Table 3-4. Disease Management Coarse Woody Material

Unit #	Acres	Linear ft./ac.
1-1	14	228
1-3	2	331
1-7	10	43
1-8	1	518
5-13	9	147

Due to a relatively high amount of tree mortality in the Analysis area, stand examinations revealed high amounts of standing dead trees equaling an average of 3.5 snags per acre (>50 ft. in height and >20 in. DBH) across a variety forested plant associations. Snag concentrations were observed in large size pockets to individual isolated trees, depending on the topographic proximity and site productivity. These standing dead trees will contribute to future down wood concentrations in the Analysis area and provide short-term benefit to cavity nesting wildlife.

2. Environmental Consequences

a. Alternative 1—No Action Alternative

Alternative 1 (No-Action) would allow forest stands to remain at the overall average of 0.65 relative density index, allowing density dependent mortality to occur and leaving forested stands more susceptible to insect and disease agents. Stand densities would continue on their current trajectory of stand development and remain overpopulated. A relative density index rating of 0.55 for any given stand marks the point of imminent mortality and suppression (Drew and Flewelling 1979). 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. Tree mortality represents a reduction in stand volume production, a loss of revenue, and poor forest health.

Douglas-fir dwarf mistletoe is found throughout the analysis area and cases of true fir dwarf mistletoe occur in the northern portion of the analysis area. The presence of dwarf mistletoe can contribute to increased fire behavior during wildfire events. The No Action Alternative would allow the unchecked spread of disease to continue on the sites. Diseases such as true fir mistletoe and Douglas-fir dwarf mistletoe would persist and perpetuate the infection cycle on sites currently infected. These forest pathogens create openings of varied sizes, allowing light to reach the forest floor and the understory re-initiation stage to begin. However, in the Analysis area, disease-susceptible trees continue to recolonize these sites. The regeneration becomes infected and their likelihood of attaining large sizes would be low. The pathogen would survive on the site unless disease resistant species occupy the gaps.

Without action, forest structure and species composition can shift. On pine sites that require at least 25% full sunlight, shade-tolerant white fir and Douglas-fir would continue to encroach and stands would remain in a dense stand condition in the absence of disturbance. The current average RDI for ponderosa pine stands is 0.69. Relative density indices between 0.55 and 1.00 bound the zone of imminent competition-mortality (Drew and Flewelling 1979). The data indicates that, based on Waring's vigor rating indices, last decade's growth rate, and relative density indices, ponderosa pine survival in the analysis area is threatened. Of the ponderosa pine sampled in the area, the current average ponderosa pine tree vigor rating is 29 grams of annual wood production per square meter of foliage. Trees with vigor ratings below 30 ($g/m^2/yr$) would succumb to attack from bark beetles of relatively low intensity (Christiansen et al. 1987; Waring and Pitman 1985).

Because shade tolerant species (Douglas-fir and white fir) are growing on sites better suited to early-seral species (ponderosa pine, oaks), the shade-tolerant species exhibit poor vigor and require more moisture than the site can deliver, becoming easily stressed and succumbing to density mortality or beetle kill. The average vigor rating index for Douglas-fir was 57 indicating that Douglas-fir is in danger of mortality from a beetle attack. A relative density index of 0.65 in Douglas-fir stands further indicates that Douglas-fir stands are exhibiting tree-to-tree competition, and a rating above 0.55 is within the zone of competition induced mortality.

Without management action, individual trees including old-growth ponderosa pine, old-growth sugar pine, and old-growth Douglas-fir trees, with tree size classes ranging from seedlings to poles within their dripline, would continue to die from competition for water. Thinning would bring stands out of the stem exclusion or closed-canopy stage and accelerate the development of conditions found in late seral forests

(Hayes et al. 1997). Trees should develop large crowns, large diameter limbs, and deep fissures in the bark. Maguire et al. (1991) found that large branches develop only on widely spaces trees or on trees adjacent to gaps or openings. Deep fissures in the bark are characteristic of large diameter Douglas-fir trees in old growth stands.

Shade intolerant pine and oak species would continue to decline in number from competition with encroaching shade tolerant white fir and Douglas-fir. Leaf area index would decline as live tree crowns decrease in size from tree competition. With large tree mortality, forest stand structure would gradually shift to the understory re-initiation stage. This is a transition phase when trees in the main canopy layer start to die, either singly or in small groups, from root diseases, lightning, wind-throw, and insects. This is ecologically significant in that resources previously used by the dead tree are reallocated to the surviving vegetation. These small diameter trees, instead of dying out, would continue developing into a dense unhealthy 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. The 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). No action contradicts the Medford District Resource Management Plan forest condition objectives in regard to forest health.

Fire suppression has altered landscape structural densities and species composition. Without any form of density control, including the crown bulk density of older stands that contribute to stand replacing fires, slow tree growth and poor vigor would result in individual tree and stand mortality. A decrease in stand vigor is expected with continued overstocking and increasing stand age. In regard to species and biological diversity, forested stands in the analysis area have become predisposed to stand replacing fires and insect and disease epidemics. When left undisturbed, stands continue to grow and produce new seedlings, although in unhealthy and dense conditions. Douglas-fir, a shade tolerant species, continues to occupy densely populated and thus shaded sites, even sites that previously saw far fewer numbers of Douglas-fir than exist today.

The amount of Douglas-fir dwarf mistletoe present in Southwest Oregon is at unprecedented levels (Goheen 2010). This is due to a century of fire suppression on forestlands. Wildfires have functioned as a natural tool for thinning out the understories and removing dense pockets of forest. Without this tool, Douglas-fir has seen a sharp increase in numbers. The increase of Douglas-fir in southern Oregon coincides with the increased levels of dwarf mistletoe seen today. Without the cleansing effect of fire on densities of Douglas-fir seedlings, the pathogen is consequently perpetuating on the infected sites and spreading into previously uninfected stands.

Dense stands heighten tree to tree competition. Growing conditions become so stagnant (at or above stand density index of 0.55) that intense competition follows 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. In severe cases, entire stands are completely decimated by dwarf mistletoe, insects, and/or fire. Future silvicultural options diminish when severe stand mortality results. On the other hand, hardwoods, shrubs, and forb species would become more abundant and provide forage and hiding cover for big game animals and habitat for species preferring these habitat types. Pine species would continue to decrease in number if openings are not created for these shade intolerant species. The more shade tolerant Douglas-fir and white fir would continue to encroach into the forest and species diversity would decline.

Where dense forest stands persist overtime, canopy cover would remain at 75 to 100 percent. When tree mortality is singular or in small patches, canopy cover may approach 30 to 75 percent. In pockets of mortality, canopy cover would range from 0 to 30 percent. Without controlling the relative densities, some forest stands would naturally fall below 60 percent canopy cover, especially those in dry forest stands in the pine series. Fire hazard would increase with the abundance of dead vegetation and ladder fuels, and would be at maximum levels.

b. Alternative 2

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

Effects of Management on Stand Growth and Vigor

Stands were modeled in a growth and yield modeling system called ORGANON (Hann 1992). Developed at Oregon State University, College of Forestry, the model predicts forest growth outputs based on scientific formulas programmed into it. The Southwest Oregon variant was used to model stands in the Heppsie Analysis area. Results of predicted outputs can be viewed in Table 3-5. Similar stands of each vegetation type were studied to develop the prescriptions. Currently, the relative densities of stands throughout the analysis area are high. This is primarily due to the lack of large-scale natural disturbance, fire suppression, and lack of silvicultural treatments. Table 3-5 shows the growth of conifer stands in the Heppsie Analysis area with and without management intervention.

Table 3-5. ORGANON Modeled Stands; Thinned vs. Un-thinned and 20 Year Growth

Stand ID	Stand Age	Current BA/AC (ft^2)	Current Trees/Acre	Current 10-Year Increment (inches)	Current RDI	Projected RDI After Initial Harvest	Projected RDI in 20 Years (Unthinned)	Projected RDI in 20 Years (Thinned)
122703✠	129	143	607	0.60	0.59	0.24	0.63	0.29
122701⌖	120	271	223	0.35	0.80	0.46	0.82	0.50
123878+	117	108	149	0.50	0.35	0.20	0.41	0.24
120095⌖	123	280	207	0.50	0.81	0.46	0.81	0.49
120175✠	91	213	289	1.00	0.56	0.34	0.63	0.42
124305✠	121	196	422	0.55	0.70	0.30	0.66	0.33
124639✠	99	210	98	0.75	0.56	0.33	0.61	0.39
123887✠	133	254	277	0.30	0.79	0.34	0.81	0.38

⌖ NRF Modeled Prescription
✠ Dispersal Modeled Prescription
+ Capable Modeled Prescription

Table 3-6 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 of completion mortality and Relative Density Index (RDI) is quite evident in the table below describing a NRF stand with and without treatment.

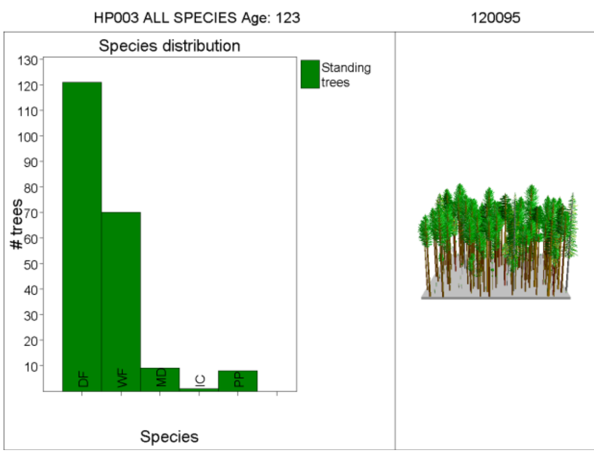
Table 3-6. Description of Douglas-fir Stand With and Without Treatment of Maintain NRF Habitat

Stand Age	Trees Per Acre	Basal Area	Relative Density Index	Canopy Cover	Quadratic Mean Diameter	Mean Live Crown Ratio
123	207	280	.810	100	15.7	.359

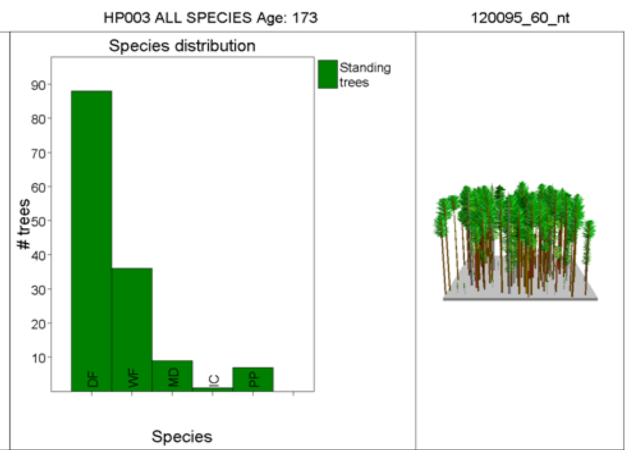
Growth of Stand if Not Treated (note the decline in trees / acre from natural mortality							Growth of Stand if Thinned to Maintain 60% Canopy Cover					
Stand Age	TPA	BA	RDI	Canopy Cover	QMD	Mean Live Crown Ratio	TPA	BA	RDI	Canopy Cover	QMD	Mean Live Crown Ratio
133	180	289	.808	100	17.1	.356	59	195	.473	81	24.6	.361
143	164	298	.812	100	18.2	.354	58	207	.494	100	25.6	.355
153	153	306	.819	100	19.2	.349	57	218	.514	100	26.5	.344
163	144	314	.827	100	20.0	.342	56	229	.532	100	27.3	.334
173	137	322	.835	100	20.8	.335	56	239	.549	100	28.1	.325

The Stand Visualization System (SVS) illustrates the prescriptions to portray what existing forest stands look like today and after application of the proposed prescriptions (USDA and University of Washington, 1995). ORGANON plot data was input into the SVS program for the simulations. Figure 3-2 illustrates pre and post-harvest stand conditions of a Douglas-fir stand modeled with a Selective Thinning-Douglas-fir prescription in NRF habitat. The following tree species are displayed within each bar graph below; Douglas-fir (DF), white fir (WF), Pacific madrone (MA), incense cedar (IC), and ponderosa pine (PP).

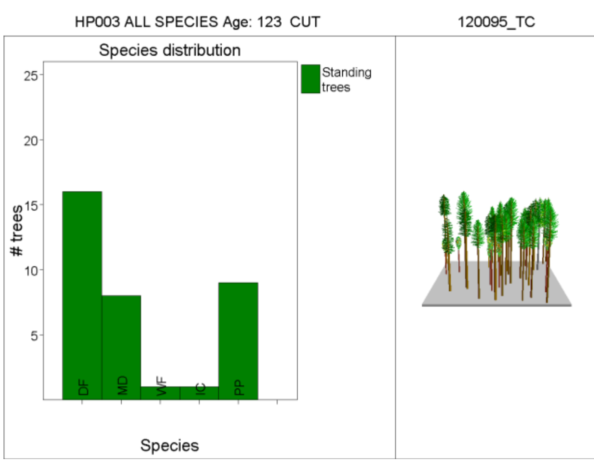
Figure 3-2. Heppsie Stand-NRF Habitat



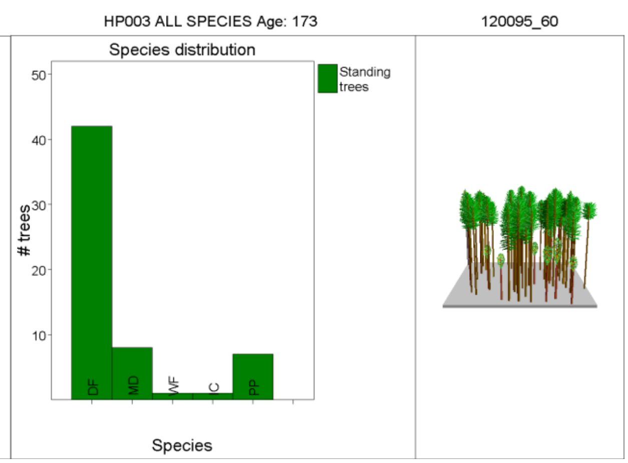
(a): Original Stand Condition



(b): 50-Year Untreated Stand Condition



(c): Post Harvest Stand Condition



(d): 50-Year Post Harvest Stand Condition

Table 3-7 displays the difference between no action and a treatment that maintains on average 40% canopy cover and compares the difference between the treated and untreated condition of a Douglas-fir stand. The original stand exhibited a RDI of 0.700 (a RDI from 0.55 to 1.00 bounds the zone of imminent mortality and suppression); 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 lower number of trees lost per acre per decade occurs in the treated stand due to a prescription that lowers the RDI from 0.700 to 0.314. After 50 years, the untreated stand holds 148 trees per acre (TPA) at a stand RDI of 0.646. In contrast, the 50-year treated stand holds 35 trees per acre at a stand RDI of 0.373 (still below the threshold of 0.550; anything at 0.55 and greater results in mortality from competition between trees for limited resources).

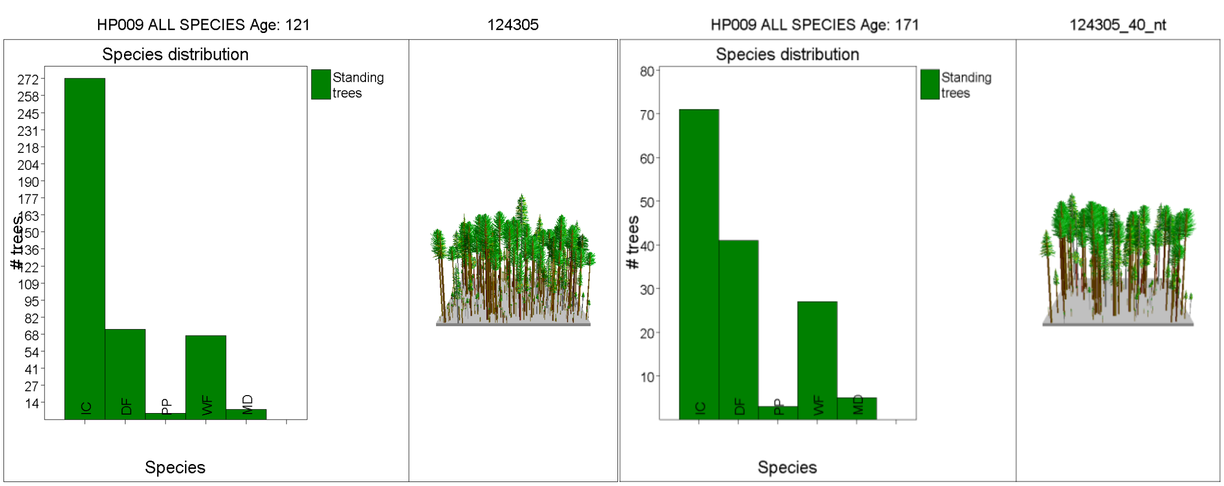
Table 3-7. Description of Douglas-fir Stands With and Without Treatment to Maintain DSP Habitat.

Stand Age	Trees Per Acre	Basal Area	Relative Density Index	Canopy Cover	Quadratic Mean Diameter	Mean Live Crown Ratio
121	422	196	.700	90	9.2	.228

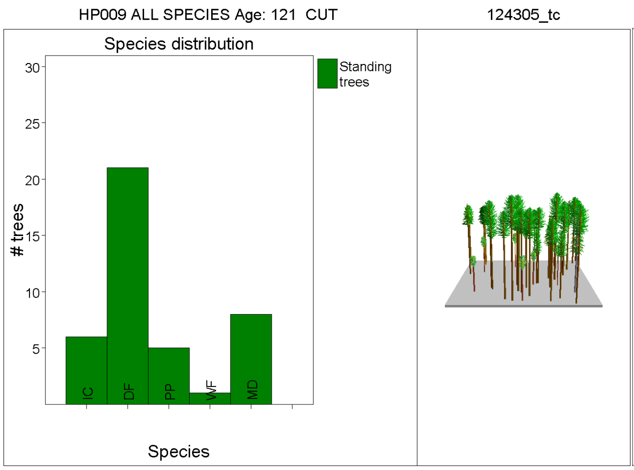
Growth of Stand if Not Treated (note the decline in trees / acre from natural mortality							Growth of Stand if Thinned to Maintain 40% Canopy Cover					
Stand Age	TPA	BA	RDI	Canopy Cover	QMD	Mean Live Crown Ratio	TPA	BA	RDI	Canopy Cover	QMD	Mean Live Crown Ratio
131	303	203	.673	100	11.1	.260	39	130	.314	62	24.9	.355
141	238	209	.659	100	12.7	.279	38	139	.329	73	26.0	.366
151	197	216	.652	100	14.2	.290	37	148	.344	76	27.1	.370
161	169	223	.648	100	15.6	.297	36	156	.359	80	28.2	.372
171	148	230	.646	100	16.9	.299	35	165	.373	83	29.2	.370

Figures 3-3 illustrates the pre and post-harvest stand conditions of a Douglas-fir stand modeled with a Density Management-Douglas-fir prescription in dispersal habitat. Currently, the stand has 422 TPA, a relative density index of 0.700, a mean live crown ratio of 0.228 percent, and a species composition of 17% Douglas-fir, 2% Pacific madrone, 1% ponderosa pine, 16% white fir and 64% incense cedar. There are currently 330 understory TPA (<8 inches DBH) composed of incense cedar (60%), Douglas-fir (9%) and white fir (30%) with <1% pine species recorded in the understory (Figure 3-3(a)).

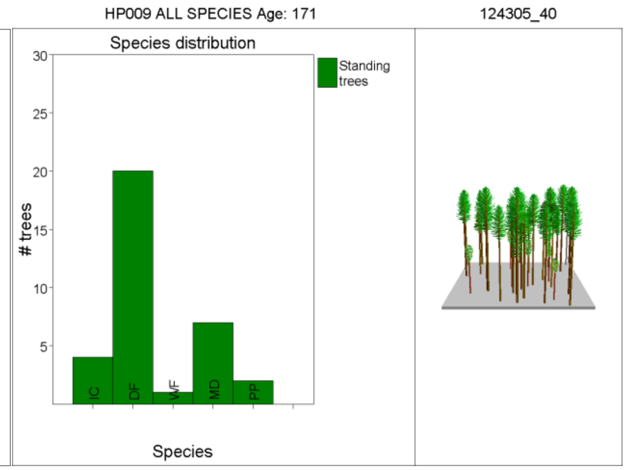
Figure 3-3. Heppsie Stand –Dispersal Habitat



(a): Original Stand Condition **(b): 50-Year Untreated Stand Condition**



(c): Post Harvest Stand Condition



(d): 50-Year Post Harvest Stand Condition

The stand immediately after harvest produces an outcome that lowers the RDI to 0.302 (Figure 3-3(c)). Immediately following harvest, the stand exhibits a projected 40 TPA with a basal area of 123 ft² per acre. The species distribution after harvest projects 51% Douglas-fir, 16% Pacific madrone, 13% ponderosa pine, 5% white fir and 15% incense cedar. Openings created from thinning would allow suitable growing conditions for shade intolerant oak and pine species to regenerate, thereby increasing species diversity within the stand. Figures 3-2 and 3-3 show a shift in species distribution, whereby shade intolerant white fir decrease and shade intolerant ponderosa pine increase from a thinning treatment.

This alternative includes 392 acres of various levels of commercial harvest, representing 9% of the BLM lands in the Analysis area. Under this alternative only 17% of the forest land base in the Analysis area is proposed for commercial treatment. This amount constitutes 4% of the Planning Area (1,966 acres of forestland in the analysis area are not being treated commercially). A total of 2,651 acres of Riparian Reserves and other reserves for plants and animals in the Analysis area would not be treated. Other untreated forested stands include those that lack sufficient conifer stocking to meet a feasible sale under guidelines for maintaining northern spotted owl habitat. Forest stands in reserve areas would remain in poor vigor and tree mortality can be expected in the future. Canopy cover for these stands would decrease with time thus degrading some types of habitat. This also decreases the effectiveness of fuels hazard reduction.

Tree species diversity would continue to decline without treatments to maintain shade intolerant species such as pine. The effects would be as described above in the No-Action Alternative. Mortality of untreated pine stands as a result of competition against Douglas-fir and white fir could cause increasing levels of bark beetle species that could infect adjacent forest stands. Bark beetles are opportunistic creatures that have the ability to detect the chemical signature that a non-vigorous tree emits when it is weakened by competition, drought, disease, or a combination of all three. Leaving these acres untreated would also decrease the effectiveness of fuels hazard reduction in adjacent treated stands. Leaving diseased forest land untreated could increase the radial spread of dwarf mistletoe as susceptible shade tolerant species such as Douglas-fir and white fir continue to occupy these sites. After initial hosts die out, re-colonization of susceptible species occurs readily in the analysis area. This would subsequently perpetuate the dwarf mistletoe parasite on the site and its damaging impacts would widen further.

Douglas-fir dwarf mistletoe is found throughout the analysis area, and cases of true fir dwarf mistletoe occur in the northern portion of the analysis area. The presence of dwarf mistletoe can contribute to increased fire behavior during wildfire events. Alternative 2 would reduce the impacts of the disease at the stand level by controlling the spread of the disease through the removal of heavily infected trees and by maintaining and encouraging species such as pine and incense cedar that are resistant to Douglas-fir dwarf mistletoe.

Pre-commercial thinning or understory treatments are proposed on 225 acres, representing 5% of the land base in the Analysis area under this alternative. Approximately 225 acres of forest stands with proposed commercial treatment would be thinned pre-commercially. The total footprint of all non-commercial vegetation treatments for this alternative is 225 acres or <1% of the Planning Area. The excess, small diameter conifer trees less than 8 inches DBH would be cut from under the drip lines of old-growth trees to assure their survival. Elsewhere, the excess tree stems would be thinned to a desired stocking level to improve the growth and vigor of the remaining trees. Pre-commercial thinning would also help to accelerate the development of vertical stand structure and reduce hazardous ladder fuels. In addition, this alternative includes 184 acres of tree planting, representing 4% of the BLM-administered lands in the Analysis area. These treatments are designed to increase the composition of drought resistant conifer and hardwood species such as pine (sugar and ponderosa), black oak and incense cedar. Maintaining these drought resistant species ensures the resiliencies of forest stands during cycles of drought.

c. Alternative 3

The stand level effects described in Alternative 2 are the same for this alternative, with some differences in the landscape level effects. This alternative includes 279 acres of various levels of commercial harvest, representing 7% of the land base in the Analysis area. Under this alternative only 12% of the forestland base in the Analysis area is proposed for commercial treatment. This amount constitutes 3% of the Planning Area (2,084 acres of forestland in the Analysis area are not being treated commercially). Pre-commercial thinning or understory treatments are proposed on 225 acres, representing 5% of the land base in the analysis area under this alternative. The total footprint for all non-commercial vegetation treatments on BLM lands for this alternative is 225 acres or <1% of the Planning Area. In addition, this alternative will also include 184 acres of tree planting, representing 4% of the BLM-administered lands in the Analysis area. Since the proposal for commercial harvest is lower in this alternative the total footprint for these vegetation treatments is lower than the proposed acres in Alternative 2.

Through recovery of past harvest units and management activities emphasizing thinning to increase growth rates, there would be fewer acres of mid and mature stands treated (118 acres) than what is proposed for Alternative 2. None of the actions proposed under this alternative would affect the long-term productivity of forest lands in the analysis area. Forest stands in the analysis area would continue to be in mostly mid- and mature-size classes since this alternative only proposes 279 acres of commercial harvest. In harvest units that have been excluded from treatment under this alternative, there is a lost opportunity to thin some of the more dense stands within the analysis area. Since these younger stands typically are in the stem exclusion phase or just starting to transition into the understory re-initiation phase, stand development into a mature-size class would be delayed by the deferral of treatment. The longer these stands are deferred from thinning, individual tree mortality from the lack of growing space/site resources would increase relative to the stocking in each stand.

d. Consideration of the 2005 Black Report

Although not specifically submitted during scoping for the Heppsie Forest Management Project, the 2005 Report *Logging to Control Insects: The Science and Myths Behind Managing Forest Insect "Pests,"* also known as the Black Report, is often submitted by some commenters to support their opinion that there is no evidence that logging can control bark beetles or defoliators once an outbreak occurs and in the long run could increase the likelihood of epidemics. The Black Report was reviewed by Forest Health Protection Entomologists from Region 6 of the U.S. Forest Service in November 2005, who concluded that the report contained many erroneous statements that were not even supported by the report's cited literature and included many citations taken out of their proper context. The Black Report was reviewed by BLM silviculturists who concur with the findings reported by Region 6 Forest Service entomologists. Many papers cited in the report support BLMs approach to managing forests to prevent bark beetle epidemics.

A recent paper, "*The effectiveness of vegetation management practices for prevention and control of bark beetle infestations in coniferous forests of western and southern United States* (Fettig et al. 2007), reviews tree and forest stand factors associated with bark beetle infestations and analyzes the effectiveness of vegetation management practices for mitigating the negative impacts of bark beetles on forests. The review draws from the examination of 498 scientific publications concerning the topic referenced above and other related topics. Fettig et al. reports that native tree-killing bark beetles are a natural component of forest ecosystems and periodic outbreaks will occur as long as susceptible forests and favorable climatic conditions exist. Recent epidemics of some native forest insects have exceeded historical records and management to reduce stand or landscape-level susceptibility must address factors related to tree density. Increased competition among trees for water, growing space, and nutrients causes trees to become stressed and compromises their resistance mechanisms, thus increasing their susceptibility to bark beetle attacks.

The report concludes that while gaps do exist in information available for some forest cover types and common bark beetle species, thinning as a preventive measure to reduce the amount of bark-beetle caused tree mortality and its effectiveness is supported by scientific literature for most forest cover types including ponderosa pine and Douglas fir forests, which are the primary focus of concern for bark beetle infestations in the Heppsie Analysis area.

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

Douglas-fir dwarf mistletoe (*Arceuthobium douglassii*) is a parasitic plant that infects Douglas-fir and is widespread in Southern Oregon dry forests. It is one of the primary diseases besides root rot that affects the growth and health of Douglas-fir. Douglas fir dwarf mistletoe evolved with its host species over the past 10,000 years. The benefits of dwarf mistletoe as wildlife habitat and a food source are well known (Mathiasen 1996). Not only does the presence of mistletoe contribute to stand diversity through the creation of gaps, structural irregularity, and the accumulation of snags and down wood, it also serves as habitat for a variety of mammals, birds and arthropods. In particular, in the Siskiyou Mountains, large witch's brooms serve as nest platforms for spotted owls and raptors. There is evidence that groups of mistletoe infected trees are the most likely areas for spotted owls to nest in the white fir and Douglas-fir forests of the Siskiyou Mountains (Marshall et al. 2003; Mallams and Goheen 2005). Dry Douglas-fir stands (Douglas-fir/poison oak) and pine-oak stands historically were shaped by frequent fire, and because of fire suppression the number of Douglas-fir trees is far in excess of historical ranges (Brown et al. 2004; North et al. 2004). The proposed forest management project does not attempt to eradicate dwarf mistletoe from the landscape; rather it attempts to minimize it in specific areas so that the objectives of Matrix lands as defined by the Medford District Resource Management Plan can be attained. Management efforts are focused towards minimizing the impacts of Douglas-fir dwarf mistletoe by maximizing tree species diversity and by reducing canopy layering. Stands composed of mixed tree species of all size classes provide barriers that inhibit the horizontal and vertical spread of mistletoe. Ponderosa pine, sugar pine, incense cedar, white fir and hardwoods are not susceptible to Douglas-fir dwarf mistletoe. Suppressed and intermediate size classes of Douglas-fir are targeted for removal, reducing the canopy height structure and reducing the potential for the vertical spread of mistletoe. With or without management activities, dwarf mistletoe will continue to be a stand and landscape feature on lands managed by the BLM and Douglas-fir mistletoe will occur at natural rates within these conifer-dominated forest types.

C. FIRE AND FUELS

1. Affected Environment

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

- Some commenters expressed concern regarding untreated logging slash and increased wildfire behavior and risk that could result from even a temporary increase in ground-based fuels.

The landscapes that comprise the project 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 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 in 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 also 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. However, there is evidence that stand replacement fires did occur historically, but they likely affected a smaller proportion of the landscape in comparison to wildfire incidents experienced across the Pacific Northwest over the last two decades.

a. Fire Regimes

Climate and topography combine to create the fire regime found throughout the project 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 and hardwood forests of the southwest Oregon and northern California Siskiyou Mountains prevents generalizations about fire and its ecological effects (Agee 1993, pp. 283-284). This is also true for the lower to mid elevations of the planning area, which is characterized by steep terrain, Douglas-fir and pine forest types, and a history of anthropogenic fire use. However, 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 fuels and live 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.

Three historic fire regimes are found within the analysis area (Schmidt et al. 2002):

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

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

Fire Regime 2: 0-35 years fire return interval, High Severity
This regime includes true grasslands and savannahs with typical return intervals of less than 10 years, and ceanothus and Oregon chaparral with typical return intervals of 10-25 years. Fire severity is generally high to moderate.

Fire Regime 3: < 50 years fire return interval, Mixed Severity
Typical plant communities include mixed conifer and dry Douglas-fir forests. Lower severity fire tends to predominate in many events. This regime usually results in heterogeneous landscapes. Large, stand-replacing fires may occur, but are usually rare events.

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 indicate and suggest that climatic factors may, in the future, have a more dramatic impact on wildland fire extent and severity. With increases in warmer winter moisture to inspire vegetation growth (along with warmer and dryer conditions in the summer months), what is now considered extreme drought conditions could easily be experienced with Pacific Decadal Oscillations (PDO) or El Niño Southern Oscillation (ENSO) in the first half of this century. Changes in ecosystem structure and spatial distribution are expected 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, to protect private property and ecosystems, is to utilize silvicultural and fuels management treatments.

c. Condition Class

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

Condition Class 1 - Fire regimes are within or near an historic range. The risk of losing key ecosystem components is low. Vegetation species composition and structure are intact and functioning within an historical range.

Condition Class 2 - Fire regimes have been moderately altered from their historical range (more than one return interval). This alteration 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 alteration results in dramatic changes to fire size, frequency, severity, or landscape patterns.

The proposed Heppsie project would treat approximately 316 to 392 acres. The forest stands proposed for treatment, primarily dry Douglas-fir, mixed conifer and pine stands (Fire Regimes 1 and 3), are in Condition Classes 2 and 3. Stands are very dense 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 rate of spread of a fire and the difficulty of fire control. Fire hazard is a useful tool in the planning process because it helps in the identification of broad areas within a watershed that could benefit from fuels management treatment. Hazard ratings were developed for the project area and reflect the results of past human and natural disturbances. In general, the existing fuel profile within the project area represents a moderate-to-high resistance to control under average climatic conditions (Table 3-8).

Table 3-8. Fire Hazard Rating Category for the Analysis area.

Fire Hazard Rating	Percentage by Hazard Category
Low hazard	11%
Moderate Hazard	54%
High Hazard	35%

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 project area. Activities within this area such as increased development of homes in the wildland urban interface (WUI), dispersed camp sites, recreational use, and major travel corridors add to the risk component for the possibility of a fire occurring from human causes. The time frame most conducive for fires to occur in the project area is from July through September.

Information from the Oregon Department of Forestry database from 1960 to 2010 shows a total of 48 fires have occurred throughout the analysis area. Lightning accounted for 37 percent of the total fires and human caused fires accounted for 63 percent of the total. Only 42 percent (20 fires) started on BLM-managed lands. Lightning accounted for 11 of the 20 fires that started on BLM-administered lands.

2. Effects of Past Management

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.

a. Fire Suppression

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 percent of all fires before they exceed 10 acres in size.

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

- BLM resource advisors will be dispatched to fires which occur on BLM 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, 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 change 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, and the increased canopy closure along with the lower canopy heights allow for more scorching in the canopy and when environmental conditions are conducive to crown fire initiation and sustained crown fire runs. High intensity fires can damage soils and can impact riparian vegetation as well.

Ponderosa pine trees that thrive in fire prone environments are being shaded out by the more shade tolerant Douglas-fir or white fir species in the absence of fire. As a result, more fire resilient pine species are declining across the landscape. Trees growing at lower densities, as in ponderosa pine stands, tend to be more vigorous and fire resilient.

For sites that have a less frequent fire regime display much the same fuel quantity and arrangement increase and possibly may burn with similarity in patch-size and intensity to their historical pattern under some weather conditions and with more severe characteristics and larger patch size under severe fire weather conditions.

b. Logging

Commercial timber harvesting has occurred in the analysis area on BLM managed lands since the 1940s. The intensity and acres harvested increased in the 1970s and 1980s, and decreased again in the 1990s (USDI 2000: 44). Past harvest techniques such as clear-cutting or overstory removal, which resulted in stands of young and more flammable trees, contributed to the current fire hazard ratings for the analysis area. Other timber harvesting that thinned from below and reduced ladder, surface and crown fuels contributed to lower fire hazard ratings within the analysis area.

Timber harvest can increase fire severity, *if not* accompanied by adequate reduction of fuels, by increasing surface dead fuels (SNEP 1996). Studies that correlate logging with increased fire behavior (Weatherspoon and Skinner 1995) are mostly based on the forest practice of not treating logging and thinning debris (slash). Thus it is the added ground fuel which in a drier, hotter microclimate, as a result of opening forest canopy that significantly contributes to fire behavior in a wildfire situation.

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 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 compared to the more densely stocked untreated stands. The degree of openness in the studied treated stands may not have been sufficient to increase fire activity. Weatherspoon and Skinner found commercially thinned stands in a mixed-conifer forest in the South Fork Trinity River watershed of the Klamath NF in northwest CA burned more intensely and suffered higher levels of tree mortality than unlogged areas (Weatherspoon and Skinner 1995). The partial cuts they examined were typically overstory removals, where large (mature and old growth) trees were removed leaving smaller trees. The study simply validates that smaller trees, due to thinner bark and crowns closer to the ground, will suffer more damage than large trees. Logging slash was not treated in the study areas.

c. Fuels Reduction and Fire Restoration

A forest that is fire-resilient has characteristics that limit fire intensity and decrease tree mortality. Improving fire resiliency means managing surface fuels to limit the flame length, removing ladder fuels to keep flames from transcending to tree crowns where trees have no defense against fire; decreasing crown density to reduce the probability for fire to spread tree crown to tree crown; and keep large diameter trees, which are more fire resistant.

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 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 (Miller and Urban 2000). Principles of fire-safe forest are most effective within plant groups assigned to the ponderosa pine series, the Douglas-fir dry plant association group and the grand fir dry association plant group (Brown et al. 2004).

3. Environmental Consequences

a. Alternative 1—No Action Alternative

Because no new management is proposed under this alternative, the effects described reflect current conditions and trends that are shaped by ongoing management and events unrelated to the project described under the Affected Environment. This section will highlight key findings related to the question "What would it mean to not meet the stated objective of fire hazard reduction?"

The current trend of increasing stand density, which results in increased mortality to timbered stands, would continue in the stands that are proposed for treatment. Trees growing under these conditions often become weakened and are highly susceptible to insect epidemics and tree pathogens. High numbers of younger trees (mostly conifers) contribute to stress and mortality of mature conifers and hardwoods. The fuels reduction objectives for the acres proposed for treatment would not be met. Without treatment, the Condition Class of these acres would continue to deteriorate to a Condition Class 3.

With no forest management activity, 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.

Fire suppression would continue because there are no policies in place or being proposed that will allow fires to burn naturally within the project area. The entire project area is within the Wildland Urban Interface (WUI) and is a priority for fire suppression, especially in those areas 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, although there are no private industrial lands that are known to be scheduled for timber harvest at this time. Any private land timber harvest would meet Oregon Department of Forestry standards for post- harvest fuels reduction. Defensible space and driveway treatments would likely continue by private land owners, but the amount of area treated 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 life loss during wildfire events continually decreases.

b. Alternative 2

Although the primary purpose of the proposed action is to meet the objectives of Matrix land allocation, vegetation treatments under this alternative would reduce vegetative horizontal and vertical structure, reducing the fire hazard and increasing the fire resiliency of the stands proposed for treatment.

Discussions for the proposed action reflect the direct and indirect impacts of the activities associated with the proposed action. The discussion of effects also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable.

The current science in determining extent and severity of wildland fire is based on three environmental variables: weather, topography and fuels (Rothermel 1972; Albini 1976). Management activities on landscapes and within ecosystems seeking to affect wildland fire extent and severity have focused on treating of fuels for obvious reasons. 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, we refer to them as “available fuels”. The interrelationship between slope and wind in relation to 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 (high temperatures, low relative humidity, windy and unstable atmospheric conditions), fires often don’t spread except under unusual wind conditions due to the lack of continuous fuels.

Activity Fuels / Surface Fuels

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

It is anticipated that fuel loading after logging would be temporarily increased by approximately 3-11 tons to the acre prior to the scheduled fuel disposal activities to be completed. The dry Douglas- fir and pine site prescriptions would create the highest amount of logging slash. This would change the existing fuel model of most of the timbered stands to a Logging Slash Group, which in turn would create higher rates of spread and greater flame lengths in the event of a wildfire. However, despite the temporary increase in ground fuels, research indicates that a reduction in crown fuels outweighs any increase in surface fire hazard (Omi and Martinson 2002). This temporary increase in surface fuels is usually for less than one year (but can be up to 2years); that is the time period that it takes to implement the fuel treatments to dispose of the surface and ladder fuels in these stands.

Utilizing the modeling tool BEHAVE (with the parameters of a 6 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 5 chains per hour in a slash fuel model. The size of a fire in a one hour period for a fire that is not suppressed would be 0.3 acres in a timber fuel type, versus two acres in a slash fuel model.

Fuels treatments (handpiling and burning of the handpiles) for stands that are commercially harvested are proposed for treatment within one year after a unit is harvested. Treatments would take place where slash loadings exceeds 3 tons per acre. Treatments should ensure that under most climate conditions, flame lengths would be less than three feet, allowing for direct attack of a wildfire. The reduction of this material, along with reduced fire ladders and canopy fuels from forest thinning, would reduce fire behavior such as flame length, rate of spread and fire duration. With the reduction of flame length and fire duration, the chance of a crown fire initiating in treated stands would be greatly reduced. Also, mortality of the smaller diameter conifers would be reduced.

The reduction in stand density, combined with handpile burning, would make it possible to use prescribed fire (underburning) as a tool to further reduce fire hazard in these stands. All stands (excluding units 5-1, 5-15, and 8-1) would be reviewed after thinning and handpile burning to determine if underburning would be beneficial to the stands.

In a 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; Graham et al. 1999; VanWagtendonk 1996). Treatments that result in forests with a lower density and larger trees show lower potential for crown fire initiation and propagation and for less severe fire effects (Pollet and Omi 2002).

Anecdotal observations should not be applied the same as rigorously tested scientific study, but they can be used to report and interpret trends. Anecdotal evidence on the 2002 Squires Fire, which occurred in Southern Oregon, showed that treatments to reduce fire behavior may have merit. Fire weather conditions during the Squires Fire, as measured by the Energy Release Component Indices, was in the 89^{th} to 90^{th} percentile during the Squires Fire event, as measured by the Star and Provolt RAWS stations. This percentile is recognized as high, but not extreme, fire weather conditions. Even though winds were reported the evening the fire reached the treated area in the Kin’s Wood project area, fire behavior decreased when it reached the treated area. Mortality to the residual stand was minimal due to the decreased fire behavior.

Fire Resiliency

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

The implementation of thinning of the 392 acres proposed for treatment would promote increased fire-resilient forest stands by thinning from below, removing suppressed, diseased, and/or over-crowded intermediate and co-dominant trees while 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; Agee et al. 2000).

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 to 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 increasing bark thickness (Agee 1993; Agee 1996). Its bark is one of the key defense mechanisms against mortality from low intensity fire. Thus, removal of larger non-pine species in this context actually improves the ecological role of fire and subsequent fire resiliency of the stand. Although some large trees would be removed for disease management, to improve the survival of large fire resistant pine species (by reducing competition for moisture and growing spaces), to encourage the regeneration of fire resilient pine species, and for logging operations (landings and cable corridors), the fire resilience of the project area as a whole is improved due to the overall reduction in fire hazard within treatment units.

The entire project area is within the 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. Although the other ongoing fuels reduction work around privately owned lands and homes would still provide improved protection from wildland fire compared to no treatment at all, fuels reduction work planned under this EA would increase the effectiveness of other ongoing fuels reduction work around private lands. The thinning proposed with this project, along with the continued maintenance of stands that have had previous fuels treatments within the WUI, reduces the chances that embers originating beyond the immediate defensible zone will ignite structures. In combination with homeowner treatments, fuels reduction beyond the home defense zone is reducing the chance of structural loss or damage in a wildfire situation.

In the study *Patterns of Fire Severity and Forest Conditions in the Western Klamath Mountains, California*, Odion et al. (2004) found closed-canopy forests had less high-severity fire than open-canopy forests and non-forest vegetation types. Based on this finding, they also concluded that a long absence of fire is also a predictor of low severity fire effects. However, this study used no local and specific weather data except for an acknowledgement that a multi-year drought preceded the 1987 wildfires. The well-known inversion conditions during these fires may have had a distinctive effect on the way these landscapes burned (Martin 2005).

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 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 shortage 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 partially-cut stands with some fuels treatment suffered less damage than partially-cut stands with no treatment.

Changes in Micro-Climate and Effectiveness of Fuels Treatments

Management of forest stands can result in altered microclimates (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 CA burned more intensely and suffered higher levels of tree mortality than unlogged areas (Weatherspoon and Skinner 1995). The partial cuts they examined were typically overstory removals, where large (mature and old growth) trees were removed, and 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; Agee et al. 2000).

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. Under the proposed action approximately 338 acres proposed for treatment will have a canopy cover of less than 60%.

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 moistures. An ambient air temperature of 90-109 degrees F and a relative humidity of 15-19% would result in a 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) is 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) shading greater than 50%, and (e) no cloud cover, one would add 3% to the fuel moisture for a total of 6%.

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

Roadside Brushing

Road side brushing throughout the project area is done for safety measures. Material that has grown into the roadbed is cut to increase sight distances for vehicle traffic. The material that is cut 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 worst case scenario of the amount of area impacted by roadside brushing material is approximately one half acre per mile of road brushed (0.5 acre/1 mile). 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 uphill. 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.

Smoke Impacts

This proposed action proposes to use prescribed fire, and consequently, there would be some smoke-related impacts. Under the proposed action, prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan (OSMP) and the Visibility Protection Plan. Prescribed burning under this alternatives is not expected to affect visibility within the Crater Lake National Park and neighboring wilderness smoke sensitive Class I areas (Kalmiopsis and Mountain Lakes Wildernesses) 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 escaped wildfire.

Prescribed burning emissions, under this alternative, is 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.

The greatest potential for impacts from smoke intrusion from underburning is to localized drainages within and adjacent to the project area. Because underburning requires a low-intensity burn, there is not the energy to lift the smoke away from the project site. Smoke retained on-site could be transported into portions of non-attainment areas if it is not dispersed and diluted by anticipated weather conditions. Localized concentration of smoke in rural areas away from non-attainment areas may continue to occur during prescribed burning operations.

However, the effects of smoke are minimized because 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 proposed burn sites would include mop-up to be completed as soon as practical after the fire, and hand piles would be covered to keep the 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 this alternative 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.

Fall Versus Spring Underburning

Future maintenance of all areas treated in the project area (excluding units 5-1, 5-15, and

8-1) could be needed in order to maintain low fuel loadings and species dependent on fire. Underburning is the preferred method for maintaining these areas. The season in which underburning is implemented is based on achieving hazard reduction objectives while minimizing impacts to the site. Fall underburning is utilized when fuel loadings are low enough to allow for a low intensity burn similar to that which was historically common in these fire regimes. Due to the long absence of fire, fuel loadings in most cases are too high to initially burn a unit in the fall.

The surface fuel loading in a unit dictates the fire intensity. A common method to reduce fuel loadings before underburning is implemented is to use manual treatment (cutting, hand piling and burning). Even after manual treatments, surface fuel levels in the 1, 10 and 100 hour fuels (1/4" to 3") are often too high to accomplish a low-intensity fall burn. When this is the case, underburning is done in the spring.

Burning in the fall with high surface fuel loadings would have adverse impacts to numerous resources due to fires being of higher intensity. Large down woody debris consumption is higher in the fall. Duff consumption is higher and soil heating also tends to be higher. Mortality to the residual stand, as well as other vegetation, is higher due to higher intensity fires and low live fuel moistures. Snag retention is difficult due to the low dead fuel moistures and higher fire intensity. With higher fire intensities and lower live and dead fuel moistures, the risk of escape is greatly increased.

Prescriptions are developed for spring burning to consume the smaller fuels (0.25" - 3") and to retain the majority of large down woody debris due to the higher dead fuel moistures. Soil moisture is also higher in the spring, resulting in minimal duff consumption. Burning under these conditions keeps fire intensity low, so impacts to the residual vegetation is minimal and the chance of escape is also minimized. Visual observations of areas that have been underburned in the spring in the Ashland Resource Area over the past decade have not shown any negative impacts to the site.

Other activities associated with underburning (such as fireline construction and mop-up operations after the burn) have minimal impacts to the site. Firelines are 1 to 2 feet wide and are waterbarred to minimize soil erosion. Re-growth of vegetation on the firelines normally occurs within one growing season. Mop-up operations are normally limited to a 100-foot perimeter around a burned unit. Soil disturbance is scattered in localized areas within this perimeter. Because prescribed fire will occur in the spring if fall burning conditions might result in unwanted intensities, damage from prescribed fire will be minimal due to higher moisture levels, and benefits from prescribed fire will be maximized.

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

c. Alternative 3

The No New Road alternative would treat 76 less acres. Under this alternative, effects for the remaining 316 acres are the same as discussed for Alternative 2.

The current trend of increasing stand density, which results in increased mortality to the timbered stands, would continue for these 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 and hardwoods.

Without treatment, the condition class of the 76 acres would continue to deteriorate to a condition class 3. With no forest management actions, there would be no temporary increase in surface fuels from timber harvest activities. Although there would be no harvest created slash, the existing surface, ladder, and canopy fuels would remain untreated for these acres.

D. SOIL RESOURCES

1. Affected Environment

The proposed project area is located in the upper reaches of the Lower South Fork Little Butte Creek and Lower North Fork Little Butte Creek 6th field watersheds. The analysis area is 9,034 acres. In the analysis area, the different land ownerships are BLM (4,694 acres), US Forest Service (1,341 acres) and private (2,989 acres). The dominant soils series identified in the project units are the McNull Loam and (gravelly loam on south slopes), Tatouche gravelly loam, Farva very cobbly loam, Geppert very cobbly loam and a small amount of McMullin and Medco.

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

- Some commenters expressed concerns regarding the potential presence of fragile soils in existing roadbeds in the project area and their possible contribution of sediments to the watershed. Tractor logging and road construction would increase soil compaction, displacement, and reduce site productivity.
- 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.

The topography in the project area consists of slopes between 4 and 70 percent slopes at elevation between 2,400 and 5,000 feet above mean sea level. The mean annual precipitation is 30 to 45 inches and the mean annual temperature ranges from 49 to 50 degrees F.

The Analysis area lies within the Western Cascades province. Physiographic Provinces are areas that have had a similar geomorphic history and have similar geologic structures and topographic relief, which are factors that greatly influence soil genesis (NRCS Oregon Department of Environmental Quality 2009).

The western flank of the Cascades is made up of lava and pyroclastic rock. The rock was uplifted, folded, faulted, affected by intruding shallow stocks, and then deeply eroded. Rock strata typically include beds of volcanic ash (tuff), large flows of andesite lava, and layers of andesitic breccia and agglomerate.

Soils that formed on concave slopes frequently are subject to increased weathering because of the concentration of water and the influence of easily weathered tuff and breccia. In some areas the concave slopes are the result of gravitational mass movement of the regolith. These soils commonly have a dense claypan that is very slowly permeable. The oldest volcanic strata, on the western fringes and foothills of the Cascades, are weathered andesite, tuff, and tuffaceous sedimentary rock. Soils that formed in these materials are influenced by accumulations of alluvium and colluvium of volcanic origin and in some areas are underlain by volcanic or sedimentary bedrock.

The younger strata that is characteristic of the Western Cascade province mark its boundary with the High Cascade province. The soils in this area are well-developed. The landforms are in a youthful stage of development. In some areas the drainageways are characterized by low relief. The bedrock commonly is hard.

Fragile soils sensitive to surface-disturbing activities were identified in the Timber Production Capability Classification handbook (USDI 1988) in order to minimize surface disturbance on fragile suitable commercial forestland (Appendix D-Soil). In the analysis area, three categories of fragile soils are present: fragile slope gradient (FG), fragile mass movement (FP) and fragile groundwater (FW) (USDI 1995, p. 155). Fragile groundwater (FW) is outside of the project area.

The soils that are fragile for mass movement (FP) are pyroclastic soils. These soils are weathered from pyroclastic material (tuff, pumice, breccia, etc.). The pyroclastic high clay soils are fragile because of the susceptibility to mass movement and ease of compaction. Pyroclastic clays have a large amount of high shrink-swell clays, which are subject to drying and cracking. When wet or saturated, pyroclastic clays are unstable, subject to slumping, and, if transported to water, can remain in suspension for long periods of time (USDI 1995).

Also included in the project area are soils fragile for high gradient and potential for surface ravel (FG). These are generally slopes greater than 60 percent.

a. Description of Soils Series

A table of the predominant soils identified in proposed harvest units are listed below (Table 3-9), followed by a general description of the soil series recognized by the Natural Resource Conservation Service. Map 3-1 displays the location of the soils on the landscape. There may be minor amounts of other soil series included within the proposed units.

Table 3-9. Soil Series and Characteristics

Map Unit #	Soil Series Name	Depth (in.)	Soil Texture	Soil Sensitivity Category
56, 57	Farva	20-40	Very cobbly loam, cobbly loam	2
69	Geppert	20-40	Very cobbly clay loam, extremely cobbly clay loam	2
110, 111, 112	McMullin	< 20	Gravelly loam, gravelly clay loam	1
111, 114, 115, 116	McNull	20 - 40	Loam, clay loam, cobbly clay	2
112,	Medco	20 - 40	Cobbly clay loam, clay	3
190, 191	Tatouche	60+	Gravelly loam, gravelly clay loam, clay	2

Farva Series
The Farva soil series is moderately deep, well-drained soil on hillslopes. 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 ½-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.

Geppert
The Geppert soil series is moderately deep, well-drained soil on hillslopes. It formed in colluvium derived from andesite. Typically, the surface is covered with a layer of needles, leaves, and twigs about ½ inch thick. The surface layer is dark reddish brown very cobbly loam about 13 inches thick. The subsoil is dark reddish brown extremely cobbly clay loam about 17 inches thick. Weathered bedrock is at a depth of about 30 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony. Permeability is moderate in the Geppert soil. Available water capacity is about 3 inches. The effective rooting depth is 20-40 inches. Runoff is rapid, and the hazard of water erosion is high.

McNull Series
The McNull soil series is moderately deep, well-drained soil on hillslopes. It formed in colluvium derived dominantly from andesite, tuff, and breccia. Typically, the surface is covered with a layer of

needles, leaves, and twigs about 1 inch thick. The surface layer is dark reddish brown loam about 6 inches thick. The upper 6 inches of the subsoil is dark reddish brown clay loam. The lower 20 inches is dark reddish brown cobbly clay. Weathered bedrock is at a depth of about 32 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony or cobbly. Permeability is slow in the McNull soil. Available water capacity is about 4 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

McMullin Series
The McMullin soil is shallow and well drained. It formed in colluvium derived dominantly from andesite, tuff, and breccia. Typically, the surface layer is dark reddish brown gravelly loam about 7 inches thick. The subsoil is dark reddish brown gravelly clay loam about 10 inches thick. Bedrock is at a depth of about 17 inches. The depth to bedrock ranges from 12 to 20 inches. In some areas the surface layer is stony. Permeability is moderate in the McMullin soil. Available water capacity is about 2 inches. The effective rooting depth is 12 to 20 inches. Runoff is slow, and the hazard of water erosion is slight.

Medco Series
The Medco soil is moderately deep and moderately well drained. It formed in colluvium derived dominantly from andesite, tuff, and breccia. Typically, the surface layer is very dark brown and very dark grayish brown cobbly clay loam about 7 inches thick. The next layer is very dark grayish brown cobbly clay loam about 5 inches thick. The subsoil is brown clay about 18 inches thick. Weathered bedrock is at a depth of about 30 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony. Permeability is very slow in the Medco soil. Available water capacity is about 4 inches. The effective rooting depth is limited by a dense layer of clay at a depth of 6 to 18 inches. Runoff is slow, and the hazard of water erosion is slight. The water table, which is perched above the layer of clay, is at a depth of 0.5 foot to 1.5 feet from December through March.

Tatouche Series
The Tatouche soil is very deep and well-drained. It formed in colluvium derived dominantly from andesite, tuff, and breccia. Typically, the surface is covered with a layer of needles and twigs about 2 inches thick. The surface layer is very dark brown gravelly loam about 11 inches thick. The upper 8 inches of the subsoil is dark brown gravelly clay loam. The lower 41 inches is dark brown clay. The substratum to a depth of 73 inches is strong brown clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony or cobbly. Permeability is moderately slow in the Tatouche soil. Available water capacity is about 8 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

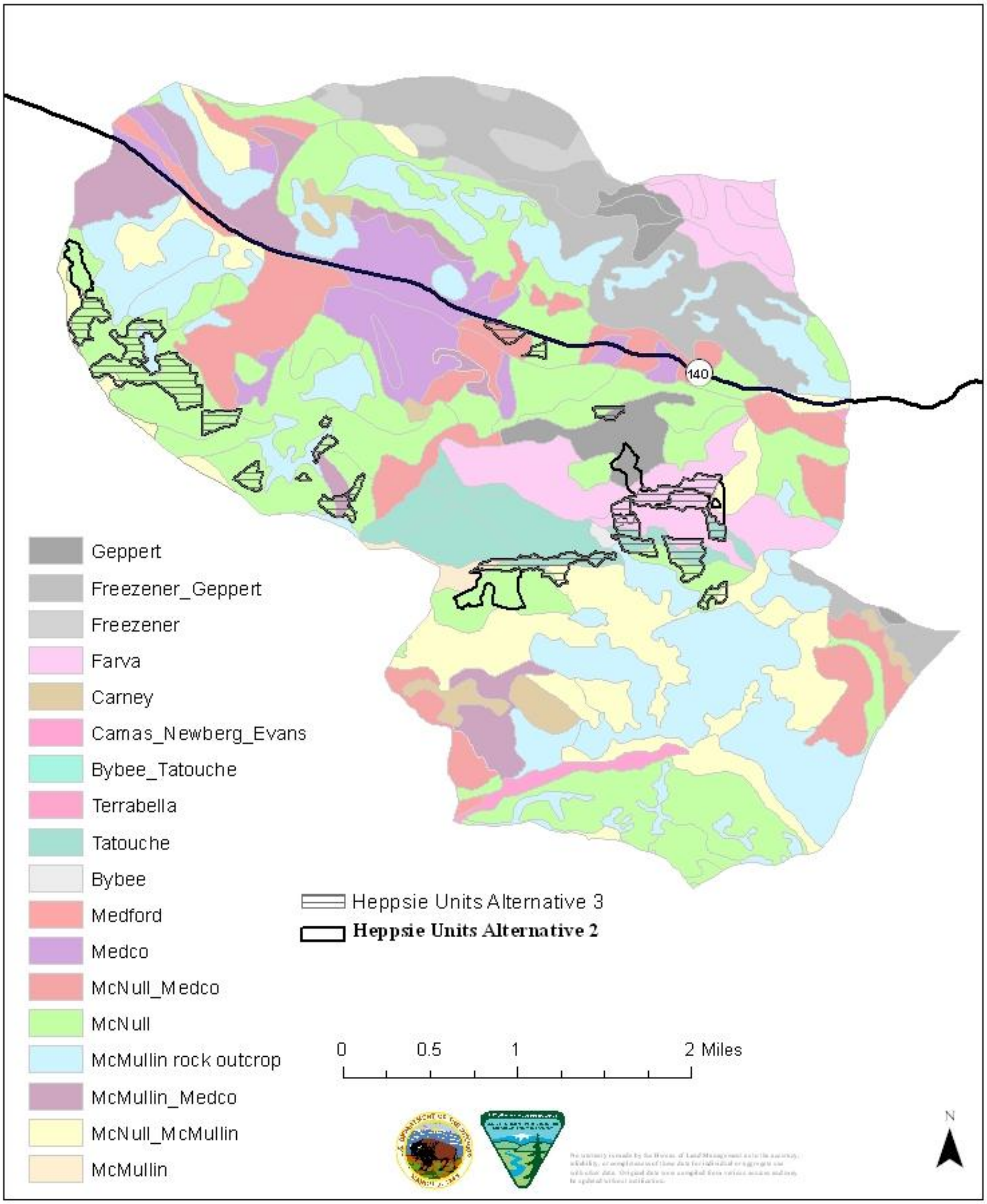
Swanson and Dyrness (1975) estimated the natural erosion rates for soils in the Western Cascade Range to be about 0.19 yd^3/ac/year and erosion rates increased in harvest areas to 0.7 yd^3/ac/yr (in Amaranthus, 1985, p.233). Erosion rates are highly dependent on the intensity and amount of rainfall that 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 amount/degree of disturbance. Most of the project area consists of slope less than 40 percent. There are some areas of steep slopes (greater than 60 percent) which are the FG soils. For this reason it is anticipated that erosion rates in the project area to be much less than those reported by Swanson and should not be of concern.

b. Roads

There are approximately 37.6 total miles of road in the 9,034 acre analysis area (4.6 of those miles are Highway 140). Approximately 22.6 miles of the existing roads are confirmed paved or surfaced with rock. The remaining roads are either natural surface (10.7 miles) or information on the surface type is unknown (4.3 miles) (un-inventoried roads on private land). Soil loss from a lightly graveled roadbed is about equivalent to loss from an ungraveled one. In contrast, soil loss from fully-graveled roadbeds (6 to 8 inches thick) was only 3 to 8 percent of that from the bare soil roadbed of otherwise similar construction (Swift 1988).

It is estimated that every 1 mile of road occupies 4 acres. Therefore, approximately 150 acres in the analysis area are roaded and removed from vegetative productivity. 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.

Map 3-1. Generalized soil map units in the Heppsie Analysis area.



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). Although other factors such as water regimes, soil biological types and populations, and soil loss can also affect long-term soil productivity, site organic matter and soil porosity are most important when measuring the effects of management.

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 abundant on all sites that are planned 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 (leaf and needles) appears typical for the region. Litter or organic horizons typically range from ½ inch to 2 inches, depending on soil type and the maturity of the forest canopy. Except for areas disturbed by roads and trails and sites with gravels and cobbles surfaces, most of the soil in the proposed project area had 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, moisture availability and increases the resistance of soil particles to root growth. Reduced soil porosity also can 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

An inventory of past actions with harvest dates and units of treatments 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 on land managed by the BLM. A nearly complete harvest data record was available from about 1975 to 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, and 2005. The past actions were digitized in Geographic Information Systems (GIS) layer and a corresponding database established.

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. The lessons learned from past actions are that roads were historically poorly designed and located without regard to erosion and stream sedimentation impacts. Clear-cutting 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, save for roads, erosion rates are near natural levels.

It is estimated that approximately 4,265 acres out of the total 9,034 acres in the analysis area have some kind of timber harvest in the past. Of the 4,265 acres, 2,081 acres are on BLM-administered land. Of these acres, 856 acres have been tractor harvested in the past on fragile pyroclastic soil. A field review of area that is fragile pyroclastic and has been tractor yarded was completed. There was no sign of instability resulting from past tractor operation on these soils. The skid trails were in place, vegetative indicators of instability such as, jack-strawed or pistol-butted trees were not present. In most of the unit, the ground was a gentle gradient and it was not hummocky.

The acres that do not have a previous harvest history are mostly areas that naturally do not support forests, due to aspect, soil characteristics, or elevation.

Approximately 3,588 acres in the analysis area have been tractor logged in the past on BLM, USFS and privately-held lands. Past timber harvest in the proposed units were accomplished using ground based equipment, cable/ skyline and helicopter. It is assumed that most of past tractor harvest occurred before 1980 and was not on designated skid roads. Most of the harvesting before the 1970s on BLM-administered land (535 acres) was in the form of single tree selection or group selection taking out the biggest and most valuable trees. During the 1970s through the 1980s clear-cutting was implemented which was often followed by broadcast burning of the logging slash on the site. During the 1980s on BLM managed land, tractor harvesting was restricted to designated skid trails that would impact about twelve percent of the harvest area. It is estimated that unrestricted tractor logging resulted in about twenty-five percent of the area being compacted. There have been approximately 999 acres of the past tractor harvested acres on BLM-administered land were harvested since 1980. Oftentimes compaction is less than 12 percent in these units, however assuming all tractor units on BLM lands since 1980 are 12 percent compacted, which results in approximately 120 acres of land that is compacted from skid trails and associated landings. Soil that was compacted between 1970 and 1980 would likely still be compacted; however, tractor harvest did not occur during this time period on BLM lands in the analysis area. The amount of acres roaded (150 acres) in all the analysis area, in addition to the amount of acres that are skid trails and landings on BLM-administered lands since 1980 (120 acres), amounts to approximately 270 acres compacted.

Skyline and cable harvesting generally results in less than 4 percent of the area compacted. Approximately 321 acres of skyline/cable harvesting has occurred on BLM-administered lands since 1970 (approximately 12.8 acres compacted). Therefore, on BLM-administered lands, approximately 132.8 acres are compacted in unit area, and 150 acres within the analysis area are compacted roaded area. The roaded area accounts for approximately 1.7 percent of the analysis area. Of the approximately 4,694 acres of BLM-administered lands, 132.8 acres may be compacted (2.8 percent). Unit compaction levels on private and USFS lands is unknown.

In 2008, a windstorm occurred in the analysis area and there was a mortality salvage sale (Down Windy) of the downed trees. These were all tractor units. Portions of units in the Heppsie project area were a part of the Down Windy sale. There were units in section 35 that were tractor harvested.

It is difficult to predict compaction's effects on soil productivity because of all the variables, but Froehlich and McNabb (1983) estimate that stand growth losses can range from 5 to 13 percent and compaction's effects can last 30 years. Lucklow and Guldin, in a compaction study of Arkansas forest, 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. This estimated recovery period is in line with other findings. Perry (1964) estimated a 40-year recovery period for reduced infiltration rates on old compacted woods roads to approach natural rates on a southern Arkansas soil.

Based on these findings, soils that have had tractor harvest activities occur on them before 1970 have recovered (1,891 acres).

Overall, it is estimated that approximately 47 percent of the analysis area has had some sort of harvest entry in the past.

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 Heppsie Forest Management project.

Discussions for Alternative 2 and Alternative 3 reflect the direct and indirect impacts of these alternatives. 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 will be 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 would be compared to natural rates.

The appropriate scale for measuring soil productivity criteria (compaction, erosion, etc.) 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. Short-term impacts (or effects) are those being ten years or less and long-term more than ten years. Although studies (Rice et al. 1972) and local observations by BLM soil scientist reveal that vegetation recovery and erosion rates return to near normal levels within approximately 5 years, short-term effects of 10 years were used because broadcast burning within 5 years after harvest could occur.

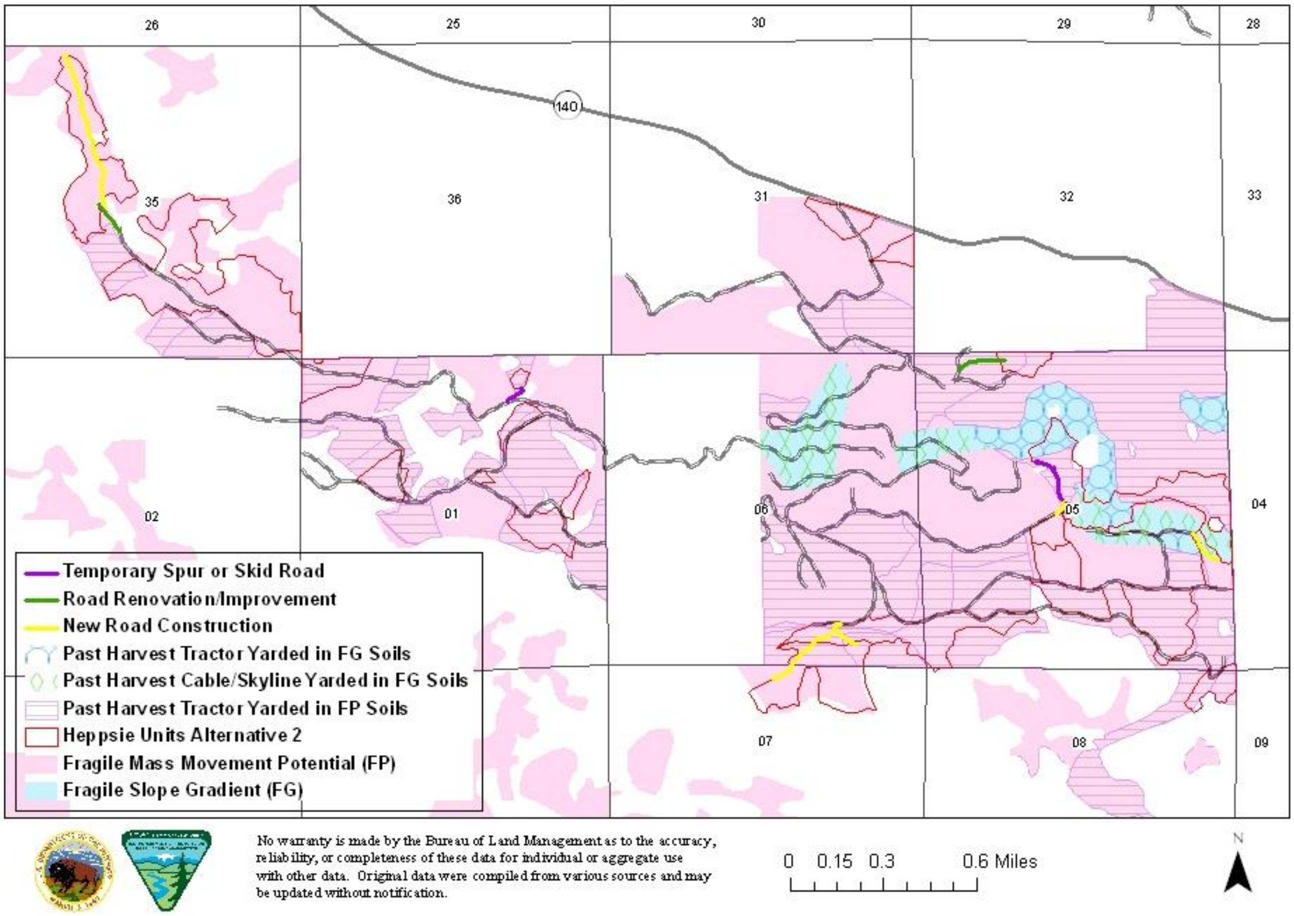
a. Alternative 1

The effect of the No-Action Alternative on the soil resource would be the continuance of existing erosion rates coming from the current conditions throughout the analysis area. Erosion rates are near natural levels throughout the project area except for areas where roads and trails exist. The 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 will occur on private land but it is presumed that all private lands having timber of commercial value would be harvested in the near future (10 years). These actions would increase the amount of compacted acres.

b. Alternative 2

Alternative 2 includes forest management, road construction, road renovation and improvement and temporary spur/ skid road construction (Map 3-2).

Map 3-2. Past timber harvest in fragile soils (FP and FG) and Heppsie Alternative 2 units.



The presence on fragile soils in the project area requires extra design features and field inspection to insure that activities will not result in mass movement for FP soils and excess surface erosion/ ravel in the FG soils.

For road construction in FP soils, road locations should seek areas of high stability. Avoid side casting material in slide prone areas (USDI 1988, p. 9.2). The roads are designed to be located in stable positions (see discussion below). During construction of road 37-3E-6.11, sidecasting will be prohibited due to slope. Road construction in FG soils is similar, however, no road construction is proposed on FG slopes.

Forest management projects in FG soils require that cable systems provide partial or complete log suspension are necessary to minimize disturbance to soil surface and loosening of existing ravel. And for prescribed fire, a cool burn is necessary to protect long term site productivity.

The presence of trees in FP soils helps stabilize the soil. Some examples are: through evapotranspiration (water is pulled out of the soil) saturated soil is more susceptible to deep seated landslides, and the roots physically hold soil in place. All the proposed management will leave trees (minimum of 40 percent canopy). The amount of remaining trees in an area noted for a potential for mass movement is important to maintaining stability.

In Alternative 2, 361 acres are proposed for ground based harvest. Of those acres, 135 acres have been tractor harvested in the past and are FP soils. Last harvest in these areas was in 1991 and a mortality salvage in portions of the proposed units in 2008. These areas were reviewed for indications of instability occurring from these harvests to help determine the impacts of ground based yarding in the current project. There are no indications of mass movement occurring from past tractor harvest in these units. The area that was tractor yarded in the past still has footprints from the skid trails. These existing footprints will again be used. 226 acres that are proposed for ground based harvest either show no evidence of past logging, or were helicopter or cable yarded in the past. Designated skid trails will be used in these areas.

There are areas around the timber (natural meadows) that are likely to be more susceptible to mass movement. These areas will not have road construction or ground based equipment or any activity in these areas.

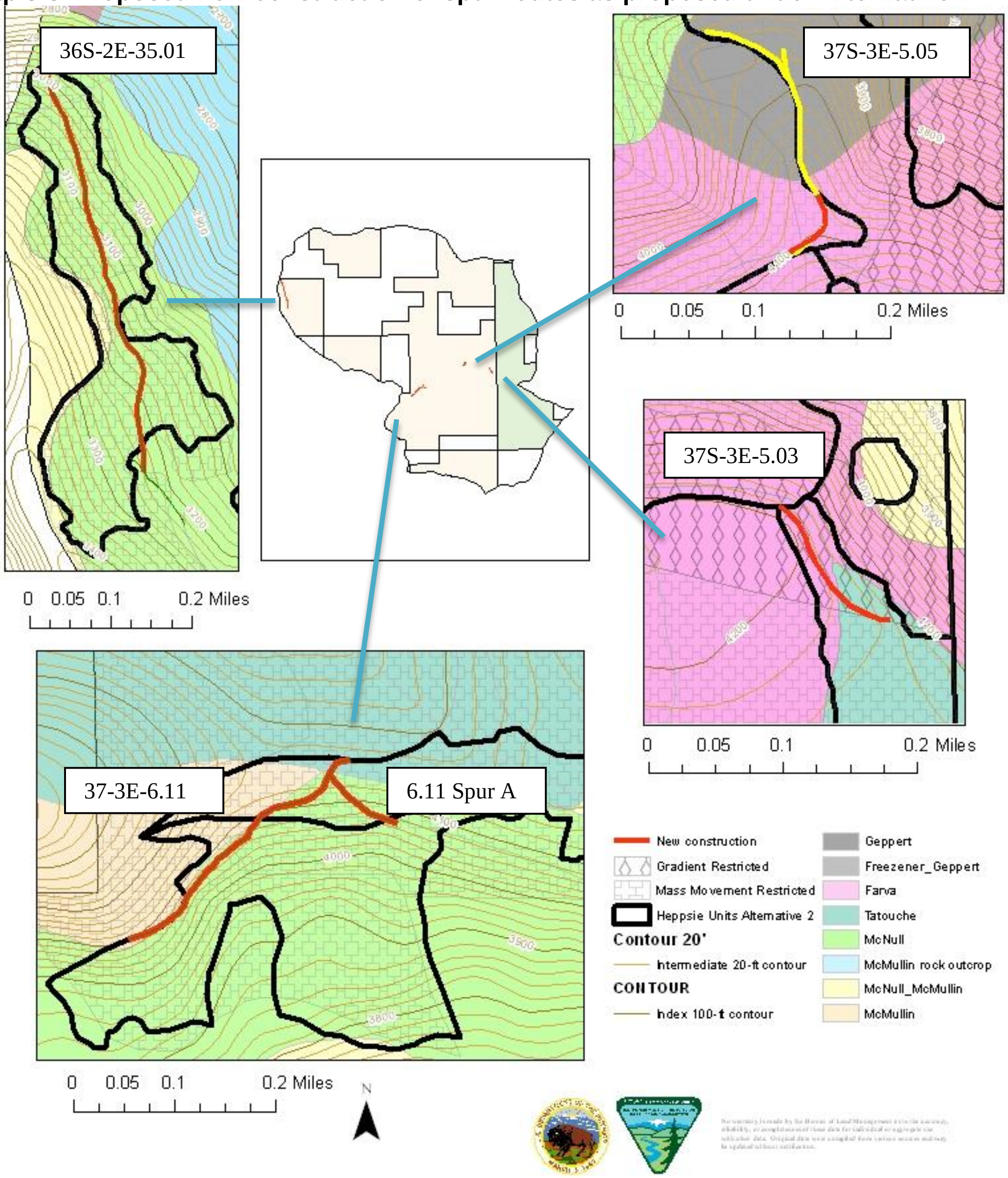
The units in section 35 that are in pyroclastic soils were harvested in the past with helicopter. Based on past harvest, slope stability and mass movement resulting from past tractor logging use did not occur. Units that had been tractor yarded in the past did not show signs of instability. All of the fragile gradient acres have been logged in the past. Some of the FG soils in the project area were tractor harvested. The proposed sale will follow all necessary operational procedures and BMPs for FG soils. Due to the scale of the map, there are small areas within the FG area that are not steep ground. For example, the new road proposed in the eastern part of section 5 is on a shoulder and is a gentle grade.

Road Construction, Renovation and Improvement

Chapter 2 (Section C: Alternatives Described in Detail) describes haul routes, new road construction, renovation and improvements proposed under Alternative 2. All roads are designed to be on areas of high stability. Roads will be blocked after use.

On all road locations, jack-strawed and pistol butted trees are not present. All proposed roads are located in soils that are well-drained, per the BMPs in the1995 RMP (p.158). Additionally, in the Jackson County Soil Survey (NRCS 1993), it states that the soils that are prone to mass movement have a dense claypan and have slow permeability. All the soils that roads are proposed in have a moderate permeability or higher except for the McNull soil. The McNull soil has slow permeability but does not contain a claypan and it is well drained.

Map 3-3. Proposed new construction of spur routes as proposed under Alternative 2.



Approximately 0.61 miles of new road construction for proposed road, 36S-2E-35.01 follows gentle grade for the total length. The topography is generally flat with a few areas of slightly higher slope (generally 20-30% and short lengths between 30 and 35%). Excess material will be endhauled. The vegetation does not show indications of instability. For short lengths of the proposed road it follows existing footprints. Although the proposed road is not on a ridge, it is located on a gentle gradient. This road is located on McNull soils. The McNull soils are generally within the timber. These soils are moderately deep (between 20 and 40 inches to bedrock). The road does not cut into a toe slope or head scarp. Based on topographic and hillshade maps and field review, the slope does not show evidence of past mass movement. Based on the gentle gradient, soil depth and landform and project design features, the road would be 2.44 acres total which is a loss in the amount of acres with vegetative productivity, it may result in short-term erosion from construction but mass movement will not occur from this road.

Leading up to proposed road 36-2E-35.01, 0.12 miles of road will be reopened by brushing, removing down logs and improving the drainage. This will improve the current condition of the road.

Road 37S-3E-5.03 will be extended down the ridge for an additional 0.13 miles. This area is mapped in fragile for slope gradient soils. However, the location of the proposed route is just above the slope break and is on a slope of approximately between 10 and 20 percent. The proposed location is on stable ground; vegetation does not show signs of instability and is on a gentle gradient. The road begins on Farva and ends on Tatouche soils. Farva soils are well drained soils and have moderately rapid permeability on plateaus and hillslopes. It is a very cobbly loam and increases to an extremely cobbly loam with depth. The Tatouche soil is very deep (over 60 inches to bedrock) well drained soils with moderately slow permeability on hillslopes. The road is on this soil for a very short length at the end. It ends before the slope break. Based on field review and topographic and hillshade maps, this road is on a flat surface and shows no indication of past landslides on that location.

Proposed road 37S-3E-5.05 is 0.11 miles long. Cuts right below an existing road. The existing road does not show signs of instability. The road contours over until it hits a shoulder/ridge and follows that down. This is located on Farva soils. For this project a temporary spur route or skid trail will be constructed further down that ridge with a short temporary spur or skid trail off of it. This is approximately 0.19 miles combined. The Temporary spur route is mainly on Geppert soils. The Geppert soils are moderately deep (20-40 inches), well drained soils with moderate permeability on plateaus and hillslopes. The surface horizon is a cobbly clay loam. Based on field review and topographic and hillshade maps, the proposed road and temporary skid is not located on areas that indicate past landslides or mass movement.

Proposed road 37S-3E-6.11 is approximately 0.3 miles. It begins on an existing footprint on Tatouche soils and then contours with a slight incline along the side slope and ends on a shoulder. The road is primarily on McNull soil with small portions (mostly at the end) on McMullin. The McNull soil is generally forested land and is moderately deep, slow permeability and well drained. The McMullin soils are shallow (17 inches to bedrock), well drained with moderate permeability and are generally non forested land. The road is generally on slopes between 40 and 50 percent. This will require cutting into the sideslope. Excess material not needed for the fillslope will be end-hauled to a stable location. The location of the road is on a straight (not hummocky) hillslope, the trees are not jack strawed or pistol butted and there are no signs of instability. However, based on interpretation of a hillshade layer, the road ends close to a possible old head scarp from a past deep-seated landslide. The road is not located on this head scarp and the condition of the slope the road is on does not show signs of instability.

The proposed road that spurs of the 37S-3E-6.11 road (Spur A) is approximately 0.09 miles. It is mainly on gentle gradient or contour to the slope. The proposed road is on McNull soils for the total length. The McNull soils are generally within the timber. These soils are moderately deep (between 20 and 40 inches to bedrock).

Road 37-3E-6.0 B is an overgrown road. This road will have the small trees currently growing in the road removed and it will be brushed and bladed. This is needed to access unit 5-1. This road may need to be widened for short segments of the length. The action of blading and uprooting the small trees may temporarily displace soil. However, due to the activity occurring during the dry season and the gentle gradient the road is located on, this material is not expected to move beyond the road prism.

A temporary spur or skid trail is proposed in section 1 to access unit 1-3. This is also proposed in Alternative 3. It is within the McNull soil series. The McNull soils are generally within the timber. These soils are moderately deep (between 20 and 40 inches to bedrock).

In total, 1.18 miles of new permanent road construction are proposed. The current condition of the proposed road locations are either undisturbed or short segments of existing footprints of skid trails from past harvest.
The length of the proposed skid or spur (total of 0.27 miles) is temporary and will be decommissioned after use.

The two roads that will be improved/renovated (in total 0.26 miles) are currently footprints in the ground but need management actions to be able to haul on such as, brushing, blading, improving water drainage etc.

Summary of effects of new construction, road renovation and improvement

Extra material not needed for the fill will be endhauled to a stable location on road 37-3E-6.11. Sidecast of material on fillslopes on steep or unstable areas can put too much weight on the fill and result in road failure.

Applicable road construction BMPs will be implemented. The new permanent roads will be blocked after use. Reviewing GIS contour maps, hillshade layers, soil surveys and field review it was determined that building the proposed roads will not result in mass movement even though it is within FP soils.

Construction of the proposed roads will affect soil productivity in the roaded area and short term surface erosion may occur.

All applicable BMPs for road construction, improvements and renovation will occur. Due to the fragile nature of the soils and the small areas of steep slopes, two of the BMPs are especially important to note:

- locate temporary and permanent roads and landings on stable locations, e.g., ridge tops, stable benches or flats, and gentle-to-moderate side slopes. Minimize construction on steep slopes, slide areas and high landslide hazard locations.
- End-haul material excavated during construction, renovation, and/or maintenance where side slopes generally exceed 60 percent, and regardless of slope where side-cast material may enter wetlands, floodplains and waters of the state.

There is about 1.24 miles of new road construction proposed under this alternative. Road construction would have the greatest impact on the soil resource as approximately 4 acres of land are disturbed and taken out of vegetation production for every one mile of road construction proposed. 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 about 9.36 yd^3/ac/yr (Swanson and Dyrness (1975) in Amaranthus et al.1985, p. 233). This total includes mass slope failures from roads and landings on unstable slopes in calculating the number. Because the newly proposed road construction would be located on 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 decrease down to about 3 times natural rates after 3 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 only 3 to 8 percent of that from the bare soil roadbed of otherwise similar construction (Swift 1988, p. 321).

The road renovation that would occur consists of roads that have had little use and or maintenance in the recent past and need more work than improvements. Renovation may include removing brush or trees from the running surface of the road. Soft spots would be fixed with filter fabric in conjunction to the spot rocking to restore the road surface. Ditches could need continuous cleaning rather than just spots. A portion of the renovation has a grass surface and erosion rates are currently near normal. Road renovation would increase erosion in the local area but the topography of the proposed renovation is very gentle and no off-site erosion is anticipated.

Forest Management

392 acres of land are proposed for land management activities. Soil disturbance from timber harvesting may not be 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 planned in this alternative would disturb, on average, about 15 percent of the ground in the proposed harvest units. As a result of implementing designated skid trails, the units tractor logged (361 acres) would result in approximately twelve percent or less of the area compacted (USDI 1995, p. 166). Designating skid trails would most likely minimize the area that would be disturbed during tractor logging operations.

In a study on partially cutting using designated skid trails conducted by Oregon State University (Bradshaw, 1979), designated skid trails occupied only four percent of the area compared to 22 percent for conventional logging. In a study of thinnings and partial cutting by yarding systems, skidding logs caused soil disturbance on about 21 percent of the site resulting in 13 percent displacement and 8 percent compaction (Landsberg 2003, p.29).

The units contain old skid trails from past harvest. Through observation of these old skid trails, no evidence of mass movement or instability is present from past use of these trails. Therefore, it is not expected that skid trail use will result in mass movement in this project. Ground based equipment will be restricted to existing footprints.

In the older skid trails in this project area, tree and brush vegetation has re-established in most of the skid trails that were previously compacted from past harvesting.

The use of a harvester/forwarder system is proposed in some units instead of tractor yarding using designated skid roads. Implementing such equipment would occur only during very dry soil conditions (or on a two foot snow pack), and would result in minimal amount of detrimental compaction. Harvested trees would be processed in front of the harvester, so that the harvester trails are covered with slash. Slash is placed in front of the harvester to produce a slash mat for the harvester and forwarder to walk over. The forwarder, which carries the logs to the landing, should remain on trails approximately 150 feet apart to avoid impacting more than 12 percent of the harvest area.

Short-term erosion rate potential would increase moderately (15-50% over undisturbed rates) in the tractor units where slopes exceed 20 percent and where the skid trails are not on the contour. Most of the eroded particles would not reach waterways as a result of riparian reserves 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 percent and skid roads that follow the contour, runoff velocity tends to be reduced and soil particles transported only a short distance. Although erosion rates would increase in the harvested units, most soil particles would not reach local waterways under normal rainfall conditions and return to near normal rates usually within 5 years as vegetative cover is re-established. In most operations, a major portion of the harvest area would remain essentially undisturbed. Even logging systems that cause the most disturbances seldom bare more than 30 percent of the soil surface. Since surface erosion depends primarily on extent and continuity of bare areas, soil loss is usually slight (Rice, 1972).

Skyline/cable yarding is proposed for 36 acres. These acres are in FG and FP soils. Partial of complete suspension of logs is required. Soil disturbance will be minimal.

Fuels reduction

Prescribed burning planned under this alternative would be in the form of handpile burning or broadcast burning. As the broadcast burning planned in this project would be an underburn, the intensity of the burn would be light to moderate and have slight direct short-term effect on soil properties. A light surface fire will generally only char the litter, leaving most of the mineral soil at least partially covered. A moderate burn would result in the duff, rotten wood, or other woody debris partially consumed; mineral soil under the ash not appreciably changed in color. Most soil and ash movement occurs during the first rainy season after the slash is burned and quickly diminishes as vegetation cover re-establishes. A recent study concluded that prescribed restoration fires did not have a significant effect on soil solution and stream chemistry or stream sediment concentrations and that low-intensity, low-severity fires could be used effectively as a tool to restore vegetation structure and composition (Elliot 2005, p. 5). Prescribed burns must be in spring like conditions in FP and FG soils.

The increase in erosion rates over present levels would be less than 15 percent as a result of burning handpiles because the piles would be spaced throughout and occupy approximately 3 to 5 percent of the total area. The increased potential of soil particles reaching the local waterways as a result of the prescribed burning would be low because of prescribed riparian buffers and handpiling of slash would not occur near waterways. High soil temperatures generated by burning piles would severely and negatively affect soil properties in the 3 to 5 percent of the unit by physically changing soil structure and reducing nutrient content. In most pile burning operations, the duff and woody debris 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 also is reduced (14% in moderate burns, 33% in intense burns), and the effects last at least 4 years (Atzet et al. 1987, p.193). Overall, soil productivity would experience a slight (<15%), negative decrease 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

In summary, there would be a net increase in compacted area in the tractor harvest units averaging about 12 percent which would slightly decrease soil productivity long-term. Based on research and past monitoring of operational activities, it is assumed there would be a 5 percent loss of productivity on all lands that would be tractor harvested using designated skid trails. The loss is accounted for in the (Medford District) non-declining timber harvest calculations (USDI 1994, pp.4-13). Soil productivity would experience a slight (<15%), negative decrease short-term but potential long-term positive effects would be realized by thinning and prescribed fire. 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 about three to five years. A slight cumulative long-term increase in erosion rates would occur as a result of road building.

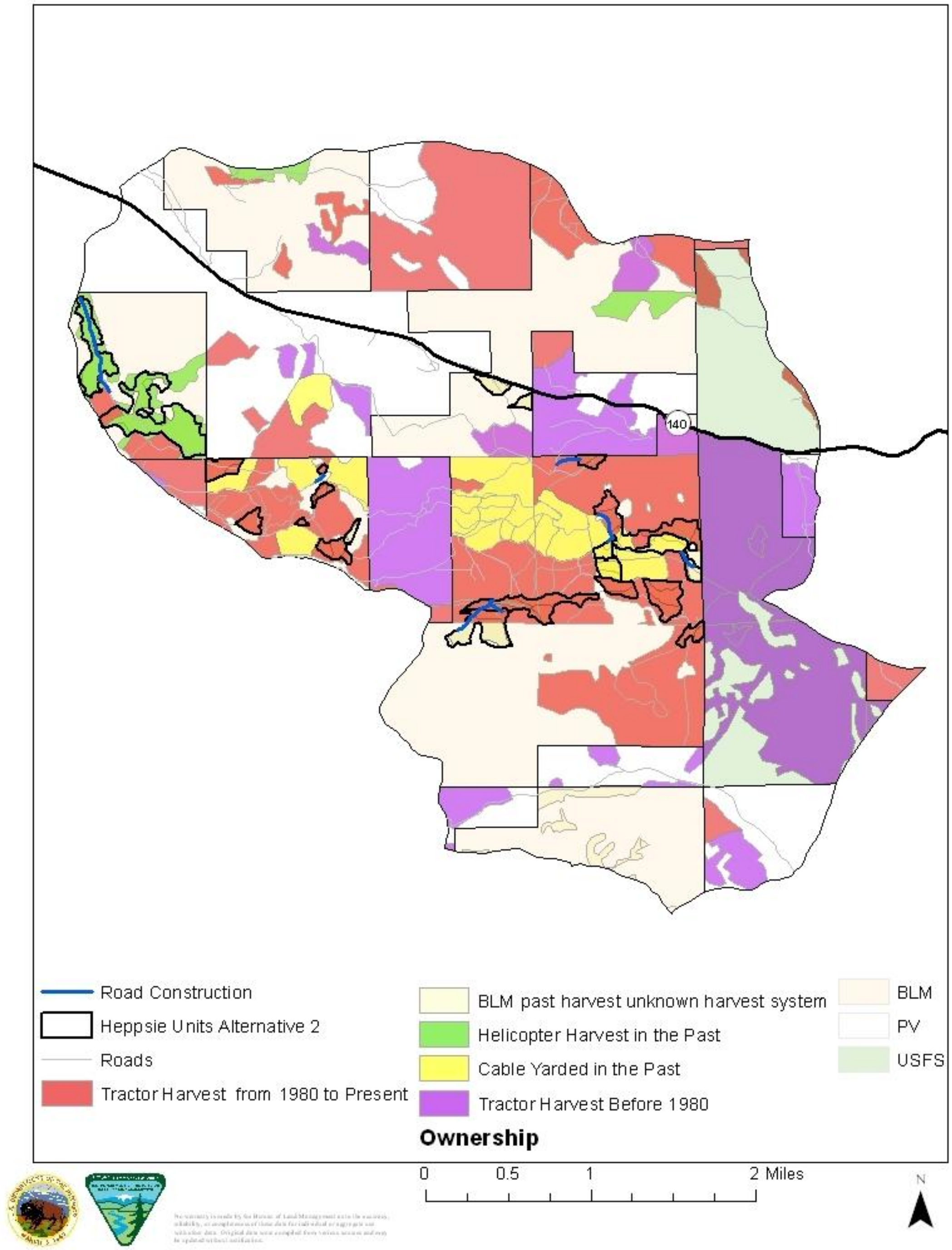
Cumulative Effects

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 (in Beschta n.d.). In the project area there are both fragile mass movement soils and fragile gradient soils. Based on field review it was determined that the soils are stable where project activities occur. Many of the units are in low gradient slopes and no mass movement has occurred for past harvest operations. The soils designated fragile for high gradient are present in some of the harvest units. Locations where this existed was field reviewed and it was found that there were areas within the fragile designated for gradient that were of gentle slope. The proposed road extension of road 37S-3E-5.3 is on a flat ridge/shoulder that shows no signs of instability. The high gradient area is on the east side of the ridge and any vegetation removal will be skyline/cable.

Cumulatively, there is currently little direct evidence to indicate that harvest removals in themselves lead to soil depletion over several succeeding rotations (Beschta n.d.). A crucial aspect that affects soil productivity is cutting intensity. Cutting intensity means the proportion of standing trees harvested (i.e., clearcutting vs. shelterwood vs. selection cutting). Lower cutting intensity results in lower effect on the soil.

Map 3-4 illustrates the amount of past management in the analysis area. This map does not include the mortality salvage units harvested in 2008.

Map 3-4. Cumulative Effects of Alternative 2.



Past actions in the proposed units in Alternative 2 are that 43 acres have been tractor yarded in the past. 15 of those acres have been tractor harvested since 1980 which means that designated skid trails were used and the units are under 12 percent compaction. The most recent tractor harvested area inside the proposed units was in 1991 and a mortality salvage in 2008. Before 1980, approximately 28 acres were tractor harvested and at time of harvest were likely over 12 percent compaction. These units are either recovered through natural processes or will be in the next 10 to 15 years. The project design features and Best Management Practices (BMPs) identified in the RMP will result in units not exceeding the 12 percent threshold. Of the proposed units, 158 acres were cable/skyline yarded in the past. The last harvest was in 1999. Also in 1999, 52 acres within the proposed units were helicopter yarded. The most recent harvest occurred 15 years ago.

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 nutrients are removed, redistributed or lost. Rotation length is especially important from the point of view of cumulative effects since 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 through time if periodic disturbances occur (that result in soil leaving the site) at intervals too short for the site to stabilize to bring about recovery. This should not be the case as a result of the Heppsie project as soil disturbance would not result in a significant amount of soil leaving the site and erosion rates would return to near normal within about five years. Most past harvest activities that had a substantial effect on soil erosion rates occurred over twenty years ago and most sites have recovered from those events. Therefore, there is a low potential for adverse cumulative impacts to the soil resource as a result of the timber harvest if the soil resource is allowed enough time to recover from the disturbance of this project.

c. Alternative 3

Cumulative effects for Alternative 3 are similar to Alternative 2 except that Alternative 3 does not include new road construction and the corresponding units acres that the roads would access are not included.

This alternative proposes to harvest approximately 316 acres of trees. 279 of the total acres will be ground based harvested. The cutting prescription proposed would maintain at least 40 percent tree canopy across the units. Logging systems planned for the proposed units would be the same as prescribed in Alternative 2. The 1.24 miles of new road construction proposed in alternative 2 as well as the temporary spur off of the 37-3E-5.05 is not proposed in Alternative 3. The proposed temporary spur/ skid road in section 1 is included in Alternative 3 and the impacts will be the same. The anticipated effects of new road construction described in Alternative 2 would not occur in this alternative. The fuels treatments proposed in Alternative 2 would be the same in this alternative.

The elimination of approximately 1.24 miles of road makes the most difference in comparing Alternative 2 and Alternative 3. Approximately 4.96 acres of soil would be unaffected by road building and maintain erosion rates at natural levels. This alternative avoids harvesting in units 35-3 and the portion of unit 7-1 that is in section 7 which have not been tractor harvested in the past. Cumulative impact would be just slightly less than those proposed in Alternative 2 mainly as a result of not building the 1.24 miles of road.

E. WATER RESOURCES

1. Affected Environment

A watershed analysis provides general water resources background information for the project area. This document is titled the *Little Butte Creek Watershed Analysis* (USDI 1997). The *Water Quality Restoration Plan for North and South Forks Little Butte Creek Key Watershed (WQRP)* provides additional water quality information about the area (USDI 2006).

Water-related issues associated with the Heppsie Project have been identified through public scoping or ID team specialists 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.
- Under the Medford District BLM's October 2010 Water Quality Restoration Plan (WQRP), some streams within the Heppsie Analysis area do not meet water quality standards and are 303(d) listed.
- Some commenters expressed concern that the project appeared (in the scoping letter maps) to be entering areas that are currently considered "low-density" road areas.
- Both existing roads and new roads proposed for construction need to be evaluated for stability, long-term necessity and placement with regard to road density per square mile, location with regard to riparian reserves, and potential for sediment delivery in the Little Butte Creek Key Watershed.

a. Analysis area Description

The Heppsie project area is located in the Little Butte Creek Watershed, which is a tributary to the Rogue River. The Heppsie project straddles the divide between the North and South Forks of Little Butte Creek. 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 the Lower North Fork and Lower South Fork of Little Butte Creek.

These are called subwatersheds and represent 6th field hydrologic unit codes or HUCs. These sub-watersheds are further subdivided into 7th field HUC's called drainages which range in size from 443 to 4,606 acres (Table 3-10). The total size of the analysis area is 9008 acres (approximately 14 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 (site scale) may not be significant, but when combined with effects from everything else going on in the drainages, may have a potential impact ("cumulative effect"). The drainage areas are small enough to avoid "drowning out" evidence of adverse effects. As the size of the analysis area increases, there is an increasing possibility of the analysis indicating that there is "no problem" when in fact individual drainages may have issues of concern.

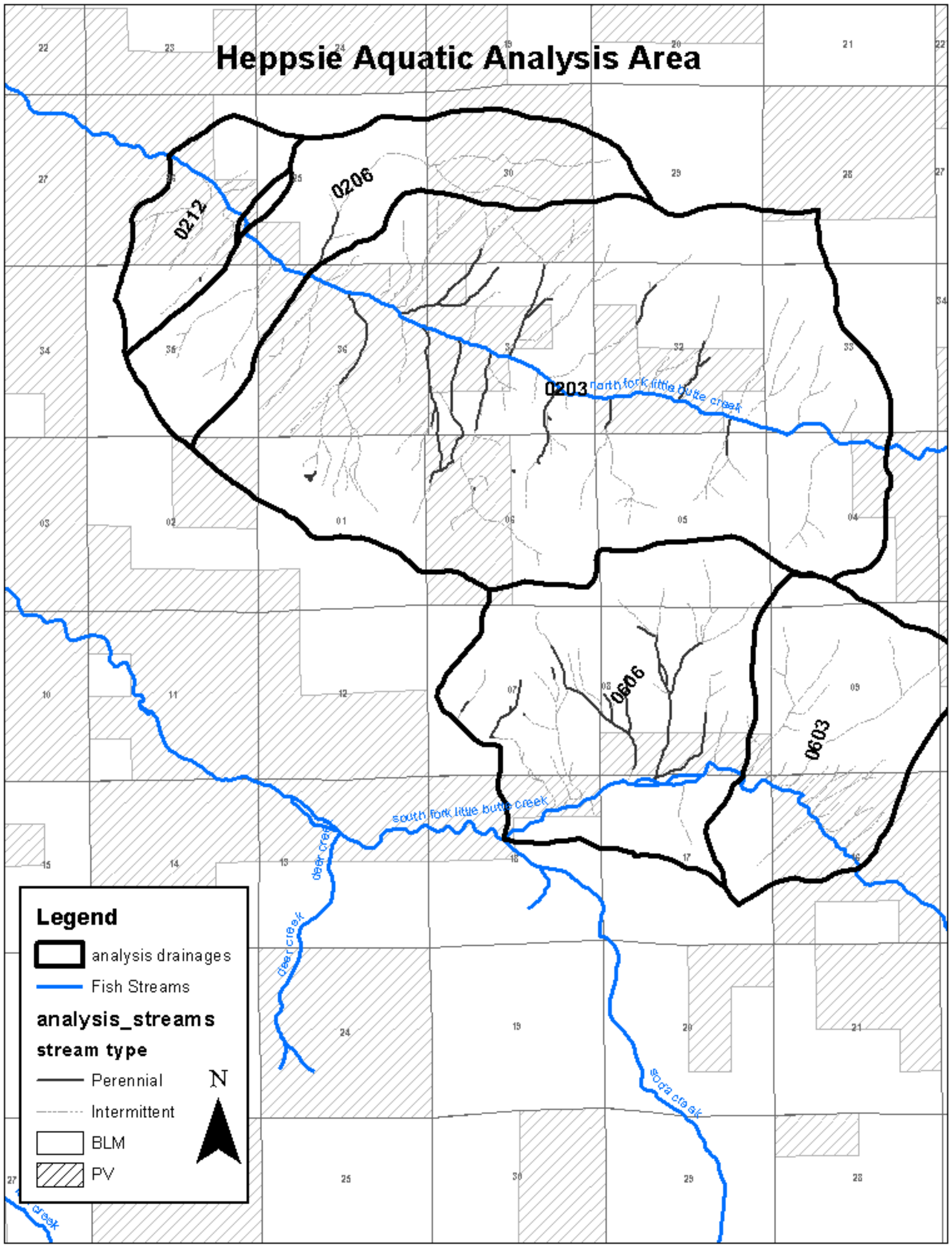
Table 3-10. Analysis areas and Ownership Associated with the Heppsie Project Area

HUC 7 (drainage)	Acres	BLM (percent)	USFS (percent)	Private (percent)
NF0203	4,606	46	15	39
NF0206	1,106	61	-	39
NF0212	443	48	-	52
Total	**6,155**	**49**	**12**	**39**
SF0603	1,138	16	56	28
SF0606	1,715	86	-	14
Total	**2,853**	**58**	**22**	**20**
Total (All)	**9,008**	**52**	**15**	**33**

The analysis area is within Jackson County and is a mix of public and private land (Table 3-10 and Map 3-5). Public lands make up the majority of the analysis area. BLM parcels are scattered and somewhat discontinuous. The affected sub-watersheds are Lower North Fork and Lower South Fork Little Butte Creeks which are tributaries of Little Butte Creek. Both the North Fork and the South Fork of Little Butte Creek are Tier 1 key watersheds. Little Butte Creek is considered a 5th field HUC or watershed and flows into the Rogue River. The analysis area is within the extreme eastern portion of "interior southwest

Oregon". Elevations range between approximately 2,060 feet to over 4,416 feet at the top of Heppsie Mountain. The headwater areas of these catchments are steep and forested.

Map 3-5. Analysis area Displaying 7th Field HUC's and Ownership



The climate is characterized by mild wet winters and hot dry summers and has the highest average summertime temperatures and the lowest average precipitation within western Oregon and Washington. Average annual precipitation ranges from approximately 28 inches on the most westerly side of the analysis area closest to South Fork Little Butte Creek to 43 inches on the northeast corner of the analysis area near North Fork Little Butte Creek. Winter precipitation in the higher elevations usually occurs as snow, which ordinarily melts during the spring runoff season from April through June. Rain predominates in the lower elevations with a mixture of rain and snow occurring between approximately 3,500 feet and 5,000 feet in what is referred to as the transient snow zone (TSZ). Rain-on-snow runoff events originate in this zone and when they occur can trigger landscape altering responses such as floods, debris torrents and landslides. Summer rainstorms occur occasionally and are usually of short duration and high intensity. These types of events are usually limited in coverage but can result in increased erosion and sediment deposition.

The geology of the analysis area is volcanic in origin and is part of the Western Cascades sub-province. The drainages are dominated by lava flows of basaltic andesite, basalt, and andesite. The landscape is deeply dissected and has a well-developed dendritic drainage pattern in response to landsliding. Within the analysis area there are landforms that indicate areas of geomorphic instability. The presence of hummocky terrain and sag features represent localized areas of instability resulting from earthflows. The majority of these features are dormant, however signs of recent activity were observed in isolated areas.

Private lands in the lower elevations within the analysis area are generally used for ranching and residential parcels. Private lands in upland areas are primarily owned by private timber companies and managed for timber production. Public lands are almost entirely managed by the BLM and are primarily used for timber harvest, grazing and recreation, which in some areas is a significant use on public lands. Regional public issues reflect the dominant uses of the analysis area and include concerns with recreational activities such as off-highway vehicle (OHV) use; concerns with timber harvest and grazing on private and public lands; concerns about fish and water quality; concerns over water rights and allocations; and concerns over general degradation of the natural environment. As a result, the hydrology of the analysis area has been altered through irrigation withdrawals, roads, grazing, timber harvest, and other actions.

The effects on channel morphology and flows are particularly evident in the lower more developed portions of the sub-watersheds. The upper portion of the sub-watersheds, and the mainstem of North Fork Little Butte Creek are considered transport systems. In transport channels, sediment is routed through stream reaches only to be deposited in lower gradient depositional reaches. Generally speaking, stream morphology is less affected in headwater areas than in the lower reaches. Winter flows in North Fork Little Butte Creek are moderated by storage in Fish Lake. The flow regime in the North Fork of Little Butte Creek is greatly altered by augmented flows in the summer to the convey water from Fish Lake to agricultural operations downstream.

Other than water withdrawal, the major factors currently influencing both water quantity and quality within the analysis area where harvest is to occur include canopy cover, roads/trails, and riparian grazing impacts. Reduced canopy cover within the upper forested portion of the drainages that are less than historical can alter the amount and timing of streamflows. This may result in increased channel erosion and morphological changes to the stream channels.

Roads, trails, and clearcut logging, can accelerate erosional processes and result in increased turbidity and sedimentation. This can also result in adverse impacts to aquatic habitat and organisms, including fish. Grazing along streams and within meadows can elevate stream temperatures and accelerate erosion by reducing streamside shade and altering channel form and process.

b. Roads and Road Density

Research (Reid and Dunne, 1984: Luce and Black, 1999) supported by local and regional field evaluations have consistently found roads to be the primary source of accelerated erosion in wildland watersheds. Roads impact aquatic systems through both chronic and episodic erosion. Chronic erosion is where material is detached and transported to streams via the road surface and drainage structures such as cross drains and inboard ditches. This occurs in response to precipitation events throughout the year. Episodic erosion usually occurs as a result of intense rainfall and rain-on-snow events within the transitional snow zone. Large failures often occur as a result of culvert plugging, stream diversion and fillslope landslides. In addition, where road densities are high, concentration and routing of stormwater may result in increased peakflows. Both road density and the number of stream crossings are gross indicators of the level of road impacts in watersheds.

High road densities, greater than 4.0 miles per square mile (USDI and USDC 2004) are found in nearly all of the drainages within the analysis area on the North Fork Little Butte side (Table 3-12). Road densities within the analysis area on the South Fork Little Butte side are lower than those in the North Fork Little Butte side. The lowest road density in the analysis area is 0.8 miles per square mile. Although road density is a useful indicator, it should be noted that not all roads impart similar effects. For instance, the magnitude of impacts from roads on steep slopes is different than those from roads located on flat terrain. Roads located near streams and road stream crossings are responsible for the majority of sediment delivered to channels. Within the analysis area, many roads are located within Riparian Reserves. In addition, some native surface roads are open during the rainy season. This type of use can render drainage features ineffective and result in concentrated flow and increased erosion. Of the two drainages (NF0203 and NF0206) with the highest road densities, BLM managed lands account for 46 and 61 percent of total ownership.

Although some road work has been accomplished, some crossings are susceptible to failure through culvert plugging and stream diversion. Other road segments are unsurfaced, steep, lack adequate drainage, or are located within close proximity to streams. Lack of road maintenance or improper road maintenance by all jurisdictions within the analysis area has increased sediment production or the potential for sediment production. OHV use is occurring in the watershed as well. OHV trails with hydrologic connectivity impact water quality in a similar fashion as roads. OHV trails often utilize old road beds or are established through repeated off-road travel, or illegally constructed by proponents. They exist on the landscape irrespective of sensitive soils, adequate drainage, or proximity to watercourses and are also responsible for increased sediment production. BLM inventories have documented that the majority of user-created OHV trails in the Little Butte Creek Watershed are in the Lake Creek and Antelope Creek subwatersheds. Less than 0.25 mile of OHV trails were found on BLM lands within the Heppsie analysis area. Additionally, in 2011 BLM obliterated a network of user-created trails in Lake Creek and in the Heppsie Analysis area (NF0203) a user-created 4x4 route that bisected a meadow and diverted an intermittent stream down an adjacent ridge.

Table 3-11. 7th Field Road Densities and Road Densities within Riparian Reserves

HUC 7 (drainage)	Road Density (miles/square mile) [1]	Road Density within Riparian Reserves (miles/square mile) [1]
NF0203	4.6	4.7
NF0206	5.9	7.6
NF0212	3.8	5.6
SF0603	0.8	1.9
SF0606	1.7	2.1

[1]Road densities were calculated using BLM corporate GIS data and includes all roads representing numerous jurisdictions, including urban or otherwise developed areas within the HUCs.

The major tributaries in the Lower North Fork and Lower South Fork Little Butte Creek sub-watersheds, which comprise the 7th field HUCs analyzed, have steep gradients, usually greater than 10 percent. The channels are entrenched with steep sideslopes. Material is quickly moved through these reaches and deposited within the lower reaches as the gradient flattens. BLM conducted stream surveys on BLM land throughout the analysis area in 1998. Evidence of high levels of sediment was observed in most perennial stream reaches within the analysis area. These high sediment levels are likely due to the natural geomorphic instability of the landscape and the high density of roads. Based on recent field observations, conditions are highly variable and site specific.

c. Canopy Cover and Transient Snow Zone

Historically, geomorphic processes that shape landscape and channel geometry are triggered by large, infrequent storm events. In recent times, these events can be characterized by warm moist storms that result in high intensity, long duration rainfall. The results can be intensified when rainfall occurs on an established snowpack. The percent of a watershed in the transient snow zone (TSZ), for Heppsie roughly an elevation band between 3,500 and 5,000 feet, can indicate elevated risk of adverse impacts. These impacts can be accelerated by modifications to forest canopy cover and as discussed, roads and other disturbance features. Drainages where TSZ compromises greater than 25 percent of the drainage area are of hydrologic concern, particularly where large openings such as clearcuts exist. All the drainage areas in the analysis area, except 0212, have greater than 25 percent in the TSZ (Table 3-13). Large areas of vegetation removal in the transient snow zone are of particular concern due to alterations of the streamflow regime and the potential for resultant increased peak flow magnitudes (Christner and Harr 1982).

Table 3-12. 7th Field HUCs Percent of land in the TSZ

HUC 7 (drainage)	Percent of Drainage Area in Transient Snow Zone (TSZ)
NF0203	29
NF0206	31
NF0212	0
Total	**28**
SF0603	46
SF0606	43
Total	**44**
Total (All)	**33**

Modifications of canopy cover in a watershed, particularly in the TSZ, that result in less than historical conditions either through fire or timber harvest, may affect the timing and volume of streamflow. An assessment of percent canopy cover is also useful in determining potential cumulative effects of the proposed activities. In the analysis area, the Ecoregion Description (WPN 1999: Appendix A) lists historic canopy closure as greater than 30 percent, with the exception of the oak woodland. An analysis of percent canopy cover of forested land at the 7th field HUC was conducted. This scale is where detectable changes in peakflows would likely occur. The table that follows summarizes percent of forested acres within the drainages that are below 30 percent canopy cover and percent below within the TSZ. One drainage in the North Fork side of the analysis area (0206) exceeds the criteria for the entire area. (The criteria is discussed below.) For the TSZ, none of the drainages exceed the criteria.

Table 3-13. 7th Field HUCs Percent Less Than 30% Canopy Cover (CC) and Percent Less Than 30% Canopy Cover within the TSZ.

HUC 7 (drainage)	Percent Forested Area Less Than 30% CC[1]	Percent Forested Area Less Than 30% CC within TSZ [1]
NF0203	19	13
NF0206	40	0
NF0212	0	0
Total	**22**	**13**
SF0603	13	16
SF0606	10	18
Total	**11**	**17**
Total (All)	**19**	**15**

[1]Includes existing disturbance features such as roads and landings

Different levels of harvest in watersheds have demonstrated variable effects on peak flows (Wemple et al. 1996; Harr and Rothacher 1979). When less than 25 percent of a watershed is harvested, no detectible change in peak flows have been observed (Stednick 1996). It should be noted the majority of literature available regarding the relationship between harvest and flow have focused on clear cut harvesting, many in areas that removed close to 100 percent of the overstory canopy. For this analysis, any area where 30 percent or greater of the forested acres is less than 30 percent canopy cover is assumed to be hydrologically altered and responds similar to a clearcut. This is particularly true if a large percentage of the drainage is located within the TSZ. Although one of the drainages (NF0206) in Table 3-13 has a large percentage of forested area with reduced canopy cover, it should be noted the drainage area has no forested area with less than 30 percent canopy cover within the TSZ. In 2005 the Wasson Fire burned 125 acres in drainage NF0206 and 1200 acres of drainage NF0203, in areas north of Highway140. Nothing is proposed in the Heppsie project in the north side of drainage NF0206 and NF0203, the areas with streams affected by the Wasson Fire. None of the TSZ canopy cover values within the analysis drainages reflects a value that may elevate the potential to alter timing and increase the potential for peakflows.

Recent research indicates that effects from peak flows, although of concern, should be confined to a relatively discrete portion of the network where channel gradients are less than approximately 2.0 percent and streambeds are composed of gravel and finer material. Furthermore, data supports the interpretation that if peak flow increases do occur, they can only be detected in flows of moderate frequency and magnitude. Beyond that, they are likely not detectable (Grant et al. 2008). What this suggests is that if increases in peak flows occur, they are unlikely to result in adverse effects to the higher gradient channels located within the analysis area. Also, that peak flows are only detectable in smaller storm events with return periods of 6 years or less, where channel forming processes are minor in effect.

d. Surface Water

Surface water in the Heppsie analysis area includes streams, ditches, springs, wetlands, and reservoirs. Streams in the project area are classified as perennial, intermittent with seasonal flow (long duration intermittent), intermittent with ephemeral flow (short duration intermittent), and dry draws with ephemeral flow. 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 1995:27). Streams on private forest lands are managed according to the Oregon Forest Practices Act. Stream types on BLM-managed 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. For this analysis the site potential tree lengths used for establishing riparian reserves are 165 for the Little Butte Creek Watershed. Table 3-14 summarizes stream miles within each HUC. Mileages include perennial, intermittent, and ephemeral (or short duration intermittent).

Table 3-14. 7th Field HUC Stream Miles, BLM and Private

HUC 7 (drainage)	Stream Miles			Total Miles
	BLM	USFS	Private	
NF0203	13.7	3.7	15.7	33.1
NF0206	3.0	-	2.6	5.6
NF0212	0.6	-	2.7	3.3
Total	**17.3**	**3.7**	**36.7**	**42**
SF0603	0.6	3.6	7.9	12.1
SF0606	10.8	-	4.0	14.8
Total	**11.4**	**3.6**	**11.9**	**26.9**
Total (all)	**28.7**	**7.3**	**48.6**	**68.9**

Large numbers of cattle and sheep were introduced in the area in the mid-1800s and heavy livestock use continued until the early 1900s. They tended to concentrate along stream courses and likely caused streambank deterioration as they moved in and out of channels. Livestock grazing is currently occurring on both public and private lands in the analysis area. Logging and land clearing for agricultural use resulted in the removal of large woody material from stream channels in addition to removal of streamside trees. In some reaches, there continues to be an apparent lack of large wood available today.

As a result, floods can be more destructive without sufficient instream structure to reduce stream energy. As more streambank erosion occurs and streams downcut, the channels become more entrenched. This also reduces channel diversity necessary for sustaining aquatic species.

Within the upper watersheds where harvest is proposed, the primary concerns are lack of riparian shade and large wood recruitment from past harvest activities. Also, as discussed previously, elevated sediment and turbidity levels are occurring as a result of an extensive road network and cattle grazing. Within the Heppsie analysis area, North Fork Little Butte Creek and South Fork Little Butte Creek are listed on ODEQs 2004/2006 303(d) list. Five miles of the mainstem North Fork Little Butte are within the analysis area, of which only 1.4 miles are located on BLM-administered lands. The mainstem of the South Fork Little Butte Creek flows through 2.6 miles of the analysis area, of which 1.2 miles are on BLM-administered lands. Both streams are listed for exceeding the summer temperature and *E. coli* criteria; North Fork Little Butte Creek also exceeds the pH criterion; and South Fork Little Butte Creek also exceeds the sedimentation criterion.

The long-term goal of the *Water Quality Restoration Plan for the North and South Forks of Little Butte Creek Key Watershed* is compliance with water quality standards for the 303(d) listed streams in the North and South Forks Little Butte Creek Key Watershed (USDI 2006). It contains information that will support the Oregon Department of Environmental Quality's (DEQ) development of the Rogue Basin Total Maximum Daily Load (TMDL). The WQRP identifies TMDL implementation strategies to achieve this goal. Recovery goals 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. The recovery of water quality conditions on BLM-administered land in the North and South Forks Little Butte Creek Key Watershed is dependent upon implementation of the BLM *Medford District Resource Management Plan* (USDI 1995). The RMP (Appendix D) includes best management practices (BMPs) that are intended to prevent or reduce water pollution to meet the goals of the CWA. Most of the stream warming in the analysis area can be attributed to channel alterations, loss of riparian shade, water withdrawals, and irrigation return flows in the lower watershed. Within the upper watershed, impacts affecting temperature are from past logging and grazing. Stream temperatures on Federal lands are expected to improve as Riparian Reserves promote the maintenance and improvement of streamside vegetation on BLM administered lands.

Fecal coliform bacteria are produced in the guts of warm-blooded vertebrate animals, and indicate the presence of pathogens that cause illness in humans. Sources of bacteria from BLM-administered lands include animal feces (wild and domestic, including livestock such as cattle) and inadequate waste disposal by recreational users. High summertime stream pH values in the North Fork Little Butte Creek probably result from algal growth upstream in Fish Lake. Generally, pH is not sensitive to forest management activities. Sediment sources on BLM-administered lands are nonpoint sources associated with management activities such as road development, timber harvest, and livestock grazing which can accelerate both upland and stream channel erosion rates.

Recovery goals for temperature, sedimentation, E. coli, and pH and restoration techniques for achieving these goals on BLM-administered land are specified in Table 3-15.

Table 3-15. Recovery Goals for BLM-Administered Land in the North and South Forks Little Butte Creek Key Watershed

Element	Goal	Passive Restoration	Active Restoration
Temperature ***Shade***	• Achieve coolest water possible through achievement of percent effective shade targets.	• Allow riparian vegetation to grow up to reach target values.[1]	• Use prescriptions that ensure long-term riparian vegetation health. • Implement prescriptions that increase growth rate and survival of riparian vegetation. • Plant native species from local genetic stock to create a stand that will result in increased tree height and density.[1]
Temperature ***Channel Morphology***	• Increase the amount of large wood in channels. • Improve riparian rooting strength and streambank roughness. • Decrease bedload contribution to channels during large storm events. • Maintain or improve channel types, focusing on width-to-depth ratios. • Increase the ratio of wood-to-sediment during mass failures.	• Follow NWFP Standards and Guidelines or watershed analysis recommendations for Riparian Reserve widths (including unstable lands). • Allow historic streambank failures to revegetate. • Allow natural channel evolution to continue. (Time required varies with channel type.)	• Promote riparian conifer growth for future large wood recruitment. • Encourage woody riparian vegetation versus annual species. • Stabilize streambanks where indicated. • Maintain and improve road surfacing. • Reduce road densities by decommissioning non-essential roads. • Increase culverts to 100-yr flow size and/or provide for overtopping during floods. • Minimize future slope failures through stability review and land reallocation if necessary. • Ensure that unstable sites retain large wood to increase wood-to-sediment ratio.
Temperature ***Streamflow***	• Maintain optimum flows for fish life. • Maintain minimum flows for fish passage.		• Utilize authorized water storage facilities to avoid diverting streamflows during low flows.

Element	Goal	Passive Restoration	Active Restoration
Sedimentation (South Fork Little Butte Creek and tributaries) ***Riparian Vegetation***	• Stabilize streambanks. • Filter sediment from upslope sources.	• Follow NWFP Standards and Guidelines or watershed analysis recommendations for Riparian Reserve widths (including unstable lands).	• Stabilize streambanks where indicated. • Implement prescriptions that increase growth rate and survival of riparian vegetation. • Use prescriptions that ensure long-term riparian vegetation health.
Sedimentation (South Fork Little Butte Creek and tributaries) ***Roads***	• Decrease sediment production and delivery from roads.	• Allow natural decommissioning to occur on non-essential roads where there is long-term maintenance-free drainage.	• Maintain adequate drainage facilities on all BLM-maintained roads open for administrative access during the wet season. • Maintain a minimum of four inches of rock surfacing on all BLM-maintained roads open for administrative access during the wet season. • Close all natural surface roads during the wet season. • Improve or install new drainage systems and surfacing on non-system roads near Riparian Reserves or unstable terrain. • Decommission or obliterate roads not critical for future management activities. • Provide a vegetative surfacing (native grass and conifers) on natural surface roads that are closed year-round. • Manage for no net increase in the amount of roads in the Key Watershed. • Allow for 100-year runoff events, including associated bedload and debris, when installing new stream crossing structures and for existing stream crossing structures that pose substantial risk to Riparian Reserves. • Stabilize road cuts and fills in Riparian Reserves. • Apply appropriate road BMPs identified in the RMP to minimize soil erosion and water quality degradation.
Sedimentation (South Fork Little Butte Creek and tributaries) ***Timber Harvest***	• Decrease sediment production and delivery from timber harvest.	• Follow NWFP Standards and Guidelines or watershed analysis recommendations for Riparian Reserve widths (including unstable lands).	• Decommission skid trails and landings located within Riparian Reserves; plant conifers where appropriate. • Stabilize actively eroding landslide areas that are contributing sediment to streams.

Element	Goal	Passive Restoration	Active Restoration
			• Apply appropriate timber harvest BMPs identified in the RMP to minimize soil erosion and water quality degradation.
Sedimentation (South Fork Little Butte Creek and tributaries) ***Livestock Grazing***	• Maintain or improve riparian vegetation in allotments. • Decrease bank degradation and off-site soil erosion caused by livestock.		• Manage livestock to maintain or improve riparian vegetation. • Complete assessment, evaluation, and determination of rangeland health followed by the appropriate level of NEPA analysis for issuing a grazing lease renewal.
E. Coli	• Decrease E. coli contamination caused by livestock.		• Manage livestock to prevent concentrations in streams or riparian zones.
pH	• Minimize nutrient inputs to surface water.	• Follow NWFP Standards and Guidelines or watershed analysis recommendations for Riparian Reserve widths (including unstable lands).	• Apply appropriate BMPs identified in the RMPs to prevent fertilizers and wildfire retardants from entering surface waters.

1 Passive versus active restoration of riparian areas. If current percent effective shade is greater than or equal to the target shade or 80 percent, the stream is considered recovered in terms of percent effective shade and the riparian area should not be a candidate for active restoration for the purposes of temperature recovery (ODEQ 2004). If current shade does not meet the target shade and is less than 80 percent, the site may benefit from active restoration and should be examined.

e. Fuel Loading

Within the forested portions of the watersheds, fuel loading beyond historical conditions has increased the potential for high intensity wildfire. Although humiditys are generally higher, given the right conditions some riparian areas are susceptible as well. High intensity fires can burn off the canopy and duff layers that protect soils from erosive and gravitational forces. A high intensity wildfire along the steep, stream-adjacent sideslopes would increase the potential for debris torrents and surface erosion. These impacts are often severe and may persist for long periods of time.

f. Groundwater

Groundwater supplies in the analysis area are limited due to the low permeability of the volcanic rocks found in the majority of the analysis area. In the lower portions, sand and gravel materials are more permeable; however, these materials are too small in extent to be major groundwater sources. Well water quality problems are prevalent throughout the Rogue Basin, arising from natural sources such as arsenic, boron, and fluoride. Surface contaminants such as nitrate and fecal matter may enter ground water through improperly constructed wells. Increasing demand from rural population density increases and years with below-normal precipitation have been identified as factors affecting ground water supplies in Jackson County (USDI 1994:3-13). The Medford District PRMP/EIS identified that an increase in rural population density has been accompanied by an increase in ground water diversion, and this trend is expected to continue (USDI 1994:3-13).

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 Heppsie project. Discussion for Alternative 2 and 3 reflect the direct and indirect impacts of the proposed actions. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to 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 1994:4-4).

As part of an assessment of cumulative effects, a discussion of reasonably foreseeable future activities combined with those of the action alternatives is included. Below is a summary of those actions that may occur with reasonable certainty. The affected environment section summarizes present conditions and effects.

Timber Harvest on Private Lands

Future timber harvest on private lands would likely occur within the analysis area and assumes that it will continue at a similar rate as has occurred in the past. Private lands are governed under state forestry regulations, and as such receive a different level of protection than federal lands. Analysis of effects from private timber harvest generally considers the worst case scenario (i.e., all suitable forested lands would be logged at ~ 60 year tree-growing rotations) with regeneration harvest and road building as the predominate effects.

Currently, approximately 1,155 acres of private timberland within the analysis area is 60 years or older and available for harvest. The drainages with the highest number of those acres are NF0203 and SF0606 which contain 647 and 200 acres respectively. Under this proposal, timber harvest on Federal land (BLM) is planned for NF0203 with more extensive harvest planned for SF0606. NF0203 is currently at 19 percent canopy cover less than 30 percent and 13 percent within the TSZ. SF0606 is currently at 10 percent canopy cover less than 30 percent and 18 percent within the TSZ. These numbers are considered relatively low, and as a result increased harvest on private land could likely be accommodated without approaching the 30 percent threshold that may increase risk.

Future Fuels Treatments

Fuel treatments are tentatively planned in the project area, to treat activity fuels. Fuels treatments would not occur within Riparian Reserves and require minimal ground disturbance. Because stream side shade producing vegetation would be buffered, treatments would not lead to increases in water temperature or sediment inputs to channels. Canopy levels would not be reduced, nor would ground compaction increase; hence peak flows would not be affected. The only effect fuels treatments may have to hydrologic resources is a possible increase in ground water storage and subsequent release to streams throughout the dry season. However, any extra water available is likely to be utilized by remaining vegetation before entering stream channels. For these reasons, fuels treatments are not expected to impact hydrologic resources, and they will not be considered further in this analysis.

Grazing

Cattle grazing is widespread throughout both the analysis area and in the larger watershed, both on private and BLM managed lands. The Heppsie allotment on BLM managed lands was recently renewed in 2010. The renewal included a 23% reduction in Annual Unit Months and modified the season of use slightly. In addition, the preferred alternative included additional fencing and stubble height trigger points which would be used to determine when cattle would be herded out of sensitive areas. The water resources analysis anticipated less hydrologic impacts at site locations, primarily less bank trampling, sediment inputs, and grazing of riparian vegetation. Some cattle grazing in sensitive riparian areas would likely continue to impact water quality, with chronic episodic inputs of sediment and turbidity occurring to stream reaches adjacent to destabilized and trampled banks. In areas lacking a large overstory component, cattle browse of riparian vegetation would perpetuate stream temperature warming. In general, it is anticipated that grazing will continue to occur and contribute effects to hydrologic resources in the Heppsie analysis area. The current baseline condition of stream temperature modification and sedimentation will be maintained. Slight improvements are anticipated from mitigation proposed during the allotment renewal process.

Riparian Road Obliteration

Road obliteration is planned in the Lower South Fork of Little Butte Creek Subwatershed in the summer of 2012. A total of 1.6 miles of road will be scarified and re-contoured to the extent possible. A total of 7 culverts will be removed, including a major culvert that was recently plugged by a debris torrent. The roads scheduled for removal are 37-2E-25.4, 37-3E-31.2 and 31.5, and 38-2E-1.2. The roads are located in the Deer Creek, Soda Creek, and Lost Creek drainage areas, and all involve perennial stream crossings. All four roads have the potential to deliver sediment into streams. This work will be performed during the dry season and will incorporate best management practices to minimize the potential for sediment delivery to watercourses during and immediately after the work is completed. Obliteration of the roads would be performed under the Aquatic Restoration programmatic EA.

a. Alternative 1

There are no actions proposed under Alternative 1 (the No Action Alternative); therefore, there are no direct, indirect, or cumulative effects which would result from selection of this alternative. The current conditions in the analysis area which are the result of past actions not related to the Heppsie Project would persist. All current conditions and trends would continue as specified in affected environment. Namely roads with poor drainage and lack of maintenance, or improper maintenance, would continue to deliver water and sediment to streams. Likewise, in certain stream reaches, channel processes would maintain poor habitat conditions due to a lack of large instream wood.

On BLM managed lands, over time, vegetation recovery within Riparian Reserves would moderate steam temperatures and provide for increased wood recruitment to stream channels. There would be no changes in percent of area in non-recovered (less than 30 percent canopy cover) openings, areas of compacted soil, road densities, percent of area in roads, or number of stream crossings. There would therefore be no changes to the magnitude and frequency of peak flows beyond those which may already be occurring.

In the long term, climate change projections indicate that the West and Pacific Northwest are likely to experience continued warming and increased precipitation along with more extreme wet and dry years (Furniss et al. 2010). As a result, hydrologic changes, particularly the changes in snowpacks and runoff patterns are among the most prominent and important consequences. Declines in snow water equivalent occurring in low and mid-elevation sites may result in earlier spring flows and lower late season flows. Changes in average annual streamflows are also expected to decrease. Flood severity is expected to increase because increased inter-annual precipitation variability would 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, given the right conditions, the lack of vegetation and fuels treatments may increase the likelihood 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.

b. Alternative 2

Direct and Indirect Effects

This alternative proposes various prescriptions of commercial tractor and cable timber harvest, new road construction, and road improvement. In addition, depending on post-harvest conditions, harvest units could be followed up by silvicultural treatments that would entail hand thinning, piling and burning.

A total of 1.2 miles of new road construction, none of which is within Riparian Reserves, and 0.4 miles of road renovation are proposed. All road renovation and new construction would occur on BLM land. In addition, road maintenance, including spot rocking would occur. All, road construction, improvement, and log hauling would be restricted to the dry season (see PDFs as described in Chapter 2 of this document).

All vegetation treatments would maintain an overstory and mosaic of understory vegetation. At least 30-50 percent canopy cover would be maintained in harvest units. There would be no increase of percent canopy cover less than 30 percent within the analysis area, including the TSZ, the threshold which may result in an increase in peak flows. Baseflows would likely remain unaffected as the magnitude of vegetation removal would not significantly reduce transpiration. Since there is no harvest proposed within Riparian Reserves, stream temperatures would not be affected by the proposal.

Where silvicultural treatments occur, tree thinning and low intensity underburning and pile burning would retain a mix of hardwoods and conifers, organic duff layer, leaf litter, and coarse wood debris. Collectively these forest components provide nutrients, bacteria and fungi decomposers, and mycorrhizae to maintain long term site productivity. Additionally, silvicultural treatments would likely occur over a period of years, distributing activity over time. These activities would not appreciably decrease canopy cover as only small diameter vegetation would be cut and piled.

As described above, sediment levels due to roads, past harvest, grazing and other disturbances is the primary focus of concern. In addition to road construction and improvement, this proposal includes log hauling and associated minimal road maintenance. This could include minor ditch cleaning (if necessary), road blading, and maintenance of drainage features. Log truck traffic, especially on unsurfaced roads, loosens the road surface and makes that material available for transport to channels. When road maintenance is performed improperly or best management practices (BMPs) are not implemented the potential for sediment delivery to streams increases dramatically. In 2011, the BLM conducted a review an update of BMPs to provide direction regarding road maintenance practices and road-related actions with the intention to minimize or prevent sediment delivery to waters of the United States in compliance with e Clean Water Act and its revisions. All applicable road construction and road improvement BMPS from the 1995 RMP or 2008 RMP, whichever is more stringent, will be utilized in this project. Examples include sidecasting material, undercutting cutslopes, improper disposal of material, and unnecessary disturbance within riparian reserves. Luce and Black (1999) found no significant increase in erosion when only the road surface was treated; however, statistically significant erosion occurred when road ditches were bladed. Luce and Black (2001) observed an 87% decrease in erosion and sediment transport from roads in years one and two following road maintenance activities.

With this alternative, hauling and road maintenance activities are expected to result in short term increases in sediment and turbidity. If BMP's are implemented and maintenance activities are properly conducted, these increases are expected to be minor. If transport occurs during high flows, which is likely, the introduced sediment would become an immeasurable fraction of the total sediment load and would not be detectable at downstream locations.

Road construction has the potential to increase sediment production as well. Under this alternative, no new road construction will occur in riparian reserves, nor will any of the new roads have hydrologic connectivity. None of the new roads will involve any stream crossings. New road construction would increase road density (Table 3-16) and the compacted area attributed to roads. An indirect affect that is difficult to quantify is OHV use following harvest. In areas not already closed by gates or other measures, OHV use of skid trails and other features such as previously closed roads has been observed. The result is a potential increase of unmanaged OHV trails leading to elevated sediment rates and adverse impacts to soils and other resources. These effects may persist over time. Within the analysis area, light use is occurring and may increase if project design features (PDFs) specific to skid trails are not adhered to. . The potential for OHV use of skid trails is limited, as the project area is not heavily used by OHVs, much of the tractor ground is behind locked gates, and PDFs to discourage use of tractor yarding corridors are included in this sale. If OHV use were to occur in the tractor units which resulted in increased erosion, it would not affect aquatic habitat; the tractor units are mostly ridge-top units located far from stream channels.

Table 3-16. Comparison of Road Density in Miles/Square Mile for Drainages with New Construction

Subwatershed	HUC 7 (Drainage)	Alternative 1 (no action)	Alternative 2
		Total	Total
North Fork	0203	4.6	4.7
Little Butte Creek	0206	5.9	5.9
	0212	3.8	4.5
South Fork	0603	0.8	No new roads
Little Butte Creek	0606	1.7	1.9

Actions included in this proposal that have a higher probability of erosion include road use, pre/post haul road maintenance, cable and tractor yarding, road construction, and road improvement activities (see soils section). Of these activities, the road improvement, road use, and pre/post haul road maintenance would have direct connectivity to hydrologic resources. With proper implementation of project design features (PDFs) and BMPs contained in Chapter 2 , there would be small increases of sediment routed to stream channels. Also, given the small amount of additional compacted area and no increases in canopy cover less than 30 percent (current condition in Table 3-13), there is little probability the proposal would modify the magnitude or timing of peak or base flows.

No timber harvest will occur in Riparian Reserves. Per the WQRP, the recovery of water quality conditions on BLM-administered land in the North and South Forks Little Butte Creek Key Watershed is dependent upon implementation of the BLM *Medford District Resource Management Plan* (USDI 1995). Stream temperatures on Federal lands are expected to improve as Riparian Reserves promote the maintenance and improvement of streamside vegetation on BLM administered lands and shade targets are met. This alternative is compliant with the Rogue Basin TMDL (ODEQ 2008).

In the long term, climate change projections indicate that the West and Pacific Northwest are likely to experience continued warming and increased precipitation along with more extreme wet and dry years (Furniss et al. 2010). As a result, hydrologic changes, particularly the changes in snowpacks and runoff patterns are among the most prominent and important consequences. Declines in snow water equivalent occurring in low and mid-elevation sites may result in earlier spring flows and lower late season flows. Changes in average annual streamflows are also expected to decrease. Flood severity is expected to increase because increased inter-annual precipitation variability will cause increased runoff in wet years and increased rain-on-snow probability in low elevation snowpacks.

Given the uncertainty in climate models and the predicted effects of climate change on a site specific scale, it is difficult estimate the combined effects of this site-specific project with those anticipated effects of climate change with any certainty. Therefore, the best way to address this issue is to discuss the effects of this project on maintaining watershed resiliency. Under this alternative, vegetation and silvicultural 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. Alternately, roads and road construction can decrease watershed resiliency.

Cumulative Effects

As described in the affected environment, impacts from roads, grazing, clearcut logging and water diversions have altered watershed processes in the drainages. In the lower stream reaches of the sub-watersheds, grazing, roads, channel alteration, and water diversions are responsible for degraded aquatic processes and conditions. This mix of impacts is typical of many of the drainages that are tributary to the North and South Forks of Little Butte Creek.

It is expected that reasonably foreseeable future actions including rotational harvest on commercial timberlands that maintain forest conditions in an early to mid-seral condition (USDI 1995) and land disturbance attributed to development of private lands will continue. Activities on BLM 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. On BLM managed lands, in the Heppsie Mountain allotment, it is expected that the reduction in AUMs, additional fencing, and stubble height trigger points to herd cattle out of sensitive areas will slightly reduce grazing impacts in the long term.

Overall, Alternative 2 would not reduce canopy cover below critical thresholds (<30 percent) or result in appreciable increases in ground disturbance (Table 3-17). These would be the primary catalysts that may trigger synergistic responses. The proposal does not appreciably decrease canopy cover within the TSZ that may result in peak flow increases. The timing of foreseeable actions such as harvest of trees 60 years and older is speculative. The potential impact to canopy cover of these actions, were they to occur all at once are summarized in Table 3-17. The elevated risks to peak flows from this potential reduction in canopy cover exist regardless of the actions proposed under alternative 2.

Recent research supports the interpretation that if peak flow increases do occur, they can only be detected in flows of moderate frequency and magnitude. Beyond that, they are likely not detectable (Grant et al. 2008). What this suggests is that if increases in peak flows occur, they are unlikely to result in adverse effects to the higher gradient channels located within the analysis area. Also, that peak flows are only detectable in smaller storm events with return periods of 6 years or less, where channel forming processes are minor in effect.

Table 3-17. 7th Field HUCs Percent Less Than 30% Canopy Cover (CC), With Alternative 2, and With Alternative 2 and Foreseeable Future Actions

HUC 7 (drainage)	Current Percent Forested Area Less Than 30% CC[1]	Percent Forested Area Less Than 30% CC with new road construction in Alternative 2 [2]	Percent Forested Area Less Than 30% CC with Alt. 2 road construction and foreseeable future actions[3]
NF0203	19	19	38
NF0206	40	40	59
NF0212	0	<0.1	40
Total	**22**	**22**	**41**
SF0603	13	13	32
SF0606	10	10	26
Total	**11**	**11**	**28**
Total (All)	**19**	**19**	**37**

[1]Includes existing disturbance features such as roads and landings
[2]Assumes 2 acres/mile for newly constructed road
[3]Includes two qualifiers above and harvest on private timberlands 60yrs & older

Road densities are considered high in all the North Fork Little Butte Creek drainages, including within Riparian Reserves. Table 3-16 summarizes the changes between Alternative 1(No-Action) and Alternative 2. One drainage in particular (0206) has both high road densities and a relatively high percentage of forested acres that is less than 30 percent canopy cover. This drainage may be at an increased risk of cumulative impacts. However, there are no forested acres less than 30% CC in the TSZ, it is unlikely that private timber land in this small drainage area could be harvested (most was harvested after the 2005 Wasson Canyon Fire), the canopy cover would be maintained on BLM lands, and the 0.10 miles of new road proposed under this alternative are not hydrologically connected. Therefore, this alternative would not increase risk within this drainage. The other drainages with proposed new road construction under this alternative are NF0203, NF0212, and SF0606. Drainage NF0212 will have the largest increase in road density of the analysis HUCs. None of the drainages would have new road construction within Riparian Reserves.

Increased road density, particularly with Riparian Reserves, can increase the potential for sediment delivery to stream channels. Although road densities would increase, there is no new road construction in Riparian Reserves. All new construction occurs high up in the drainages. Although drainage 0203 and 0212 are at elevated risk of cumulative effects, and this alternative increases that risk, it is expected that with effective implementation of BMPs and PDFs sediment delivery from new road construction would be dissipated on the forest floor and subsequently not have hydrologic connectivity to any stream.

A foreseeable action that would ultimately reduce road densities within the Lower South Fork Little Butte Creek Subwatershed is described in the road obliteration section above. The BLM received funding and has a contract in place to decommission approximately 1.6 miles of riparian roads on BLM land. This work is expected to take place in the summer of 2012. The road decommissioning will offset new construction and ensure no net gain in road densities occurs within key watershed; however, this action would occur separate from and regardless of the timber sale. Additionally, there are 25 roads that were identified in the Little Butte Creek Watershed Analysis that are proposed for decommissioning should funding become available. This would further reduce road densities in the affected drainages. These roads are summarized below (Table 3-18).

Table 3-18. Roads Identified as Opportunities for Decommissioning

Road Number	Road Number	Road Number
37-1E-11.1	37-2E-19.4	38-2E-1.6
37-1E-11.3	37-2E-24.0	38-2E-3.3 (part)
37-1E-11.5	37-2E-25.2	38-2E-3.4
37-1E-13.1	37-2E-29.0	37-3E-5.2
36-2E-35.0	37-2E-33.3	37-3E-5.3
37-2E-19.0	37-2E-33.5	38-3E-15.3
37-2E-19.1	38-2E-1.0	38-3E-27.3
37-2E-19.2	38-2E-1.3	38-3E-29.4
37-2E-19.3	38-2E-1.4	

This alternative elevates the potential for cumulative effects resulting from increasing already high road densities. Since canopy cover would not be reduced below 30 percent, synergistic cumulative effects would likely be minimal. Sediment production resulting from road use and construction may increase in the short term. In many cases riparian vegetation vigor would improve over time, thus potentially decreasing stream temperatures. Although there are both natural and human induced risk factors for cumulative effects, this alternative is not expected to significantly increase these within the project area drainages, or the larger subwatersheds.

c. Alternative 3

Direct and Indirect Effects

This alternative is the same as Alternative 2 except it does not propose any new road construction and will result in harvesting less timber, as those units accessed by the proposed new roads would be dropped.

All vegetation treatments would maintain an overstory and mosaic of understory vegetation. At least 30-50 percent canopy cover would be maintained in harvest units. There would be no increase of percent canopy cover less than 30 percent within the analysis area, including the TSZ, which may result in an increase in peak flows. Baseflows would likely remain unaffected as the magnitude of vegetation removal would not significantly reduce transpiration. Since there is no harvest proposed within Riparian Reserves, stream temperatures would not be affected by the proposal and the project would allow attainment of the Aquatic Conservation Strategy (ACS). An assessment of the ACS Objectives is contained in Section E, this Chapter (below).

Where fuel treatments occur, tree thinning and low intensity under burning and pile burning would retain a mix of hardwoods and conifers, organic duff layer, leaf litter, and coarse wood debris. Collectively these forest components provide nutrients, bacteria and fungi decomposers, and mycorrhizae to maintain long-term site productivity. Additionally, fuel treatments would likely occur over a period of years, distributing activity over time. These activities would not appreciably decrease canopy cover as only small diameter vegetation would be cut and piled.

As described in the affected environment section, sediment levels due to roads, past harvest, grazing and other disturbances is the primary focus of concern. In addition to road renovation, this proposal includes log hauling and associated road maintenance. This could include minor ditch cleaning (if necessary), road blading, and maintenance of drainage features. Log truck traffic, especially on unsurfaced roads, loosens the road surface and makes that material available for transport to channels. When road maintenance is performed improperly or best management practices (BMPs) are not implemented the potential for sediment delivery to streams increases dramatically. Luce and Black (1999) found no significant increase in erosion when only the road surface was treated; however, statistically significant erosion occurred when road ditches were bladed. Luce and Black (2001) observed an 87% decrease in erosion and sediment transport from roads in years one and two following road maintenance activities.

With this alternative, hauling and road maintenance activities are expected to result in a short term increases in sediment and turbidity. If BMPs are implemented and maintenance activities are properly conducted, these increases are expected to be minor. If transport occurs during high flows, which is likely, the introduced sediment would become an immeasurable fraction of the total sediment load and would not be detectable at downstream locations.

An indirect affect that is difficult to quantify is OHV use following harvest. In areas not already closed by gates or other measures, OHV use of skid trails and other features such as previously closed roads has been observed. The result is a potential increase of unmanaged OHV trails leading to elevated sediment rates and adverse impacts to soils and other resources. These effects may persist over time. Within the analysis area, light use is occurring and may increase if project design features (PDFs) specific to skid trails are not adhered to. The potential for OHV use of skid trails is limited, as the project area is not heavily used by OHVs, much of the tractor ground is behind locked gates, and PDFs to discourage use of tractor yarding corridors are included in this sale. If OHV use were to occur in the tractor units which resulted in increased erosion, it would not affect aquatic habitat; the tractor units are mostly ridge-top units located far from stream channels.

Actions included in this proposal that have a higher probability of erosion include road use, pre/post haul road maintenance, cable and tractor yarding, and road improvement activities (see soils section). Of these activities, the road improvement, road use, and pre/post haul road maintenance would have direct connectivity to hydrologic resources. With proper implementation of PDFs and BMPs contained in Chapter 2 , there would be small increases of sediment routed to stream channels. Also, given there are no increases in canopy cover less than 30 percent (current condition in Table 3-14), there is little probability the proposal would modify the magnitude or timing of peak or base flows.

In the long term, climate change projections indicate that the West and Pacific Northwest are likely to experience continued warming and increased precipitation along with more extreme wet and dry years (Furniss et al. 2010). As a result, hydrologic changes, particularly the changes in snowpacks and runoff patterns are among the most prominent and important consequences. Declines in snow water equivalent occurring in low and mid-elevation sites may result in earlier spring flows and lower late season flows. Changes in average annual streamflows are also expected to decrease. Flood severity is expected to increase because increased inter-annual precipitation variability will cause increased runoff in wet years and increased rain-on-snow probability in low elevation snowpacks.

Given the uncertainty in climate models and the predicted effects of climate change on a site specific scale, it is difficult estimate the combined effects of this site-specific project with those anticipated effects of climate change with any certainty. Therefore, the best way to address this issue is to discuss the effects of this project on maintaining watershed resiliency. Under this alternative, 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. Alternately, roads and road construction can decrease watershed resiliency.

Cumulative Effects

As described in the affected environment, impacts from roads, recreation, grazing, OHVs, clearcut logging and water diversions has altered watershed processes in the drainages. In the lower stream reaches of the sub-watersheds, grazing, roads, channel alteration, and water diversions are responsible for degraded aquatic processes and conditions. This mix of impacts is typical of many of the drainages that are tributary to the North and south Forks of Little Butte Creek.

It is expected that reasonably foreseeable future actions including rotational harvest on commercial timberlands that maintain forest conditions in an early to mid-seral condition (USDI 1995) and land disturbance attributed to development of private lands will continue. Activities on BLM 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. On BLM managed lands, in the Heppsie Mountain allotment, it is expected that the reduction in AUMs, additional fencing, and stubble height trigger points to herd cattle out of sensitive areas will slightly reduce grazing impacts in the long term.

Overall, Alternative 3 would not reduce canopy cover below critical thresholds (<30 percent) or result in appreciable increases in ground disturbance (Table 3-19). These would be the primary catalysts that may trigger synergistic responses. The proposal does not appreciably decrease canopy cover within the TSZ that may result in peak flow increases. The timing of foreseeable actions such as harvest of trees 60 years and older is speculative. The potential impact to canopy cover of harvesting all trees 60 years and older on private lands in the analysis area, were they to occur all at once is summarized below in Table 3-19. The elevated risks to peak flows from this potential reduction in canopy cover exist regardless of the actions proposed under alternative 3.

Table 3-19. 7th Field HUCs Percent Less Than 30% Canopy Cover (CC), With Alternative 3, and With Alternative 3 and Foreseeable Future Actions

HUC 7 (drainage)	Current Percent Forested Area Less Than 30% CC[1]	Percent Forested Area Less Than 30% CC in Alternative 3 [2]	Percent Forested Area Less Than 30% CC with Alt. 3 and foreseeable future actions[3]
NF0203	19	19	38
NF0206	40	40	59
NF0212	0	0	40
Total	**22**	**22**	**41**
SF0603	13	13	32
SF0606	10	10	26
Total	**11**	**11**	**28**
Total (All)	**19**	**19**	**37**

[1]Includes existing disturbance features such as roads and landings
[2]Assumes 2 acres/mile for newly constructed road
[3]Includes two qualifiers above and harvest on private timberlands 60yrs & older

Recent research supports the interpretation that if peak flow increases do occur, they can only be detected in flows of moderate frequency and magnitude. Beyond that, they are likely not detectable (Grant et al. 2008). What this suggests is that if increases in peak flows occur, they are unlikely to result in adverse effects to the higher gradient channels located within the analysis area. Also, that peak flows are only detectable in smaller storm events with return periods of 6 years or less, where channel forming processes are minor in effect.

Road densities however are considered high in all the North Fork Little Butte Creek drainages, including within Riparian Reserves. One drainage in particular (0206) has both high road densities and a relatively high percentage of forested acres that is less than 30 percent canopy cover. This drainage may be at an increased risk of cumulative impacts. However, there are no forested acres less than 30% CC in the TSZ, it is unlikely that private timber land in this small drainage area could be harvested (most was harvested after the 2005 Wasson Canyon Fire) and the canopy cover would be maintained on BLM lands. Therefore this alternative would not increase risk within this drainage.

Current road densities and riparian road densities in the analysis area would remain unchanged (current condition in Table 3-11). Road density and riparian road density at the watershed scale (Little Butte Creek) would be reduced appreciably more by the foreseeable action; 1.6 miles of riparian road decommissioning/obliteration planned for summer 2012, in Deer Creek, Soda Creek, and Lost Creek. The net gain to the key watershed would be the 1.6 mile reduction, rather than 0.4 mile net reduction in the key watershed under alternative 2. Additionally, there are 25 roads that were identified in the Little Butte Creek Watershed Analysis that are proposed for decommissioning should funding become available. This would further reduce road densities in the affected drainages. These roads are summarized in Table 3-20 above.

Since canopy cover would not be reduced below 30 percent, synergistic cumulative effects would likely be minimal. Sediment production resulting from road use and road improvement may increase in the short term. 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, Alternative 3 is not expected to significantly increase these within the project area drainages, or the larger subwatersheds. Any effects would be less than Alternative 2 since no new road construction is proposed.

F. AQUATIC HABITAT & FISH

The proposed Heppsie timber sale would be located on Heppsie Mountain, a prominent ridge system which lies between the North and South Forks of Little Butte Creek. Included in the analysis area are five 7th field watersheds (HUC 7s, referred to as drainages), three of which drain the north slope of Heppsie Mountain to the North Fork of Little Butte Creek, the other two draining the south side to the South Fork. All elements of the Heppsie timber sale would occur within these five drainages, which make up a small portion of the much larger Little Butte Creek fifth field Watershed (Map 3-6). Short portions of the mainstem fish-bearing channels of both the South and North Forks of Little Butte Creek are contained within the analysis area drainages, though the majority of the streams within the analysis area are small intermittent fishless frontal tributaries. This portion of the Little Butte Watershed is a designated tier one key watershed. Key watersheds have a federal management mandate that no net increase in road densities should result from any project.

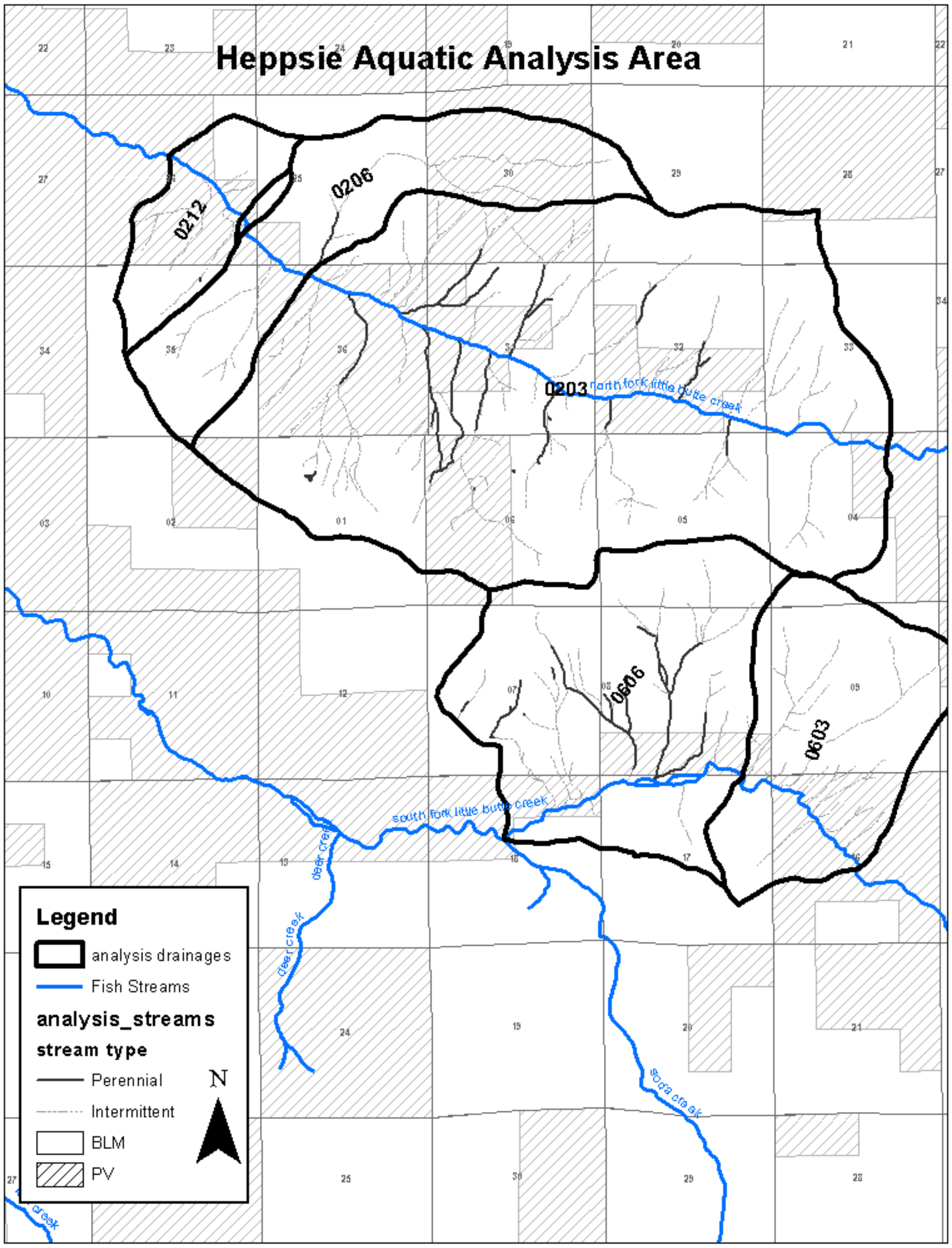
Aquatic habitat- and fish-related issues associated with the Heppsie Project have been identified through public scoping or ID team specialists and will be addressed in this document. These relevant issues are:

- There could be short-term increases in sediment from roadbed and drainage ditch disturbance associated with road maintenance activities.
- Some commenters expressed concern that logging and road building could contribute to upland erosion in the Little Butte Creek Watershed.
- 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 aquatic habitats and associated organisms.
- Any increased sedimentation to streams from the implementation of the project proposal could potentially impact aquatic habitat and fish.

Map 3-6. Aquatic Fish and Habitat Analysis area for the Heppsie Forest Management Project.



1. Key Fisheries and Aquatic Resources Issues

Scoping (external and internal) generated the following key issues for fish and fish habitat both existing and anticipated under implementation of the action alternative:

- 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) Urbanization and development, especially along the main channel of Little Butte Creek and its larger tributaries, has resulted in a high percentage of the watershed now being covered by non-porous surfaces. This has altered run off patterns, which in turn has led to reduced water quality, and physical alterations of aquatic habitat.

  2) Extensive road construction has created high road densities and led to increased sediment inputs to aquatic habitat.

  3) Demands for water use have led to: construction of dams which may obstruct fish passage; some streams in the watershed being over allocated; and altered stream flow regimes.

  4) Historic and ongoing grazing has resulted in increased erosion and sediment transport to many stream reaches, particularly within uppermost portions of the watershed, but also within the analysis area drainages.

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

- Sediment and turbidity levels in many of the watershed streams, including the South Fork of Little Butte, are elevated, compromising the function and health of both the stream system and populations of aquatic organisms. The Oregon Department of Fish and Wildlife (ODFW) considers fine sediment levels of greater than 20% to be undesirable for salmonids. Furthermore, several streams are listed for other water quality deficiencies, including exceeding water temperature standards. 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 further degrade habitat, as a result of implementing the action alternative.

- Off Highway Vehicle (OHV) use is occurring within portions of the watershed. Heppsie Mountain appears to receive only very limited OHV use, the bulk of which occurs during hunting season and is mostly confined to open surfaced roads rather than unauthorized trails. Some steps have been undertaken recently to address OHV use, as a network of trails in the Lake Creek area was recently obliterated, and within the analysis area specifically, one user-created truck trail which bisected a meadow on Heppsie Mountain was recently closed. 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.

Endangered Species Act & Coho Critical and Essential Fish Habitat

In 1997 the Southern Oregon/Northern California Coasts (SONCC) Evolutionary Significant Unit (ESU) of coho salmon (*Onchorynchus kisutch)* was listed as "threatened" with the possibility of extinction under the Endangered Species Act (ESA) by the National Marine Fisheries Service (NMFS). SONCC coho occur in the mainstems of both the North and South Forks of Little Butte. None of the small frontal drainages within the analysis area are fish bearing streams.

On May 5, 1999, NMFS designated Coho Critical Habitat (CCH) for SONCC coho salmon. Critical habitat includes "all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers." It further includes "those physical or biological features essential to the conservation of the species and which may require special management considerations or protection...", including all historically accessible waters (F.R. vol. 64, no. 86, 24049). In the analysis area, both the North and South Forks of Little Butte Creek are SONCC CCH.

Essential Fish Habitat (EFH) has been defined by NMFS as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This definition includes all waters historically used by anadromous salmonids of commercial value (in this instance, coho salmon). EFH within the planning area is identical to CCH. More information regarding EFH may be found at: http://www.nmfs.noaa.gov/ess_fish_habitat.htm.

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 165' in the Little Butte 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 Medford District Resource Management Plan (RMP). See Appendix A, pg. C-31 of the Medford District RMP, 1994. 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 9 objectives, which guide BLM's management of Riparian Reserves. These objectives are examined at the site (e.g. a single pool or stream reach), HUC 7 (drainage) and HUC 5 (large watershed) scale. The 9 objectives and effects from implementation of the preferred alternative are presented in Appendix D of this document.

2. Foreseeable Future Actions

This section will present projects proposed in the foreseeable future that may add cumulative impacts to fisheries resources on top of anticipated impacts resulting from the Heppsie project, within the analysis area. Anticipated affects to fisheries resources will be described from each action. For any foreseeable future action determined to have any anticipated effects to aquatic habitat, the cumulative effect of the action coupled with effects from the Heppsie timber sale will be discussed at the end of this analysis.

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 ~ 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 managed lands. The Heppsie allotment on BLM managed lands was recently renewed. The preferred alternative (EA # DOI-BLM-OR-M060-2010-0012) proposed a 23% reduction in AUM's and modified the season of use slightly, as well as additional fencing and stubble height trigger points which would be used to determine when cattle would be herded out of sensitive areas. The water resources analysis anticipated that this alternative would be expected to result in less aquatic impacts at site locations, manifested primarily as less bank trampling, sediment inputs, and grazing of riparian vegetation. Some cattle grazing in sensitive riparian areas would likely continue to impact water quality, with chronic episodic inputs of sediment and turbidity occurring to stream reaches adjacent to destabilized and trampled banks. Small springs and seeps are particularly vulnerable to degradation, as these areas often contain suitable browse along with a reliable water source, which both attracts and concentrates cattle to these areas. In areas lacking a large overstory component, cattle browse of riparian vegetation would perpetuate stream temperature warming. In general, it is anticipated that grazing will continue to occur and contribute deleterious effects to aquatic habitats in the Heppsie analysis area, helping maintain the current baseline condition as manifested by increased stream sedimentation and water temperature, though to a slightly lesser degree due to mitigation proposed during the allotment renewal process.

Riparian Road Obliteration

Not within the analysis area but pertinent to this analysis, 1.6 miles of riparian roads are planned for obliteration in the summer of 2012 in the South Fork of Little Butte Creek catchment (several miles south of the Heppsie analysis area). The roads (37-2E-25.4, 37-3E 31.2 and 31.5, and 38-2E-1.2 rds.) all include perennial stream crossings, channel adjacent segments, and all have potential to chronically input sediment into aquatic habitat. None of the roads are near fish bearing streams. The 37-2-25.4 road was recently subjected to a debris torrent, which resulted in the plugging of a major culvert and the subsequent overtopping of the road by the creek. Obliteration of the roads would be performed under the Aquatic Restoration programmatic EA, and will involve pulling of all drainage structures (including the plugged culvert described above), ripping the road surface, and establishing as much of a re-contour as feasible, followed by seeding, planting, and mulching of all disturbed surfaces. These activities (save planting which would likely occur at the onset of the wet season) would occur during the dry season, and are anticipated to contribute very small amounts of sediment at each crossings (7 culverts would be pulled). Similar past restoration projects performed on the resource area suggest that amounts of sediment contributed to channels would be less than 1 cubic yard at each crossing.

The amount of sediment anticipated to be input into each of the subwatersheds (< 4 cubic yards in Deer Creek, < 2 in Soda, and < 1 in Lost Creek) is not anticipated to adversely affect fish or fish habitat. Coarse sediment released to the stream channels after pulling the culverts would eventually either settle out in natural deposition areas during flood events and be assimilated into the stream substrates of the small perennial streams, or slowly work its way downstream where it would be released in small undetectable pulses to fish bearing habitats in Lost, Deer, and Soda Creeks. Fine sediment would probably be entrained during the first large flushing event following road work and transported through the system as a brief pulse of elevated turbidity, undetectable behind background conditions by the time it reached fish habitat. These onetime inputs are much less than that which could be reasonably expected to be input by these roads over their life span in the event they are not obliterated. The obliteration of these roads would offset new road construction proposed in alternative 2 of the Heppsie timber sale within the designated key watershed portion of Little Butte.

3. Affected Environment—Fish and Designated Habitat

This section will present baseline conditions in the Little Butte 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 added on top of these past actions as a result of the Heppsie timber sale, coupled with foreseeable effects from future projects as described above, are the cumulative effects of this project to fisheries resources.

a. Fish and Designated Habitat

Little Butte Creek Watershed

SONCC coho salmon, fall Chinook salmon (*O. tshawytscha)*, summer and winter steelhead (*O. mykiss*), and Pacific lamprey (*Entoshpenus tridentatus)* are native migratory fish species present in the watershed.

Chinook distribution includes the mainstem of Little Butte Creek from its mouth to the confluence of the South and North Forks of Little Butte Creek, at which point they begin to peter out. Coho and steelhead occur up both forks, and are also present in many of the larger tributary streams in the watershed.

Cutthroat trout (*O. clarkii*), sculpin (*Cottus spp.*), Klamath small-scale sucker (*Catostomus rimiculus*), and rainbow trout (*O. mykiss*) are native fish species present in the watershed that do not migrate to the ocean. Distribution of most of these species extends well upstream in both forks of Little Butte. Cutthroat and rainbow trout are typically found the farthest upstream. In the analysis area, coho, steelhead, rainbow and cutthroat are present in the mainstem channels of both the North and South Forks of Little Butte Creeks. None of the small frontal streams which drain Heppsie Mountain are fish bearing streams.

A host of introduced fish species are also present in the watershed, including brook trout (*Salvelinus fontinalis*) redside shiners (*Richardsonius balteus*), largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), Yellow Perch (*Perca flavescens*), and common carp (*Cyprinus carpio)*. The warm water species are primarily found in Agate Reservoir and many of the other watershed impoundments, and in the slower and warmer water areas in lower reaches of Little Butte Creek. The brook trout reside in the headwater stream reaches at higher elevations.

Little Butte Creek is used as a migratory corridor for adult and juvenile coho and steelhead to access their primary spawning and rearing habitats located in the larger tributaries. Fall Chinook salmon are mainstem spawners and utilize suitable spawning locations in Little Butte Creek. Both forks of Little Butte and the larger tributaries are utilized as spawning and rearing habitat for coho and steelhead and resident trout species.

4. Environmental Consequences—Fish and Designated Habitat

a. Alternative 1—No Action Alternative

The No Action Alternative will have "*No Effect*" to fish populations or distribution, SONCC coho salmon, CCH, or EFH, as no ground disturbing activities would occur under this alternative. Affects already occurring to fish habitat as a result of past and ongoing activities are presented in the Aquatic Habitat and Riparian Reserve sections following.

b. Alternatives 2 and 3

Both Alternatives 2 and 3 have been determined to be "*No Effect*" to SONCC coho salmon, CCH, and EFH. This determination was made based on analysis to fish and aquatic habitat in this EA. Effects to aquatic habitat would occur well upstream of CCH, and were determined to be of insufficient magnitude and of a nature to not meaningfully impact aquatic habitats in the fish bearing North and South Forks of Little Butte Creeks (see aquatic habitat discussion, below), and hence implementation of either action alternative would not affect threatened coho populations in the Little Butte Creek Watershed.

5. Affected Environment—Aquatic Habitat

Little Butte Creek Watershed

Instream habitats in the Little Butte Creek Watershed as a whole can be described as degraded as compared to pre-European settlement. Generally speaking, lower portions of the watershed have been impacted more so than upper portions, as lowland areas have been settled and developed extensively. Houses, agriculture fields, and roads occur adjacent to much of the mainstem of Little Butte Creek and its major tributaries, resulting in narrowed and constrained riparian corridors. Confinement of the streams by roads and structures has resulted in a loss of habitat features as little natural stream channel meander remains; this has resulted in higher riffle to pool ratios, and a corresponding reduction in the amount of quality rearing habitat. Water quality is relatively poor in the mainstem of Little Butte, which is plagued by elevated water temperatures, and subject to moderate to high levels of sediment and turbidity, as well as a suite of other water quality issues (see Section E: Water Resources). Water is withdrawn for agricultural purposes from many of the streams in the lower watershed, exacerbating water quality/quantity issues during the summer months. The forks of Little Butte and tributaries farther up in the watershed, though far from pristine, have been subject to less channel adjacent development, and as such contain greater habitat complexity which provides higher quality habitat for aquatic organisms. In general, water quality is better in these stretches, though water temperature and sediment/turbidity problems persist through many of these stream reaches as well.

Many miles of road have been constructed in the watershed, and road densities in many of the subwatersheds and drainages, including in three of the analysis area drainages, are considered high (see water resources, this document). Roads have contributed to sedimentation of instream habitat. The effects of fine sediment on aquatic organisms have been well documented; fine sediment (such as decomposed granitic sand or silt) in excessive amounts degrades stream and aquatic organism health. This sediment can fill in pools, cover spawning gravels, and smother eggs (Meehan et al. 1991). Reduced substrate availability and complexity may decrease the diversity and quantity of aquatic organisms, upsetting the ecological balance of the stream system. Extended periods of increased turbidity, which occurs when fine sediment becomes entrained in the water column, can disrupt feeding and territorial behavior of juvenile salmonids. This can lead to decreased growth rates and increased mortality. These effects may be far-reaching, and stream reaches many miles downstream of point-sources of sediment input (including downstream areas designated as CCH and EFH) have the potential to be negatively impacted (Meehan et al. 1991). The Little Butte Creek Watershed Assessment identified roads as the largest human impact to the watershed in terms of sediment delivery and negative effects to fish habitat (USDI 1997).

Upland areas of the watershed have been affected primarily by commercial logging (including roads associated with harvest activities) and cattle grazing. These activities have in the past and continue at present day to contribute to elevated levels of sediment delivery to aquatic habitats. Clear cutting large swaths of forested land is still practiced on private lands in the watershed. Some of the cuts have occurred in areas prone to large scale erosional processes; this coupled with an extensive road network which has a high degree of hydrological connectivity has increased the risk of events with potential to impact aquatic habitat, such as elevated peak flows and episodic mass wasting. Recent examples of such an event occurred in 2005 and again in 2011, when large debris torrents impacted many miles of habitat in the Deer Creek catchment.

Large episodic wind events have led to recent harvest of toppled trees on some BLM-administered lands within the watershed, and within the analysis area specifically, as 170 acres of units on Heppsie Mountain were recently salvaged logged. These acres are reflected in the water and soils resources analysis of disturbed ground. Salvage operations did not enter Riparian Reserves, were confined to upper slopes, far from fish bearing stream channels, and did not result in detectable sediment inputs into the aquatic system.

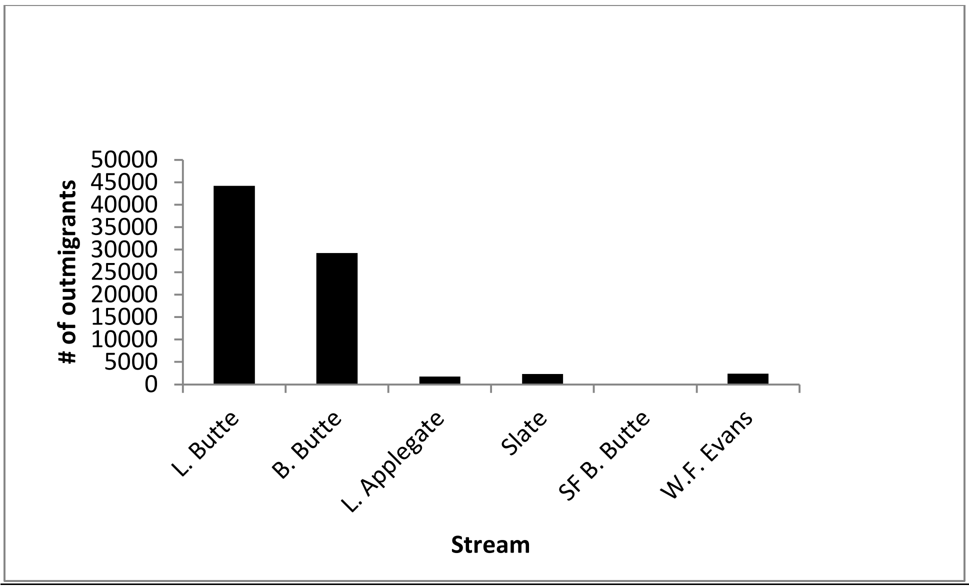
Cattle grazing is widespread throughout the entire watershed, on both on private and federal lands. The primary effects to aquatic habitat from cattle grazing occur when cattle are concentrated for extended periods in sensitive riparian areas (i.e. those not armored by rocky banks or surrounded by dense 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 stream side 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 as well. OHV trails with connectivity to aquatic environments impact aquatic habitat in a similar fashion as roads. However, as OHV trails are typically user created natural surfaced trails with no thought given to their drainage capabilities, they can be particularly prone to rutting and subsequent transport of eroded particulates down the trail and towards aquatic habitat. Inventories have documented that the majority of user created OHV trails in the Little Butte Creek

Watershed are in the Lake and Antelope Creek catchments; less than ¼ mile of trails were found on BLM lands within the analysis area.

In spite of the myriad of issues affecting both water quality and aquatic habitat, Little Butte Creek remains a very productive stream, producing some of the highest numbers of salmon and steelhead smolts observed in the upper Rogue River basin (Figure 3-20). Recognizing this, extensive restoration efforts have occurred in the watershed over the last decade or so, and include the removal of barriers, the placement of large wood in many miles of stream, planting of riparian vegetation, historic channel reconnection, and exclusion of cattle from sensitive riparian areas. Efforts are ongoing; recent efforts in the summer of 2011 led to the obliteration of many miles of user created OHV trails with hydrological connectivity on federal and private lands, and several riparian road segments on BLM lands are slated for obliteration in 2012.

Figure 3-20. Estimated numbers of coho, steelhead, and lamprey outmigrants from six Rogue Basin tributaries. (Data from Smolt Trapping project conducted by ODFW and BLM in 1999.)



<u>Analysis area Streams</u>

Both the North and South Fork of Little Butte Creek are large streams which drain the west slope of the Cascades. Flows in the North Fork are largely controlled by releases from Fish Lake, a large storage reservoir which is augmented by water diverted from the Klamath Basin. Though there are numerous small diversion dams and water transfers out of the basin, the hydrologic regime in the South Fork is more natural in nature, with streams fluctuating in response to climatic conditions. Both catchments drain mountainous terrain, and are fed by snow melt late into the summer. Both streams are water quality limited for exceeding summer temperature criteria.

The reach of the South Fork of Little Butte Creek which flows through the analysis area drainages includes ~ 2.2 miles of the creek, of which about a mile is located on BLM managed lands. This area is primarily rural residential with light agriculture, interspersed with small BLM parcels. Oregon Dept. of Fish and Wildlife (ODFW) aquatic inventories (1994) documented that instream habitat in this reach was generally good, composed of diverse habitats which support spawning and rearing, but that large wood densities were lower than desired at 8 pieces per 100 M of stream, and that the percent of fine sediment (22%) was elevated above desirable limits. As a result of the noted high sediment, the South Fork of Little Butte Creek is listed as water quality impaired for exceeding sediment standards. Despite these shortcomings, the ODFW surveyors placed the South Fork of Little Butte in the best condition of all surveyed reaches in the entire Little Butte Creek Watershed, and the stream is noted as a very productive salmonid stream. Note that all proposed project elements of the Heppsie timber sale would be over one mile upslope of the mainstem channel of the South Fork of Little Butte Creek.

The North Fork of Little Butte drains a much smaller catchment area-wise than the South Fork, but as mentioned flows are augmented and kept artificially high (and low) through controlled water releases from Fish Lake. This has significantly altered the hydraulic regime of the stream, because sustained flows are higher in the summer than they are in the winter as water is released down the channel to meet the needs of water users. This reduces both the quality and quantity of rearing habitat in the North Fork, as the greater volume of water forced down the narrow channel creates a situation in which slow water habitats are very few and far between. Given the persistent high flows, the majority of the mainstem channel of the North Fork of Little Butte acts a transport reach; boulders, cobbles, and bedrock dominate the instream substrate, and fine sediment levels are low. On the short reach of the North Fork which flows through BLM lands in the analysis area, BLM surveyors noted that the higher flows were leading to bank erosion in some areas, and that the sustained high flows limited the ability of the stream to recruit and hold large wood (USDI 1998). In the Heppsie project, two proposed harvest units and the mainline haul route (paved) would have close proximity to the North Fork, while all other project elements, including all proposed road work, would occur well upslope from the creek.

There are numerous small frontal catchments which drain the analysis area, both to the North and South Forks, which all outlet as steep gradient, very small, non-fish bearing streams. In addition, there are numerous perennial springs, seeps, and wetlands scattered throughout the area as well. Though these water features do not directly provide fish habitat, they do support other aquatic organisms, and can contribute effects to downstream fish bearing channels. Several small springs on Heppsie Mt. are known to contain populations of bureau sensitive pebble snails (*Fluminicola spp*.). The bulk of the activities proposed in the Heppsie project would occur in the upper third of these small frontal catchments.

6. Environmental Consequences—Aquatic Habitat

a. Alternative 1—No Action Alternative

The No Action Alternative would have no direct or indirect effects, and hence would not add a cumulative effect to aquatic habitats, as no ground disturbing activities would occur. Aquatic habitats within the 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 the current level within the analysis area, but would be reduced at the watershed scale as planned obliteration of 1.6 miles of road in the South Fork of Little Butte Creek would still occur. This would represent an improvement in this gross indicator of watershed health, and coincide with site level reductions in chronic sediment input to aquatic habitat. 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.

Urban and agricultural lands would likely remain in their current state, impacting fish habitat in Little Butte. It is unknown at this time what additional development may occur on private lands, but increased development of the area would likely place greater stresses on aquatic habitats.

b. Alternative 2

This alternative proposes various prescriptions of commercial timber harvest and yarding, road construction, road improvement, and log hauling, as described in Chapter 2 of this document. All commercial harvest activities will be followed up by activity fuels treatments, and in select units, PCT treatments. No new road construction would cross or parallel any stream channels, dry draws, or Riparian Reserves. Road improvement of existing roads would include riparian areas surrounding road side seeps and one stock pond. Road decommissioning is also proposed to offset new construction and ensure no net gain in road densities occurs within a key watershed; however, this action would occur separately from (and regardless of) the timber sale.

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 (Sections D and E, respectively) 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, road construction, road improvements, and log hauling proposed under this alternative have been identified as having the greatest potential to increase erosion rates (see soils write up), though only the road improvements and portions of haul routes would have direct connectivity to aquatic habitat. Units and haul routes are spread amongst the analysis area drainages, though the bulk of the activity proposed in the Heppsie timber sale would occur in the North Fork Little Butte side of the mountain (Table 3-21).

Table 3-21. Amount of activity proposed in Alternative 2 in each of the drainages in the Heppsie timber sale, including the number of stream crossings the estimated haul routes would include. 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 and miles in this table are rounded to the nearest tenth. NF denotes drainages that flow to the North Fork of Little Butte, SF to the South Fork.

HUC 7 Drainage	Proposed Activities					
	Harvest (acres)	Road construction (miles)	Road Improvement (miles)	Haul (miles)	# haul route Stream Crossings	
					Perennial	Intermittent
NF 0203	169	0.2	0.2	9	1	18
NF 0206	76	0.2	0.2	.7	0	0
NF 0212	22	0.4	0	.4	0	0
SF 0603	4	0	0	.1	0	0
SF 0606	121	0.4	0	2.6	0	3
TOTAL	**397**	**1.2**	**0.4**	**12.8**	**1**	**21**

Commercial Timber Harvest

There are three primary mechanisms by which timber harvest may influence aquatic habitat:

1) Removal of stream side 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 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 Heppsie timber sale, all harvest would occur outside of Riparian Reserves, at a minimum distance of one site potential tree height from the edge of the stream channel. Because existing large wood densities and shade would be maintained within the Riparian Reserves, harvest and yarding operations would have no impact to stream temperatures, or future large wood recruitment potential. The Water Resources analysis of this timber sale documented that harvest operations would not reduce canopy cover within any of the planning area catchments enough to measurably affect or alter the timing of peak or base flows (see 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 Heppsie timber sale, all harvest units would be buffered from stream channels by full width Riparian Reserves, and hence 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 nature of increased erosion rates, could result if unauthorized OHV use were to occur on the skid trails following harvest. However, the potential for this to occur is limited, as the area is not heavily used by OHVs, much of the tractor ground is behind locked gates, and PDFs to discourage use of tractor yarding corridors are included in this sale. If OHV use were to occur in the tractor units which resulted in increased erosion, it would not affect aquatic habitat; the tractor units are mostly ridge-top units located far from stream channels, and the two valley bottom units would retain full width fish buffers (330 feet) between units and the North Fork of Little Butte. Connectivity between the skid trails and aquatic habitat would not exist, and therefore harvest would have no causal mechanism to indirectly impact fish or aquatic habitat, and as such would not add a cumulative effect.

Activity Fuels and PCT Treatments

These activities would treat non-commercial small diameter vegetation and accumulated understory fuels remaining in the commercial harvest units, following harvest operations where needed. Both fuel and PCT treatment activities would involve only hand crews with saws, thinning small diameter vegetation. Very little ground disturbance would occur. Any check lines would be rehabilitated following ignition operations, reducing the risk of the fire-lines contributing sediment downslope. Ground cover, such as forbs and grasses, trees greater than 8 inches diameter and all riparian plant species would remain after fuels activities. This activity would not impact aquatic habitat. The treatments would leave no-treatment buffers, as outlined in the project design features, around stream channels, and hence would not reduce shade afforded to stream channels. The vegetative buffers remaining adjacent to channels would trap any off-site sediment or ash 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/PCT treatments as proposed in the Heppsie timber sale would have no causal mechanism to affect any aquatic habitats, and hence would not contribute to 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. 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 watershed, both fine sediment delivery to stream channels resulting from weathering of road surfaces and the potential for mass failures are of concern. Several debris torrents in the last decade have occurred in the Deer Creek catchment (South Fork Little Butte, outside of the analysis area). While these events did not initiate at roads, they do provide evidence that the climate and geology of the general area is conducive to large wasting events.

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 ridge top segments which 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. Note that none of the proposed new roads in the Heppsie sale would have hydrological connectivity to 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, ground water tables elevated, and runoff more likely (Furniss et al. 2000). For this reason, wet season use of a given road system has a much higher potential to contribute impacts to aquatic habitat then dry season use. In the Heppsie Timber sale, road construction, renovation, and log haul are proposed. These activities would be restricted to the dry season (see PDFs as described in Chapter 2).

<u>Road Construction</u>
Under Alternative 2 in the Heppsie sale, five new road segments are proposed to facilitate access to timber units, totaling a little over 1.2 miles in length. Road construction would occur during the dry season. Three of the segments would be in the North Fork drainages, and two would be located on the South Fork side of the mountain. All of the roads would be located near ridge tops, and none of them would cross any stream channels, draws, or Riparian Reserves.

Two short segments in the North Fork (roads # 37-3E-5.3 and 37-3E-5.5, totaling ~0.2 miles) would be located on ridge tops and would have no probability of intercepting ground water. They would be able to intercept precipitation directly, which could potentially become concentrated flow capable of rutting the road surface and transporting eroded material downslope. However, drainage relief would be incorporated into the new construction, which would ensure the road surfaces would shed intercepted water and any mobilized sediment off of their prisms and into downslope vegetation, minimizing the potential for rutting and disruption of natural flow paths. This, coupled with the absence of hydrological connectivity precludes the potential for the ridge top new road construction to affect aquatic habitat.

The third segment in the North Fork is much longer (road 37-2E-35.1, 0.6 miles) and would occur as an extension to a segment of road improvement on an existing old road. This road would be located ~ 500' below the drainage divide between the North and South Forks of Little Butte on relatively gentle gradient. No channels, Riparian Reserves, or dry draws would be bisected by this road. On the South Fork side, one new road is proposed (road 37-3E-6.11, ~0.3 miles), which would take off from the drainage divide between the North and South Forks. A short spur (37-3E-06.11 Spur A, ~0.1 miles) would branch off this road. As stated, no channels, Riparian Reserves, or dry draws would be bisected by any of these roads; however, the three non-ridge roads would have the potential to intercept and route both precipitation and ground water, disrupting natural flow paths. Again, drainage relief would be incorporated into the road designs, minimizing the potential for rutting, and ensuring that water is turned off the road prisms quickly. As none of the roads would have hydrological connectivity with aquatic habitat, the roads would have no potential to input sediment or intercepted water to aquatic habitat. Any intercepted water and transported sediment would be shed off of the road and into downslope vegetation, where it would be assimilated into the forest floor.

Although the construction of the new roads would increase road densities in four of the analysis drainages, given that the proposed new roads would lack hydrological connectivity, there is no potential that any of these roads would impact fisheries or aquatic resources. In the event that sediment generated from construction, use, or maintenance of these new segments was mobilized during a precipitation event, the roads would shed the water and eroded particulates into downslope vegetation, where it would be filtered and stored before reaching any stream channels.

Road Improvements

Two road segments are proposed for improvement. Both segments are located in the North Fork of Little Butte side of the project. One segment (37-3E-6, 0.2 miles long) is currently completely overgrown, and would require clearing along the existing road prism, blading the surface, and installation of water bars as needed to improve or maintain drainage. This segment does not include any stream channels or Riparian Reserves, though it is very close to the outer edge of a Riparian Reserve of an ephemeral stream. Ground disturbance of the stable and relatively recovered road prism would likely result in increased erosion and transport of sediment down the existing road prism. The road slopes gently away from the adjacent Riparian Reserve, so any disturbed sediment would not be routed towards the creek.

The other segment (37-3E-6.8, 0.2 miles long) includes two small perennial seeps which daylight on the existing road surface, flow across the road, and then disappear less than 200' downslope in an oak woodland. These seeps are not natural features, but rather are ground water which is intercepted by the road cut and caused to be exhibited as surface flow on the road. Improvement of the road would allow this intercepted water to be passed through the road, to ensure proper drainage. Additionally there is a stock pond just downslope of where the road renovation would begin that is fed by a small spring and intercepted road transported water. During wet periods, the pond overtops a small earthen dam, and the outflow is dispersed through grasses in an oak woodland, and quickly seeps back into the ground; the pond is not connected via surface flow to natural stream channels. A culvert used to pass water from the spring/road to the pond, but was pulled some years ago; activities would also include installing a temporary culvert at this crossing point.

Road improvement on road 37-3E-6.8 would likely generate sediment, some of which would be directly input into aquatic habitat into the two small springs and the constructed stock pond. These inputs would be limited to the three sites described above. As the affected springs do not connect to downstream hydrologic networks, impacts would be limited only to the springs. Dirt created from digging the road prism to install drainage features would settle out and assimilate into the substrate (dirt and mud) already present in the springs. Any sediment released to the pond as a result of installing and removing the temporary culvert would likewise settle out and be assimilated into the existing muddy bottom of the pond. Downstream natural aquatic habitats would be unaffected by improvement of this short road segment.

<u>Haul Routes</u>

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 ~ 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 Heppsie timber sale, all haul would be seasonally restricted to the dry season and the majority of the routes are both well rocked and regularly drained; hence, haul would not likely result in rutting of the road surfaces. However, repeated use of the unpaved haul roads potentially may both directly and indirectly contribute fine sediment to streams as rocked surfaces become pulverized rock (i.e. dust, a form of fine sediment) surfaces after repeated heavy truck traffic. 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 channels crossing or adjacent to the haul route. Indirectly, the fine sediment that remains on the road prism would be available to be transported off of the road during the first significant rain 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 Heppsie project, log haul would occur on an estimated 12.8 miles of non-paved roads in the analysis area, of which 11.6 miles would occur on rocked roads, and 1.2 miles on natural surfaced roads. Most of the hauling would be in the North Fork Little Butte catchments (Table 3-21). As this particular sale covers a relatively small geographic area, the haul routes, though limited in miles, are also concentrated, and all haul would outlet at one point (the paved Heppsie Mt Road to Hwy 140). Haul routes are largely confined to upslope areas, and only include 22 channel crossing, of which only one is over a perennial channel. No unpaved routes would parallel or cross fish habitat, and no segments parallel any streams in the entire haul analysis area. Therefore the primary mechanism by which road-derived sediment is most likely to enter streams 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 the South Fork drainage # 0206, as there is only 1/10 of a mile of ridge top haul routes in this drainage and no stream crossings. There is very little potential for haul to contribute detectable quantities of sediment to aquatic habitat in the South Fork drainage # 0603; routes are limited to near ridge top locations and would only cross three intermittent channels, and the routes that include the crossings are low gradient, stable, and well drained. Sediment generated through the break-down of aggregate on these surfaces would not likely be transported down the roads, as they are flat. In the event transport did occur, drainage controls on the roads would serve to turn out any mobilized sediment during precipitation events to downslope vegetation.

There is no potential for haul to contribute sediment into the stream network in the North Fork drainages # 0212 or # 0206; there are no channel crossings along haul routes in either of these drainages. The aforementioned springs and constructed pond (see road improvement discussion above) would be crossed by this route, but as described, these features are disconnected from the greater aquatic network.

It is likely that small amounts of sediment generated from haul would find its way into aquatic habitat in the North Fork drainage #0203, given the greater number of stream crossings, that all haul ultimately would pass through this drainage, and some of the routes are steep, in particular the mainline route which climbs the mountain. This road is drained by an inboard ditch with cross drains to pass water and transported fines off the road prism and into downslope vegetation; as such, most of the road lengths are disconnected from the stream system. At points upslope of crossings, there are segments that are directly connected to the streams, and at these points (the channel crossings) sediment resulting from haul would have the potential to be input into aquatic habitat.

It is not possible to accurately quantify how much dry season haul may increase erosion rates or sediment input into aquatic habitat; there are too many interacting variables (MacDonald and Coe 2008), and what studies have been done have focused on wet season haul. Given dry season haul would yield both substantially less initial erosion of the road surface and less subsequent transport of eroded sediment, amounts contributed to aquatic habitat are anticipated to be minimal. These inputs would occur only during a precipitation event of sufficient magnitude to get the intermittent streams flowing, would be spatially spread over multiple input locations, and would occur in the nature of increased turbidity. Under such conditions it is extremely unlikely that sediment input by haul would be detectable behind background levels in the small frontal streams, let alone in fish bearing habitat in the North Fork of Little Butte Creek located well downstream of the haul/channel crossings.

To sum, although haul would have a high likelihood of inputting some sediment into aquatic habitats in one drainage basin in the North Fork of Little Butte, the magnitude of the inputs would be small because dry season haul restrictions would reduce impacts to the road surfaces, there are relatively few channel crossings, and the majority of the road system is disconnected from the aquatic system by drainage control devices. It is not anticipated that the amount would be discernible above those contributions chronically occurring. As such, the amount of dust (sediment) to reach and settle out in any one pool would be insufficient to adversely modify aquatic habitats.

Aquatic Habitat Effects Summary

Short term (one to three years) there would likely be small inputs of sediment in the nature of small turbidity pulses to channels in the NF drainage # 0203 as a result of haul. 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 new roads would increase road densities and represent a decline of this gross health indicator in the drainages, but would be offset at the watershed scale by planned obliteration of 1.6 miles of riparian roads. 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. Road improvement activities would generate sediment which would impact three non-natural water features; two springs which daylight on a road and a constructed stock pond. These features are disconnected from the greater aquatic system, so sediment would not migrate to natural channels from renovation. 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 normal 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 water resources, this document). Future private harvest is expected to continue the declining trends in streambank stability, sedimentation potential, and health of riparian areas currently present in the planning area. The Heppsie timber sale would, in the short term contribute a small amount of sediment to headwater channels in NF drainage # 0203, on top of the large amounts contributed annually from all other sources. 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). In sum, though this project would not benefit aquatic resources (i.e. no road decommissioning or closures), no measurable changes to aquatic habitat conditions are anticipated to result from implementation of Alternative 2.

c. Alternative 3

Alternative 3 is the same as Alternative 2, except it does not propose new road construction, and as a result, also proposes less harvest, as those units accessed by the proposed new roads would be dropped. As no new road construction would occur, road densities would not increase in the in the analysis area drainages, resulting in a positive change in this gross watershed indicator as the riparian roads are obliterated in the South Fork subwatershed, and would represent a small decrease in overall road densities in the Watershed. From the perspective of aquatic habitat, this alternative would also result in small inputs of sediment in the NF drainage #0203 stemming from haul, albeit to a lesser degree as the volume of haul would be reduced. The number of haul route channel crossings would remain unchanged, so inputs would still occur in the same locations as under Alternative 2.

7. Affected Environment—Riparian Reserves

Riparian corridors along fish bearing stream reaches in the Little Butte Creek Watershed have been reduced from historic levels as agriculture and urban development of valley lands, road construction, and historic timber harvest practices have cleared vegetation adjacent to stream channels. This has increased penetration of solar radiation to stream channels, resulting in elevated summer stream temperatures. Riparian corridors are narrow around most reaches as roads, businesses, and homes now exist in the historic flood plain. Generally, riparian corridors are likewise very narrow or absent throughout the majority of the lower, fish bearing reaches of the tributary streams in the watershed, as residences, roads, and agriculture lands now parallel these lower stream reaches. Invasions of introduced species (especially Himalayan blackberry) have also reduced the quality of riparian vegetation in the watershed. The result in many areas are riparian corridors that do not provide desirable levels of shade to stream channels to prevent solar penetration to, and heating of, the water. ODFW considers greater than 70% shade desirable, and less than 60% shade undesirable to aquatic organisms in small (less than 12 meters [39 feet] wide) forested streams. Both the South and North Forks are all listed as water quality limited for exceeding summer stream temperature criteria by the Oregon Department of Environmental Quality (DEQ). Elevated water temperatures can affect spawning and incubation time, feeding, growth, and survival of salmonids (Meehan 1991).

Within the planning area catchments, there are an estimated 1,160 acres of Riparian Reserves (calculated from GIS) on BLM managed lands. There are many more acres of 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 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). A summary of existing vegetative states in RRs on BLM-administered lands within the Heppsie analysis area is presented by catchment in Table 3-22.

Table 3-22. Seral state of Riparian Reserves in the Heppsie 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 R.R.'s
NF 0203	29	81	57	33	230	127	557
NF 0206	12	62	1	0	21	29	125
NF 0212	9	11	8	0	0	0	28
SF 0603	2	0	0	0	6	17	25
SF 0606	124	124	4	0	135	38	425
Project total	**176**	**278**	**70**	**33**	**392**	**211**	**1160**

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 inches in diameter at breast height [DBH]) or older will function to provide sufficient shade to stream channels, and that pole size trees (< 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 size trees may tend to underestimate the percent of reserves that are currently providing sufficient levels of shade to stream channels. Table 3-23 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 3-23. Percent of all reserves in mid-seral or greater, and mature seral stages in the planning area.

HUC 7 Drainage	% of Reserves in Mid Seral Stage or Greater (Trees >11" DBH)[1]	% of Reserves in Mature Stage (Trees >21" DBH)[1]
NF 0203	65%	23%
NF 0206	40%	23%
NF 0212	0%	0%
SF 0603	92%	68%
SF 0603	38%	9%
Project Total	**52%**	**18%**

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

This analysis suggests that within the Heppsie analysis area, Riparian Reserves capable of providing both maximum shade and inputs of large wood are lacking throughout, with the exception of the South Fork drainage # 0603. However, it should be noted that within the analysis area catchments, there are many areas that naturally contain a large hardwood component (in particular oaks). There are also many areas characterized by natural meadows, which do not support conifers. In these areas, the lack of mid seral and/or mature conifers is a natural condition, and inclusion of them in this type of analysis greatly overstates past disturbances to RRs in this particular area. In any event, RRs in forested areas which have been altered by past human caused disturbances will continue to recover and mature over time, and it is expected that both the amount of shade and the potential for large wood inputs will increase, barring a catastrophic wildfire or major flood event.

8. Environmental Consequences—Riparian Reserves

a. Alternative 1—No Action Alternative

The No Action alternative would have no direct or indirect effects to RRs within the Little Butte 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. Benefits will be limited in RRs impacted by roads, as save those adjacent to the proposed road obliterations planned in the South Fork subwatershed, the existing road system will likely remain in use, perpetuating canopy openings adjacent to the fish bearing stream reaches. As this alternative would not contribute any direct or indirect affects to the reserves, no cumulative effects would result from implementation of the no action alternative. Obliteration of the identified riparian roads will allow for recovery of those Riparian Reserves in the South Fork of Little Butte Creek, representing a positive trend to this indicator.

b. Alternatives 2 and 3

Activities proposed in RRs are the same in both alternatives, and limited to road improvement and log haul. Neither activity would change the existing condition of the RRs; neither activity proposes the removal of riparian vegetation.

As the recovery of RRs on Federal lands continues, it is anticipated that both shade levels and inputs of large wood will eventually increase over stream channels on BLM-administered lands within the planning area. However, it will take many years for the RRs to achieve their full potential, and benefits would be limited in areas already impacted by permanent roads. Because the majority of riparian areas over the fish bearing channels are on private lands, it is unlikely that the recovery of Riparian Reserves on Federal lands would translate to lower stream temperatures in the fish bearing reaches, which are anticipated to remain in their current state (i.e. narrow corridors, impacted by roads, residences, and pasture land). Obliteration of the identified riparian roads will allow for recovery of those Riparian Reserves in the South Fork of Little Butte Creek, representing a positive trend to this indicator.

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 5^{th}-field hydrologic scale, or watershed, at the 6^{th} and or 7^{th} fields (subwatershed and or drainage), and at the site level. In this case, the analysis area covers 5 small 7^{th} field drainages, 3 of which include frontal tributaries to the North Fork of Little Butte, and 2 of which drain to the South Fork of Little Butte. The North and South Forks are the primary tributaries to Little Butte Creek, which is a large fifth field watershed. How the four components of ACS relate to the Heppsie Sale is explained below:

1. Riparian Reserves: Riparian Reserve widths for streams, springs, wetlands, and unstable soils have been determined according to the protocol outlined in the NWFPs Aquatic Conservation Strategy and are listed in the PDFs for the Heppsie Timber Sale.

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 upper half of the Little Butte Watershed, including both forks and the analysis area is a key watershed, designated for its value as a noted productive salmonid watershed.

3. Watershed Analysis: BLM completed Little Butte Creek Watershed Analysis in 1997. The Watershed Analysis encompasses the project and analysis areas.

4. Watershed Restoration: Most of the restoration activities in the watershed have focused on restoring fish passage to provide better access to habitat on upstream private and federal lands. Projects by the local watershed council, ODFW, USFS, and/or BLM include culvert removals and replacements, dam removals, historic channel reconnection, large wood placement projects, riparian plantings, road and OHV trail obliteration, livestock fencing and exclusion, and irrigation ditch fish screens and siphoning.

2. Consistency Review

Evaluation of This Action's Consistency with Northwest Forest Plan Aquatic Conservation Strategy Objectives

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 timber sale is to compensate for an altered fire regime and increasing episodes of beetle kill, 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 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 Little Butte Creek Watershed, BLM-administered lands adjacent to fish-bearing streams are limited to a few scattered parcels; the majority of BLM lands are concentrated in the steeper slopes of the tributary streams. Here, longitudinal connectivity and road densities are the primary issues for aquatic species. No activities planned under the Heppsie timber sale would affect spatial and/or temporal connectivity. A temporary culvert would be placed across a road to allow road intercepted water and seepage to fill a constructed stock pond, but no culverts are proposed for addition or removal on any stream channels. This indicator would not be affected at any spatial scale under the Heppsie timber sale.

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

> No activities are proposed in Riparian Reserves or in/adjacent to stream channels in the Heppsie Timber sale. Drainage would be incorporated in a road proposed for improvement which would allow intercepted ground water to bypass the road and be turned out into downslope vegetation, though these seeps are not connected by surface flow with the aquatic system. This would help restore natural flow paths, though it would also change the physical integrity of the seeps, as they are currently on the road prism, and the proposal would be to bypass them underneath the road. The intent is to get the water off the road and into downslope vegetation where it can sub underground and return to a more natural flow path. The alteration of the current seeps would be limited to those portions which currently flow across the road prism, or approximately 15 linear

feet on each seep. The bypasses would outlet the seeps at the same locations, preserving the short linear communities of sedges that grow in the wet areas downslope of the road. This indicator would be unaffected at the drainage or watershed scales.

*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. Short term (one to three years) there would likely be a small amount of fine sediment entering small headwater stream channels as small turbidity pulses adjacent to certain roads used as haul in one HUC7 drainage in the North Fork. Sediment (turbidity) increases resulting from this activity would be minor relative to existing levels, and not detectable behind background levels beyond the site level. Upland work would have no effect on fine sediment levels, due to the filtering action of Riparian Reserve buffers, extensive PDFs designed to prevent overland sediment movement, and 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 element of this project which could affect the sediment regime is log haul, which is expected to contribute small amounts of sediment in the nature of turbidity pulses to aquatic habitats, composed primarily of small intermittent streams. Haul would likely result in site level inputs of very small amounts of fine sediment 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 were 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. Also see ACS Objective #4. In general, high road densities, past and ongoing harvest of industrial and federal timber lands, extensive agricultural and urban development, episodic slope failures, 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.*

Peak flows and summer low flows are unlikely to be affected by the Heppsie Sale. 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, much less the drainage or watershed scale. 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.

*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 at 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 activities proposed in Riparian Reserves under this sale are road improvements and log haul. Neither would disturb riparian vegetation. This indicator would remain unaffected by the Heppsie project at all 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 effect populations of native flora and fauna at any spatial scale.

H. TERRESTRIAL WILDLIFE

1. Introduction

This section discusses terrestrial wildlife habitats and the potential impacts to terrestrial wildlife species from the proposed actions as described in Chapter 2 of this document. For the purpose of analysis, this EA section will hereafter refer to two reference scales: the project area and the analysis area. The project area describes where action is proposed, such as units where forest thinning is proposed and where road construction or road improvements are proposed. The larger analysis area is used for a more applicable spatial scale for species with larger home ranges and dispersal movements.

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

- Some commenters submitted peer-reviewed articles that discuss the impacts of proposed road construction on density, habitat fragmentation, edge effects and other effects to wildlife.
- Timber harvest and road construction has the potential to affect northern spotted owl nesting, roosting, foraging, and dispersal habitat.
- Timber harvest, including the treatment 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 a variety of wildlife species.
- Timber harvest and associated activity has the potential to affect rare bird species, Bureau Sensitive bat species, goshawks and Pacific fisher.
- Some commenters expressed concern that harvest of large trees would contribute to habitat fragmentation for those species dependent on large-scale habitat patches.
- 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 terrestrial habitats and associated organisms.

<u>Assumptions:</u>

- No activities will occur within the 100-acre spotted owl activity centers or 300-meter (984 foot) nest patch radii of known nest sites.
- PDFs will be properly implemented.

- If no T&E (Threatened and Endangered) or Special Status species habitat is known or suspected to be present in the project area, or the area is outside the range for a particular species, then no further analysis is needed. If habitat is present, but no activities are planned for that habitat or the project would not impact the population or habitat, no further analysis is needed. If a T&E or Special Status species is known or suspected to be present and habitat is proposed to be disturbed, then the species will be analyzed.
- Coarse wood already on the ground will be retained and protected from disturbance to the greatest extent possible during treatment.
- Snags which do not need to be felled for safety reasons will be retained within the harvest units to the extent possible.
- "Treat and maintain" spotted owl habitat means the action occurs within NRF (nesting, roosting, and foraging) or dispersal habitat but would not change the conditions that classify the stand as NRF or dispersal post treatment. NRF habitat will retain at least 60 percent canopy cover, large trees, multistoried canopy, standing and down dead wood, and diverse understory adequate to support prey, and may contain some mistletoe or other decay. Dispersal habitat will retain at least 40 percent canopy. The habitat classification of the stand following treatment will be the same as the pretreatment habitat classification.
- Per direction in the Northwest Forest Plan (Chapter 2, p. 26), late-successional forest is forest habitat 80 years or older. Late-successional forest generally, but not always, provides suitable habitat for spotted owls. Suitable spotted owl habitat is generally 80 years and older, but also contains other attributes such as multiple layers.
- 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.

2. Affected Environment—General

a. Vegetation Conditions and Terrestrial Wildlife Habitats (General)

The Heppsie Forest Management Project proposal is located in the western portion of the Little Butte Creek watershed, which is a tributary to the Rogue River. The total size of the analysis area is 9008 acres (approximately 14 square miles). BLM administered lands comprise 52% of this area.

The present-day composition and distribution of vegetation in the project area is influenced by site characteristics (soil types, aspect, and topography), natural disturbance (wildfires, insects, disease, etc.) historic mining, rural residential development, agricultural activities, timber harvest, fuels reduction projects, fire suppression, and road building. Common forest types include Douglas-fir, ponderosa pine, white fir, mixed conifer, and white oak forest series (USDI 1995).

The vegetation condition classes presented in Table 3-24 provide habitat for the terrestrial wildlife species found in the proposed Heppsie analysis area. Acreage of each vegetation condition class and several wildlife species that are representative of the various habitats are also displayed. Approximately 200 vertebrate terrestrial wildlife species are known or suspected to occur in the analysis area based on known range and habitat associations. This includes species that migrate through the area.

Table 3-24. Vegetation Condition Classes on BLM-Administered Lands within the Heppsie Analysis area.

Vegetation Condition Class	Acres (BLM Lands)	Representative Species (from Brown 1985)
Grassland/Shrubland	685	gopher snake, California ground squirrel, western meadowlark, wrentit, dusky-footed woodrat
Hardwood/Woodland	863	acorn woodpecker, western gray squirrel, ringneck snake
Seedling/Sapling	531	northwestern garter snake, mountain quail, pocket gopher

Vegetation Condition Class	Acres (BLM Lands)	Representative Species (from Brown 1985)
Small Conifer	146	golden-crowned kinglet, porcupine, Southern alligator lizard
Large Conifer	1450	ensatina, Stellar's jay, mountain lion
Mature Conifer	1020	northern spotted owl, northern flying squirrel, pileated woodpecker,

b. Special Status Wildlife Species

Special Status Species are those species that are Federally listed as Threatened or Endangered; proposed or candidates for Federal listing as Threatened or Endangered; or are BLM-designated Sensitive species. Survey and Manage species are listed for protection under the Northwest Forest Plan. Table 3-25 lists the Special Status and Survey and Manage species that are known, suspected or have habitat in the project area. Species determined to have a very low likelihood of occurring in the project area, or whose presence would be considered accidental, were not included in this analysis.

Table 3-25. Wildlife Species Known, Suspected or Habitat Occurs in the Project Area

Scientific Name	Common Name	Status	Occurrence
Strix occidentalis caurina	northern spotted owl	FT	Known
Strix nebulosa	great gray owl	SM	Suspected
Haliaeetus leucocephalus	bald eagle	SEN/EPA	Known
Aquila chrysaetos	golden eagle	EPA	Known
Falco peregrinus anatum	American peregrine falcon	SEN	Suspected
Martes pennanti	fisher	SEN/FC	Suspected
Antrozous pallidus	pallid bat	SEN	Suspected
Myotis thysanodes	fringed myotis	SEN	Suspected
Actinemys marmorata	Pacific pond turtle	SEN	Suspected
Helminthoglypta hertleini	Oregon shoulderband	SEN	Suspected
Monadenia chaceana	Chase sideband	SEN/SM	Suspected
Monadenia fidelis celeuthia	travelling sideband	SEN	Suspected
Vespericola sierranus	Siskiyou hesperian	SEN	Suspected
Callophrys johnsoni	Johnson's hairstreak	SEN	Suspected
Chloealtis aspasma	Siskiyou short-horned grasshopper	SEN	Known
Bombus occidentalis	Western bumblebee	SEN	Suspected

Status:
FT – Federally Threatened SEN – Bureau Sensitive Species EPA – Bald and Golden Eagle Protection Act
FC – Federal Candidate SM – Survey and Manage Species
Occurrence:
Known – Species is known to occur in the project area
Suspected – Species not known to occur but reasonable potential to exist in the project area
Habitat – Less probable for species to occur but suitable habitat is found in the project area and is within the known or suspected range of the species

c. Federally Listed Species

Northern Spotted Owls (NSOs)

The northern spotted owl, a Federally-listed Threatened species, is associated with existing habitat within and adjacent to the Heppsie project area. Spotted owls prefer coniferous forest with multiple vertical layers of vegetation and a variety of tree species and age classes with the presence of large logs and large diameter live and dead trees (snags), for nesting, roosting, and foraging habitat. They may also be found in younger stands with multilayered, closed canopies, large diameter trees, and abundance of dead and down woody material. Based on studies of owl habitat selection (including habitat structure and use and prey preference throughout the range of the owl), spotted owl habitat consists of four components: nesting, roosting, foraging, and dispersal (Thomas et al. 1990).

The Bureau of Land Management (BLM), Forest Service (FS), and US Fish and Wildlife Service (USFWS) have conducted a coordinated review of four reports containing information on the northern spotted owl. The reviewed reports include the following:

- Scientific Evaluation of the Status of the Northern Spotted Owl (Sustainable Ecosystems Institute, Courtney et al. 2004);
- Status and Trends in Demography of Northern Spotted Owls, 1985-2003 (Anthony et al. 2004);
- Northern Spotted Owl Five Year Review: Summary and Evaluation (USFWS 2004); and
- Northwest Forest Plan – The First Ten Years (1994-2003): Status and trend of northern spotted owl populations and habitat, PNW Station Edit Draft (Lint 2005).

Anthony et al. (2004) published meta-analysis of owl demographic data collected in 14 demographic study areas across the range of the northern spotted owl. Four of the study areas are in western Washington, six are in western Oregon, and four are in northwestern California. Although the agencies anticipated a decline of NSO populations under land and resource management plans during the past decade, Anthony identified greater than expected NSO population declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California. However, Anthony (2010) stated that that there is now an apparent decline in spotted owl occupancy in the Southern Cascades Study Area, while the presence of barred owls is increasing.

The reports listed above did not find a direct correlation between habitat conditions and changes in NSO populations, and they were inconclusive as to the cause of the declines. Even though some risk factors had declined (such as habitat loss due to harvesting), other factors had continued, such as habitat loss due to wildfire, potential competition with the barred owl, West Nile virus, and sudden oak death (USFWS 2004; Lint 2005). The barred owl is present throughout the range of the spotted owl, so the likelihood of competitive interactions between the species raises concerns as to the future of the spotted owl (Lint 2005).

In more recent reports (Davis et al. 2010, 2011; Forsman et al. 2011), it has become more evident that the barred owl population is increasing across the range of the northern spotted owl. Forsman (2011) indicates that the spotted owl populations have declined across most of the range, with the most significant declines occurring in Washington where the barred owl has been present the longest. Although analysis within the nearest NSO demography study (Klamath Study Area, or KSA) to the project area indicates a stable spotted owl population during the study period, the recent data shows the beginning of a trend towards a declining population (Davis et al. 2010). Davis et al. (2010) states that

> [t]here is mounting evidence that barred owls are negatively impacting spotted owl population within the KSA. This is illustrated by several population trends beginning about 2003, which is when barred owl detections within the KSA exceed 10% of the sites. Spotted owl detections have been steadily decreasing since 2002 and reached the lowest point in 2010, the same year barred owl detections reached their highest level. Fecundity rates appear to be declining during the past 8 years and in only 1 of those 8 years was the rate above average. Fecundity rates for sites with known barred owl presence were lower than at other sites. If these trends continue a combination of lower occupancy and reduced fecundity, there may be cause for concern regarding the spotted owl population.

On June 30, 2011, the USFWS released the *Revised Recovery Plan for the Northern Spotted Owl* for public comment (USDI Fish and Wildlife Service 2011). This Revised Recovery Plan recommends achieving recovery of the spotted owl through 1) the retention of more occupied and high-quality habitat, 2) active management using ecological forestry techniques, both inside and outside of reserves, 3) increased conservation of spotted owls on State and private lands, and 4) the removal of barred owls in areas with spotted owls. The plan recommends retaining the Northwest Forest Plan reserve network while the Service utilizes a habitat modeling framework to develop and propose a new critical habitat network for the spotted owl. At the time of this analysis, new critical habitat has not been finalized.

The original foundation for spotted owl recovery was the 1994 Northwest Forest Plan (NWFP). Management direction and land allocations in the standards and guidelines of the NWFP are intended to constitute the Forest Service and BLM contributions to the recovery of the northern spotted owl (USDA USDI 1994a). The NWFP provides a network of late-successional reserves, 100-acre Known Spotted Owl Activity Centers (KSOACs), connecting riparian corridors, and connectivity blocks across the lands within the Plan area.

The NWFP-designated KSOACs were the best habitat on Federal lands as close as possible to the spotted owl nest site, or owl activity center, for all sites known as of January 1, 1994 (USDA and USDI 1994b). These KSOACs are to be protected to preserve an intensively used portion of the breeding season home range close to a nest site or center of activity (USDI 1995). There are no KSOACs in the project area.

The Heppsie project area is located within the provincial home ranges (1.2-mile radius from the site center) of two historic spotted owl sites. No known nests are located within the proposed treatment units. The survey history for each NSO site within the planning area has varied over the years. Reproduction has been confirmed at both sites in the last 10 years. For purposes of this analysis, both sites are assumed to be occupied. While there is no requirement to survey for spotted owls prior to implementing forest management actions, the BLM conducted five survey visits to each of these sites in 2011, and the sites will be surveyed again in the 2012 field season. The 2011 surveys resulted in aural and visual detections of one male NSO at one of the sites. No signs of reproduction were detected.

Northern Spotted Owl Habitat

For the purposes of this analysis, the vegetation within the Heppsie project area was typed into habitat categories pertinent to the northern spotted owl. These categories are distinct and not over-lapping. These habitat types are used throughout this document to describe and quantify habitat conditions across the landscape (Table 3-26).

Table 3-26. Northern Spotted Owl Habitat Types and Area in the Heppsie Project Area

Habitat Type	Description	Areas (Acres)
Suitable Habitat (NRF)	Meets all spotted owl life requirements. Stands are generally older than 80 years, have a high canopy cover (greater than 60 percent), a multilayered structure, and large overstory trees. Deformed, diseased, and broken-top trees, as well as large snags and down logs, are also present. Suitable habitat also includes areas with more uniform structure that may not have nesting structures, but provides roosting and foraging habitat with flying space for owls in the understory.	1874
Dispersal Only Habitat	Not suitable for spotted owl nesting/roosting/foraging, but has sufficient patchy cover to be used for travel between suitable stands, a minimum 40 percent canopy cover, and an average tree diameter greater than 11 inches with flying space for owls in the understory.	675
Capable Habitat	Forest that is currently not spotted owl habit, but can become NRF or dispersal in the future as trees mature and canopy fills in.	1287
Non-Suitable Habitat	Lands that do not provide habitat for spotted owl and would not develop into NRF or dispersal in the future (open prairies, meadows, shrub lands, etc.)	1677
	TOTAL	**5513**

Highly suitable, or **RA32** (Recovery Action 32) **habitat**, is a sub-set of NRF habitat. Under the NSO Recovery Plan, the US Fish and Wildlife Service recommends agencies maintain substantially all of the older and more structurally complex, multilayered conifer forests on Federal lands (USFWS 2008c). These forests are characterized as having large diameter trees; high amounts of canopy; and decadence components such as broken-topped live trees, mistletoe, cavities, large snags and large coarse wood. Stands proposed for harvest in the Heppsie Project Area were evaluated using interagency draft methodology. Stands evaluated and meeting the definitions in the methodology are referred to as RA32 stands. Through field evaluations, no proposed treatment units were determined to meet RA32 stand conditions. (see also Chapter 1.2: Issues Considered but not Further Analyzed).

Spotted Owl Prey Base

Dusky-footed woodrats, the primary prey species for spotted owls in southwest Oregon, are found in high densities in early-seral or edge habitat (Sakai and Noon 1993). Down wood is an important habitat feature for these major prey species in southwest Oregon. Dusky-footed woodrats build stick nests, sometimes incorporating logs as part of the structure. Northern flying squirrels are another major source of owl prey in southwest Oregon. (Forsman 2004).

Northern Spotted Owl Proposed Critical Habitat

Critical habitat is designated under the auspices of the Endangered Species Act of 1973 and was first designated for the northern spotted owl in 1992. Critical habitat includes the primary constituent elements (PCE) that support nesting, roosting, foraging, and dispersal. It also includes forest land that is currently unsuitable, but has the capability of becoming NRF habitat in the future (57 Federal Register 10:1796-1837). On February 28, 2012, the US Fish and Wildlife Service released the proposed revised critical habitat in the form of maps and the draft form of the federal register publication. The proposed rule was published in the Federal Register on March 8, 2012 (77 Federal Register 46:14062-14165). The final CHU rule will be published in November, 2012.

The proposed project is located in the Klamath East (KLE) critical habitat unit (also referred to as Unit 10) and specifically, it is within the subunit KLE 5. The KLE 5 subunit consists of approximately 37,646 ac (15,325 ha) in Jackson County, Oregon, and comprises lands managed by the BLM and the State of Oregon. The 37,606 ac (15,219 ha) of BLM land are managed per the NWFP (USDA and USDI 1994b) while the State of Oregon lands are managed under the Southwest Oregon State Forests Management Plan (ODF 2010b, entire) and may be considered for exclusion in the final critical habitat designation. Special management considerations or protection are required in this subunit to address threats from current and past timber harvest, losses due to wildfire and the effects on vegetation from fire exclusion, and competition with barred owls. This subunit is expected to function primarily for north-south connectivity between subunits, but also for demographic support. The USFWS evaluation of sites known to be occupied at the time of listing indicates that approximately 86 percent of the area of KLE 5 was covered by verified spotted owl home ranges at the time of listing (USDI FWS 2012).

Based on current research on the life history, biology, and ecology of the northern spotted owl and the requirements of the habitat to sustain its essential life history functions, the Service has identified the following PCEs for the spotted owl (USDI FWS 2012):

1) Forest types that may be in early, mid, or late-seral states and support the spotted owl across its geographical range

2) Habitat that provides for nesting and roosting (NR). This habitat must provide:

- a) Sufficient foraging habitat to meet the home range needs of territorial pairs of northern spotted owls throughout the year.
- b) Stands for nesting and roosting that are generally characterized by:
    - i. Moderate to high canopy closure (60 to over 80 percent),
    - ii. Multilayered, multispecies canopies with large (20- 30 in (51-76 cm) or greater DBH) overstory trees,
    - iii. High basal area (greater than 240 ft2/acre (55 m2/ha)),
    - iv. High diversity of different diameters of trees,
    - v. High incidence of large live trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and other evidence of decadence)
    - vi. Large snags and large accumulations of fallen trees and other woody debris on the ground, and

vii. Sufficient open space below the canopy for northern spotted owls to fly.

3) Habitat that provides for foraging (F), which varies widely across the northern spotted owl's range, in accordance with ecological conditions and disturbance regimes that influence vegetation structure and prey species distributions (see specific description for the Klamath province below).

4) Habitat to support the transience and colonization phases of dispersal (D), which in all cases would optimally be composed of nesting, roosting, or foraging habitat (PCEs (2) or (3)), but which may also be composed of other forest types that occur between larger blocks of nesting, roosting, and foraging habitat. In cases where nesting, roosting, or foraging habitats are insufficient to provide for dispersing or nonbreeding owls, the specific dispersal habitat PCEs for the northern spotted owl may be provided by the following:

a) Habitat supporting the transience phase of dispersal, which includes:
   i. Stands with adequate tree size and canopy closure to provide protection from avian predators and minimal foraging opportunities; in general this may include, but is not limited to, trees with at least 11 in (28 cm) DBH and a minimum 40 percent canopy closure; and
   ii. Younger and less diverse forest stands than foraging habitat, such as even-aged, pole-sized stands, if such stands contain some roosting structures and foraging habitat to allow for temporary resting and feeding during the transience phase.
b) Habitat supporting the colonization phase of dispersal, which is generally equivalent to nesting, roosting, and foraging habitat as described in PCEs (2) and (3), but may be smaller in area than that needed to support nesting pairs.

Specific Cascade Province Foraging Habitat PCEs:

- Stands of nesting and roosting habitat; in addition, other forest types with mature and old-forest characteristics;
- Presence of the conifer species, incense-cedar, sugar pine, Douglas-fir, and hardwood species such as big leaf maple, black oak, live oaks, and madrone, as well as shrubs;
- Forest patches within riparian zones of low-order streams and edges between conifer and hardwood forest stands;
- Brushy openings and dense young stands or low-density forest patches within a mosaic of mature and older forest habitat;
- High canopy cover (87 percent at frequently used sites);
- Multiple canopy layers;
- Mean stand diameter greater than 21 in (52.5 cm);
- Increasing mean stand diameter and densities of trees greater than 26 in (66 cm) increases foraging habitat quality;
- Large accumulations of fallen trees and other woody debris on the ground;
- Sufficient open space below the canopy for northern spotted owls to fly.

d. Survey and Manage Species

Great Gray Owls

Great gray owls nest in a varied array of open forests associated with grassy areas suitable for their preferred prey species (e.g., voles, moles, gophers). Broken top trees, abandoned raptor nests, mistletoe clumps, and other platforms provide suitable nest structures (USDA and USDI 2004). All of the great gray owl (GGO) nests located in the western half of the Ashland Resource Area have been platform nests, whereas nests located in the higher elevation eastern areas have been in broken top snags. Suitable nesting habitat is defined in the "Survey Protocol For The Great Gray Owl " (USDI and USDA 2004) as large diameter trees with roosting cover within 200 meters (656 feet) of suitable foraging habitat. Foraging habitat is described as relatively open, grassy habitats, such as bogs, natural meadows, open forests and recent selective/regeneration harvest areas. They have been observed foraging up to 2 miles from the nest (Bull and Henjum 1990).

There are no recorded historical nest locations of great gray owls within the analysis area. The forested stands present within the analysis area are of mixed suitability as habitat for great gray owls. Some stands are dense, steep and/or do not provide an open, grassy understory condition typical of GGO habitat. Other stands offer habitat components more typically utilized by great gray owls (e.g. broken-topped trees, grass and forb communities to support prey species). Potential foraging habitat does exist within the analysis area, although substantial portions of grasslands present are too dry and too steep to be valuable for great gray owl foraging. Surveys in the project area detected no great gray owls.

Mollusks

The proposed action is located within the suspected ranges of four terrestrial mollusk species for which surveys are required and which are granted protection through buffering of known locations. All four of these snails appear on the Bureau Sensitive Species list. One of these four, the Chase sideband, also appears on the list of Survey and Manage species. Although very little is known regarding the ecology of these species, they are generally associated with moist areas and use rock substrate, large woody debris and logs as refugia during the dry months (Duncan et al. 2003). Protocol surveys for terrestrial mollusks were conducted in the project area during fall of 2011 and the spring of 2012. Voucher specimens collected from surveys are currently being classified by species and sent to a regional malacologist for verification.

The **Chase sideband** is commonly found within 30 meters (98 feet) of rocky areas, talus deposits and in associated riparian areas. Areas of herbaceous vegetation in these rocky landscapes adjacent to forested habitats are preferred.

The **Oregon shoulderband** utilizes habitat similar to that used by the Chase sideband, but is generally associated with shrublands or rocky inclusions in forested habitat with substantial grass and subsurface water sources.

Habitat attributes for the **travelling sideband** include dry basal talus and rock outcrops, with oak and maple overstory components. Also, they have been found along spring run-off in rocks and moist silty alluvial benches adjacent to creeks with moist vegetation and detritus in mixed conifer-hardwood forest.

The **Siskiyou hesperian** 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.

e. BLM Bureau Sensitive Species

Bureau Special Status Species (SSS) are species listed or proposed for listing under the ESA and species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. The SSS list was most recently updated in January 2012. This list has two categories: Sensitive and Strategic. According to BLM Special Status Species Management (USDI BLM 2008), only Sensitive species are required to be addressed in NEPA documents. 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.

Fishers

Fishers (a mammal from the weasel family) are found in forest woodland landscape mosaics that include conifer-dominated stands. Their occurrence is closely associated with low- to mid-elevation forests (generally less than 4,100 feet) with a coniferous component, large snags or decadent live trees and logs for denning and resting, and complex physical structure near the forest floor (Aubry and Lewis 2003). Forest type is probably not as important to fishers as the vegetative and structural complexity that lead to abundant prey populations and potential den sites (Lofroth et al. 2010). Fishers do not appear to occur as frequently in early-successional forests as they do in late-successional forests in the Pacific Northwest (Powell and Zielinski 1994), but they will use harvested areas if patches of habitat with residual components (i.e., logs, hardwoods) and areas where patches of larger trees are left in the landscape (Lofroth et al. 2010). In addition, Buskirk and Powell (1994) hypothesized that the physical structure of the forest and prey associated with forest structures are the critical features that explain fisher habitat use, not specific forest types. Prey and scavenged remains recovered from den and rest sites in southwest Oregon include rabbit, ground squirrel, flying squirrel, woodrat, opossum, skunk, porcupine, bobcat, deer and elk carrion, jay, woodpecker, grouse, berries, and yellow jackets (Lofroth et al. 2011 ; Aubry and Raley 2006).

Females usually give birth in cavities (natal dens) in large live or dead trees. These cavities are in trees with openings that access hollows created by heartwood decay (Aubry and Raley 2002). After the kits become more active, the females move them to a larger den (maternal den) on or near the forest floor. These dens are primarily cavities in the lower bole or butt of live or dead large trees. Fishers also use snags, mistletoe brooms, rodent nests, logs, and cull piles for rest sites (Lofroth et al. 2010).

Currently, there are two populations of fisher in Oregon which appear to be genetically isolated from each other: a small population in the Southern Cascades near Prospect and Butte Falls, and a second population in southwestern Oregon in the Klamath and Siskiyou Mountains (Lofroth et al. 2010; Aubrey et al. 2004). This is considered to be the result of the presence of potentially strong ecological and anthropogenic barriers including the white oak savanna habitat of the Rogue Valley and Interstate 5. Based on DNA analyses, individuals in the southern Oregon Cascades appear to be descendants of animals reintroduced from British Columbia and Minnesota during the late 1970s and early 1980s by the Oregon Department of Fish and Wildlife (Drew et al. 2003). Animals in the eastern Siskiyou Mountains of Oregon are genetically related to individuals in the northwestern California population, which is indigenous (Wisely et al. 2004 ; Farber and Franklin 2005).

Fishers are highly mobile and have large home ranges, and travel over large areas. In the Southern Cascades population, the average home range for females was approximately 6,200 acres (25 km^2). Male home ranges varied from approximately 36,300 acres (147 km^2) during breeding season to 15,300 acres (62 km^2) during the nonbreeding season (Aubry and Raley 2006). One male dispersed approximately 34 miles (55 km) to the Big Marsh area on the Deschutes National Forest (Aubry and Raley 2002). Other fisher research studies on the west coast have shown that fisher mean home range size vary considerably. Females' mean home ranges vary from 1.7 km^2 to 59 km^2, and males' from 7.4 km^2 to 177.5 km^2.

The northern spotted owl NRF habitat-type described above adequately describes suitable fisher denning and resting habitat because there is a direct correlation of key habitat features used to assess NSO habitat and fisher habitat (high canopy cover, multi-storied stands, large snags, and large down trees on the forest floor). Using northern spotted owl habitat as a surrogate for fisher habitat has been accepted by the courts as a reasonable practice (*KS Wild v. US BLM*, Case No. 06-3076-PA, Order and Judgment 9/10/2007).

Based on the NSO habitat analysis, approximately 1,874 acres of suitable fisher denning and resting habitat exist on BLM-administered lands within the analysis area. However, all of these acres may not provide optimal fisher habitat because past harvest practices and land ownership patterns have resulted in fragmented habitat. BLM "checkerboard" ownership may be one of the primary factors limiting the ability of BLM lands to provide optimal habitat for fishers (USDA and USDI 1994). This checkerboard ownership pattern was created by the Congressional acts that provided land grants, and is beyond the scope of the BLM's authority.

Fisher surveys using baited camera stations and hair snares have been conducted in portions of the Little Butte Creek watershed and proximate to the project area. No fisher were detected at camera stations in the analysis area. The extent (dispersal, foraging, or breeding) to which the Heppsie Project area is used by fisher is not known.

USFWS published a finding in April 2004 that a petition to list fishers as a "Federally Threatened" species was warranted but precluded by higher priority listing actions. The species remains a USFWS candidate species (69 FR 68:18770). An interagency team of Federal agency and State biologists from British Columbia, Washington, Oregon, and California completed a draft Conservation Strategy (September 2011) and is currently being reviewed by Regional Supervisors. Fishers remain a BLM Bureau Sensitive Species.

Bald Eagle

The bald eagle is a Bureau Sensitive Species and is also protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The US Fish and Wildlife (2007b) bald eagle Management Guidelines state:

> Bald eagles generally nest near coastlines, rivers, large lakes or streams that support an adequate food supply, usually fish and waterfowl. They often nest in mature or old-growth trees; snags (dead trees); cliffs; rock promontories; rarely on the ground; and with increasing frequency on human made structures such as power poles and communication towers. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds. Nest sites typically include at least one perch with a clear view of the water where the eagles usually forage. Shoreline trees or snags located in reservoirs provide the visibility and accessibility needed to locate aquatic prey. Eagle nests are constructed with large sticks, and may be lined with moss, grass, plant stalks, lichens, seaweed, or sod. Nests are usually about 4-6 feet in diameter and 3 feet deep, although larger nests exist.

There are no known bald eagle nests in or adjacent to the project area, but the stands do have large enough trees to support nesting. Bald eagles have been observed foraging in the analysis area.

Bats

Pallid bats west of the Cascade Range are restricted to the drier interior valleys of the southern portion of the state. They are usually found in brushy, rocky terrain, but have been observed at edges of coniferous and deciduous woods and open farmland (Verts and Carraway 1998). Roost habitat includes buildings, bridges, large decadent snags, and rock outcrops. Pallid bats have not been confirmed in the analysis area, but they could be present.

Fringed myotis bats appear adapted to live in areas with diverse vegetative substrates. They are associated with a variety of habitats including conifer forests and oak woodlands. They roost in buildings, caves, and mines, and in crevices and cavities in large trees. No fringed myotis bats have been documented in the analysis area.

No mining adits are known to be present in the project area. Any mining adits located prior to harvest that can provide suitable bat habitat will be protected with a 250-foot no-cut buffer (ROD/RMP). Scattered large remnant trees and snags that could provide roosting opportunities during foraging are present in and adjacent to the proposed units. Those within the units are not the subject of treatment and would be protected to the greatest extent possible, unless they present a safety hazard.

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 analysis area. Habitat exists in the area and therefore the Johnson's hairstreak will be included in this analysis. The nearest known site is east of Medford, approximately 15 miles south and east of the project area.

Siskiyou Short-horned Grasshopper
This species is documented within the analysis area. It has been found in an open area of brush and grass. It is often associated with blue elderberry for the egg-laying phase of its life cycle. Siskiyou short-horned grasshoppers are actively feeding and reproducing from July through September.

Western Bumblebee
This species was until recently common across much of the western United States. The species has experienced a precipitous population decline in the last decade, likely due to introduction of non-native pathogens. This species is associated with open grassland/ shrubland where abundant flowering plants occur and serve as a food source.

Pond Turtle
The pond turtle is associated with streams and ponds throughout southwestern Oregon. Nest sites are terrestrial and located near water sources. Over-wintering sites may be aquatic or terrestrial, sometimes several hundred yards from water. Pond turtles have not been documented within the analysis area, but may be present in and near streams and ponds in this area.

Peregrine Falcon
The peregrine falcon is a Bureau Sensitive species. This species nests on rock cliffs and outcrops and feeds on a variety of birds including pigeons and waterfowl. Peregrine falcons have been documented nesting within the analysis area.

f. Other Wildlife Species of Concern

USFWS Birds of Conservation Concern and Game Birds Below Desired Condition
Resident (found year-round) and Neotropical bird species are addressed here due to widespread concern regarding downward population trends and habitat declines. BLM has interim guidance for meeting Federal responsibilities under the Migratory Bird Treaty Act (USDI 2008b) and Executive Order (EO)13186. Both the Act and the EO promote the conservation of migratory bird populations. The interim guidance was transmitted through Instruction Memorandum No. 2008-050. The Instruction Memorandum relies on two lists prepared by the US Fish and Wildlife Service in determining which species are to receive special attention in land management activities; the lists are *Bird Species of Conservation Concern* (BCC) found in various Bird Conservation Regions (project area is in BCR 5) and *Game Birds Below Desired Condition* (GBBDC). Table 3-27 displays those species that are known or likely to be present in the analysis area.

Table 3-27. BCC and GBBDC Species Known or Likely to be Present in the Project Area

Scientific Name	Common Name	Status
Patagioenas fasciata	band-tailed pigeon	GBBDC
Zenaida macroura	mourning dove	GBBDC
Contopus cooperi	olive-sided flycatcher	BCC
Selasphorus rufus	rufous hummingbird	BCC
Carpodacus purpureus	purple finch	BCC

GBBDC – Game Birds Below Desired Condition
BCC – Birds of Conservation Concern

Current research indicates the most appropriate scale to study impacts to migratory birds is at the eco-regional scale (California Partners in Flight 2002). Breeding bird surveys in the Southern Pacific Rainforest Physiographic Region (which includes western Oregon) indicate that songbirds are declining. The exact cause of these declines is still unclear, but issues associated with their winter grounds (Central and South America) are suspected to be an important factor.

Band-tailed pigeons are generally found in temperate and mountain coniferous and mixed forests and woodlands, especially pine-oak woodland. They will often forage in diverse habitats not used for nesting, including cultivated areas, suburban gardens and parks (Braun 1994). Mineral springs and mineral graveling sites are important for mineral intake by adults, especially during the nesting season. Pigeons show strong fidelity to mineral sites and have been documented traveling 32 miles from a nesting site to a mineral spring (Jarvis and Passmore 1992).

Mourning doves breed in variety of open habitats, including agricultural areas, open woods, deserts, forest edges, cities and suburbs. A dove may have up to five or six clutches in a single year. Human alteration of original vegetation in North America is generally beneficial for this species, with creation of openings in extensive forests and plowing of grasslands for cereal-grain production of particular importance. Mourning doves are one of the most widespread avian species in North America.

Olive-sided flycatchers are most often associated with forest openings, forest edges near natural openings (e.g., meadows, canyons, rivers) or human-made openings (e.g., harvest units), or open to semi-open forest stands. In Douglas-fir forests of northwest California, Olive-sided Flycatcher is the only common species detected more often at forest edges than in forest interior (Rosenberg and Raphael 1986). In rain forests of western Oregon, which are characterized by dense canopy closure and function as unsuitable habitat, Olive-sided flycatchers occur primarily in harvest units where at least a few large snags and live trees are retained.

Rufus hummingbirds' breeding habitat includes coniferous forest, second growth, thickets and brushy hillsides, foraging in adjacent scrubby areas and meadows with abundant nectaring flowers. They are associated with secondary succession communities and forest openings (Healy and Calder 2006). Nest sites are located in a variety of plants and sites including shrubs and drooping lower branches of conifers and oaks. There are reports of colonies of up to 20 nests only a few yards from each other in timber or second growth (Bent 1940).

The **purple finch** is likely to be found in the proposed project. In summer, purple finch mainly breed in moderately moist, open conifer forests, and edge habitat at low -to-mid elevations. They use a variety of habitats including deciduous woodlands, riparian corridors and edge habitat (Marshall et al. 2003). In winter they are more widespread, using forests, shrubby areas, weedy fields, hedgerows, and backyards.

Currently, the **golden eagle** is not recognized as a federally listed (under the Endangered Species Act) or state listed species, or under the Bureau's Special Status Species program. However, protection is afforded under the Bald and Golden Eagle Protection Act and under the 1995 and 2008 Medford District RMPs.

In Oregon, golden eagles inhabit a wide range of habitats, including shrub steppe, grasslands, juniper, open ponderosa pine, and mixed conifer/deciduous habitats. The preferred foraging habitat is generally open areas with a shrub component that provides food and cover for prey (primarily black-tailed jackrabbit). Nests are typically large (3-10' tall and 3' wide), and often built in large live ponderosa pines (>30" DBH) or on ledges along rims and cliffs (Marshall et al. 2003). There are no known golden eagles nests in the project area, but they are often seen soaring in the Little Butte Creek watershed and there are trees in the project area large enough to support a golden eagle nest.

Deer Winter Range and Elk Management Area

On BLM managed lands, approximately 4000 acres of the Heppsie analysis area are in combined Big Game Winter Range and Elk Management Area and approximately 1500 acres are only in Big Game Winter Range as identified in the Medford District RMP. Approximately 75% of these areas is located behind locked gates. The inaccessibility of much of the winter range/ management area to vehicles provides seclusion for deer and elk at a time when they are under physiological stress in winter due to low temperatures and reduced forage quality and availability. This is a benefit because nutritional reserves are not depleted on avoidance behavior.

On BLM managed lands within the analysis area, approximately 2077 acres serve as foraging areas (grass, brush, woodland, and early seral vegetation condition classes). Approximately 2470 acres serve as thermal cover (mid-seral and mature forest with a high degree of canopy closure). Thus, approximately 53% of the analysis area on BLM managed lands is currently providing thermal cover. Generally, brushland/shrubland and mature conifer forest vegetation condition classes also provide hiding cover.

Management for deer and elk in these areas is focused primarily on improving forage and cover conditions and decreasing the density of roads that are open to vehicular traffic, particularly in the winter. Winter range is located at lower to mid-elevations in the analysis area, and generally on south to west facing slopes where solar radiation is most intense. Concentrating foraging and other life functions on these aspects allows the animals to maintain normal body temperature with less energy expenditure. Elk winter range is located at higher elevations than deer winter range. "Thermal cover for big game winter range is not as critical in Little Butte Creek Watershed as it is in eastern Oregon due to the milder winters west of the Cascades. Although thermal cover may not be a major issue in this watershed, it can benefit big game by moderating thermal extremes." (Little Butte Creek WA, Nov 1997)

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 affects 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. Only Federally listed, Bureau Sensitive species, and Survey and Manage species known or suspected to occur within the Planning Area and with the potential to be impacted by the proposed actions are addressed further in this EA.

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), or at the very least, would require a much longer time scale to develop (Tappeiner et al. 1997). Habitat conditions would remain generally unchanged at the unit scale in the short term unless a major disturbance such as fire, wind, ice, insects, or disease occurred.

Conditions in the proposed thinning units would be most affected in the long term by this competition of overstory trees. Overstocked stand conditions would result in relatively slow growth rates that would prolong crown differentiation. Eventually, some trees would become dominant and shade out suppressed trees. These trees would stand as small-diameter snags and ultimately fall, but would not create openings as occur in late-seral stands because of their small size. The remaining dominant trees would soon expand their crowns into the newly-available growing space, increasing the effects of mortality on understory vegetation. Multiple waves of such competition mortality would occur before dominant tree density would be low enough for understory re-initiation. This growth trajectory would be unfavorable to the development of mature and late-successional forest attributes. These processes are discussed in further detail in the Silviculture portion of this EA (Section 3.B).

Private lands surrounding the project 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 are not expected to provide quality habitat as competing vegetation that includes flowering plants, shrubs and hardwood trees are regularly sprayed to reduce competition with future harvestable trees.

b. Alternative 2

All of the treatments proposed under the Proposed Action were designed to meet the following objectives:

- Conserve and improve survivability of older trees (trees >150 years of age) by reducing nearby fuels and competing vegetation.
- Increase resistance/resilience of forest stands and landscape to wildfire, drought, insects, etc. by reducing stand densities, ladder fuels, and shifted tree species diversity.
- Restore more sustainable structure and composition by reducing stand densities and enhancing tree diversity, including hardwoods, and desirable understory species.
- Accelerate development of structural complexity such as larger tree structures and decadence.
- Develop spatial heterogeneity within stands (e.g. fine-scale structural mosaic).
- Create conditions that are favorable for the initiation, creation, and retention of snags, down wood, large vigorous hardwoods, and understory vegetation diversity in areas where these are lacking.
- Increase growing space and decrease competition for large or legacy pine, oak, and cedar (preserve existing genotypes which are physiologically better adapted to fire disturbance);
- Maintain nesting, roosting, and foraging northern spotted owl habitat within most forest stands in the analysis area.

Federally Threatened Species—Northern Spotted Owl

Effects to Northern Spotted Owl Habitat
All action alternatives may affect northern spotted owls to some degree (Likely to Adversely Affect or Not Likely to Adversely Affect), and therefore require consultation under Section 7 of the Endangered Species Act. Consultation with the USFWS has been completed for the activities proposed under this project in BLM's Biological Assessment "Fall FY12 LAA BA" and its amendment. The Biological Opinion issued in response to this BA is designated: Medford BLM FY 2012 Formal-TAILS#: 01EOFW00-2012-F-0049. The proposed activity was found to be likely to adversely affect northern spotted owls, but *not likely to jeopardize* the continued existence of the spotted owl. No "take" of northern spotted owls is anticipated.

The Heppsie project, as per the above consultation process, proposes to treat up to 93 acres of NRF and 342 acres of dispersal habitat and 80 acres of capable habitat. No actions are proposed in the nest patches of historic spotted owl sites.

When discussing changes to spotted owl habitat, the following definitions are used to describe the anticipated effects of the activities associated with the proposed action to the NSO habitat types within the Heppsie project area. Canopy closure is used as one of the critical habitat thresholds because it is highly important to NSO nest site selection and general habitat use, because increased levels of canopy afford protection from predators, and regulate temperature extremes (Courtney et al. 2004). The proposed treatments can be assigned into the following general effect type:

1) A **Treat and Maintain** of NRF or dispersal habitat means an action or activity will occur within NRF or dispersal habitat but will not change the habitat classification post treatment. The NRF stand will retain an average of 60% canopy cover post treatment, large trees, multistoried canopy, standing and down dead wood, diverse understory adequate to support prey, and may have some mistletoe or other decay. Dispersal habitat will continue to provide at least 40% canopy, flying space, and trees 11 inches diameter at breast height (DBH) or greater, on average. The habitat classification of the stand following treatment will be the same as the pretreatment habitat classification.

Table 3-28. Effects of Alternative 2 Proposed Treatments to NSO Habitat in the Analysis area

Habitat Type	Pre-Project Acres	Treat and Maintain	Removal	Downgrade	Post-Project Acres	Percent Change
NRF	1874	51	0	8	1866	0.4%
Dispersal-only	675	227	68	N/A	615	9%

When analyzing the impacts to spotted owls from timber harvest, the amount, intensity and duration of the harvest are not the only factors to consider. A critical factor to consider is the spatial distribution of the habitat found across the landscape and where the proposed treatments would occur in relation to known NSO nest sites. These areas of use are defined as follows:

- **Nest Patch** is the 300-meter (984-foot) radius area around a known or likely nest site; it is included in the core area (USDI et al. 2008d).
- **Core Area** is a 0.5-mile radius circle (approximately 500 acres) from the nest or center of activity to delineate the area most heavily used by spotted owls during the nesting season; it is included in the provincial home range circle. Core areas represent the areas which are defended by territorial owls and generally do not overlap the core areas of other owl pairs (USDI et al. 2008d).
- **Provincial Home Range** is defined by a circle located around an NSO activity center and represents the area owls are assumed to use for nesting and foraging in any given year. For the Western Cascade Province the home range is a 1.2 mile radius circle (approximately 2894 acres (USDI et al. 2008d). The home ranges of several owl sites may overlap.

These three areas represent how NSOs utilize the forest environment around their nest sites, and the importance of the habitat located within each spatial scale to a given NSO pair. They also provide a better understanding of how habitat altering treatments may affect NSOs life functions depending on where the treatment would occur in relation to known NSO nest sites. A more detailed description of the scientific rationale for the development of these three (3) scales is provided in in the Methodology for Estimating the Number of Northern Spotted Owls Affected by Proposed Federal Actions (USDI et al. 2008d).

No harvest treatments are proposed in the Nest Patch of any NSO sites. Research has shown that the habitat quality within 300 meters (984 feet) of a nest site (known as the nest patch) is critically important to determining nest site positioning across the landscape (Perkins et al. 2000). Under Alternative 2, there are approximately 20 acres of proposed treat and maintain of dispersal habitat and approximately 6 acres of proposed treat and maintain of NRF habitat in the two spotted owl Core Areas combined.

The proposed action would take place within the Provincial Home Range of two historic northern spotted owl sites. Under Alternative 2, there are 268 acres of proposed treatments within these owl home ranges. Fifty-one (51) acres of NRF and 106 acres of dispersal will be treated, but will be maintained and still function the same following treatment, 68 acres of dispersal will be removed and 43 acres of capable will be treated. Across the analysis area, more than 96% of existing suitable (NRF) northern spotted owl habitat will remain untreated. Therefore, only minimal negative effects are anticipated as a result of the proposed treatments.

Effects to Northern Spotted Owl Prey

Timber harvest and associated activity fuels reduction projects could impact foraging by changing habitat conditions for prey. Some disturbance of habitat can improve forage conditions, 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 is also some counter research as to these effects (Gomez et al. 2005; Ransome et al. 2004; Waters and Zabel 1995). Woodrats (both bushy-tailed and dusky-footed) are important components of the spotted owls' diet in in the project area (Forsman et al. 2004). Some beneficial effects to dusky-footed woodrats due to shrub development in thinned stands will be possible (Sakai and Noon 1993; Suzuki and Hayes 2003). Also, bushy-tailed woodrat presence is more dependent on cover and food availability than on a stand's seral stage.

Treatments associated with Alternative 2 that will remove, downgrade, or maintain spotted owl habitat may impact foraging by changing habitat for spotted owl prey species (USFWS 2006). Residual trees, snags, and down wood retained in the thinned stands would provide some cover for prey species over time, and would help minimize harvest impacts to some prey species, such as dusky-footed woodrats. Treatment implementation would be spread out temporally and spatially within the project area, which would provide areas for spotted owl foraging during project implementation and reduce the impact of these short-term effects at the project level. Even though northern spotted owls seldom venture far into non-forested stands to hunt, edges created by the treatments may present new foraging opportunities.

Edges created from harvest can be areas of good prey availability and potentially increased prey vulnerability (i.e., better hunting for owls) (Zabel et al.1995). Prey animals may be more exposed in the disturbed area or could move away from the disturbed area for the short-term. Changes in prey availability occur as cover is disturbed and prey species move around in the understory. As a result, they can become more vulnerable and exposed. The disturbance could attract other predators such as hawks, other owls, and mammalian predators. This may increase foraging competition for owls in the treatment area, but the exposure of prey will also improve prey availability for northern spotted owls.

Bingham and Noon (1997) reported that a spotted owl 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 spotted owl survival and reproduction. Rosenberg and McKelvey (1999) reported that spotted owls are "central place" animals with the core area being the focal area. Several studies (Wagner and Anthony 1998; Dugger et al. 2005; Zabel et al. 2003; Bingham and Noon 1997) indicate the core area size for the Klamath province is 0.5 miles from the nest site (or 500 acres). Therefore, effects to prey species for each alternative would be assessed by the amount of habitat treated within the core area. Due to the spatial distribution of the proposed treatments, 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 Heppsie Project, there would be no treatment within nest patches and all treatment within core areas would be "treat and maintain."

Implementation of Project Design Features 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.

Effects of Noise Disturbance to Northern Spotted Owls

Mandatory PDFs would be incorporated into all action activities. Nesting owls are confined to an area close to the nest, but once the young fledge, they can move away from noise and activities that might cause them harm. Since all projects would follow mandatory 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 owls, or their young, is expected from project related noise or activities.

Effects of Fuels Reduction Treatments to Northern Spotted Owls

Alternative 2 proposes to treat slash created from harvest treatments. The fuels reduction treatments as proposed in Chapter 2 would not alter the overstory forest structure or remove additional key habitat components related to spotted owl habitat. In the thinning units, these treatments reduce understory density and improve flight paths within stands, in turn increasing the accessibility of owls to the forest floor and prey abundance or availability (Sakai and Noon 1993 and 1997).

Large down woody debris, patches of unburned vegetation in draws and cooler aspects, and some unburned slash piles would continue to provide ground cover habitat during and after treatments. These untreated areas and residual habitat features, along with the spatial and temporal staggering of treatments across the landscape should ameliorate the potential negative effects (e.g., removal of cover; disruption of normal feeding, breeding, and sheltering activities) of these fuels treatments on prey species at the landscape level.

Fuels treatments do have potential to impact the spotted owl prey base because some snags or coarse woody debris habitat that prey species utilize can be consumed during underburn operations (where underburn operations are foreseeable). 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). 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.

Effects of Road Construction to Northern Spotted Owls

Trombulak and Frissel (2000) conducted a literature review on the ecological effects of roads. These effects range from direct mortality to alteration of the chemical environment. They stressed the need to retain remaining roadless areas, remove or restore existing roads, and to consider the full range of ecological process when designing a new road. The fact that there is an array of possible negative effects associated from building roads is not debatable. The magnitude of these effects from implementing the proposed project is discussed in the analysis. From a terrestrial wildlife standpoint, BLM Specialists have selected mitigation measures to limit some of the described negative effects, which include (but are not limited to) wildlife surveys, seasonal restrictions, and placement of the road to miss large trees and retaining large woody material.

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

Under Alternative 2, the BLM proposes to utilize and maintain (as needed) about 13 miles of existing roads (i.e., road grading, rock surfacing, and water drainage improvements). Road maintenance has the potential to impact wildlife species through noise and displacement, but would be of short duration and subject to wildlife seasonal PDFs.

Approximately 1.24 miles of new road would be constructed under this alternative. The new road construction will be located in dispersal northern spotted owl habitat. Seasonal restrictions listed as PDFs would avoid adverse disturbance to adjacent nesting spotted owls during road construction.

Effects to Northern Spotted Owl Proposed Critical Habitat

Alternative 2 is located within critical habitat sub-unit KLE-5 and proposes treatment on 262 acres within 2012 proposed critical habitat. Of these treatment acres there are 116 acres of treat and maintain thinning in dispersal habitat and 51 acres in nesting, roosting and foraging (NRF) habitat. There are also 68 acres of dispersal removal and 8 acres of NRF downgrade to dispersal. The remaining 19 acres of proposed treatment are found in capable habitat, which currently does not function as suitable spotted owl habitat.

The US Fish and Wildlife Service (USDI FWS 2012) issued a Biological Opinion on the proposed project that determined the removal of dispersal habitat, PCE 4, within critical habitat sub-unit KLE-5 may affect, and is likely to adversely affect critical habitat due to a reduction of PCE 4 within the affected sub-unit. However, the proposed action is not expected to affect the intended conservation function of this unit (north-south connectivity between subunits and demographic support) because the combination of 60,767 acres of NRF and dispersal habitat will allow spotted owls to effectively disperse within and beyond this critical habitat sub-unit. Although the proposed action will remove a small amount of dispersal habitat within the KLE-5 sub-unit, the overall objectives of these projects are to restore ecological processes or long-term forest health to forested landscapes (see summation below), which is consistent with the 2011 Revised Recovery Plan and the 2012 Proposed CHU.

In their Biological Opinion, the USFWS (USDI FWS 2012) also determined that the proposed treat and maintain of PCE 2, 3 (NRF) and 4 (dispersal) within proposed critical habitat sub-unit KLE-5 will have an insignificant effect and therefore may affect, is not likely to adversely affect critical habitat because:

- Canopy cover within treated NRF stands will be retained at or above 60 percent.
- Canopy cover within affected Dispersal-only stands will be maintained at 40 percent or greater post-treatment.
- Any multi-canopy, uneven-aged tree structure that was present prior to treatment will remain post-treatment.
- No spotted owl nest trees will be removed.
- Decadent woody material, such as large snags and down wood, will be retained in the same condition as prior to the treatment.
- The proposed treatments will be dispersed in relatively small patches within the CHU to further minimize the potential for adversely affecting stand characteristics for dispersal habitat.

With regard to the downgrade of eight (8) acres of NRF habitat in the Heppsie project:
"The Service has determined the … downgrade of PCE 2 and 3 associated with projects designed to promote forest health may affect, and are likely to adversely affect proposed critical habitat for the following reasons:
• Harvest prescriptions that result in the downgrade of spotted owl NR and F habitat may eliminate key habitat elements, including large diameter tree with nesting cavities or platforms, multiple canopy layers, adequate forest cover, as well as hunting perches used by spotted owls.
• Implementation of treatments that downgrade spotted owl NRF habitat have the potential to reduce nesting, roosting, foraging and dispersal opportunities in the action area." (USFWS 2012)

Table 3-29. Effects to PCEs in KLE-5 from the Heppsie Timber Sale Project

Primary Constituent Elements	KLE-5 Acres	Treat and Maintain	Downgrade	Removal	Post-Project Acres	Percent Change
2,3 (NRF)	14,494	51	8	0	14,435	-0.05%
4 (Dispersal)	23,121	116	N/A	68	23,061	-0.3%

Northern Spotted Owl 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. It is likely that the treated stands will develop into more complex, structurally diverse forests in the long term in comparison to the No Action Alternative. In fact, thinning dense stands may be necessary in order to achieve old-growth forest characteristics in the absence of natural disturbance events (Tappeiner et al. 1997). Thinning younger forest stands may provide growing conditions that more closely approximate those historically found in developing old growth stands (Hayes et al. 1997). Many of the treatments as proposed under Alternative 2, especially those that would occur in dispersal 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 areas than would occur if left untreated.

Spotted owl habitat in the project area is already below a threshold point, at which any habitat effects in a home range would trigger a required consultation with the U.S. Fish and Wildlife Service. The proposed action would treat and maintain 227 acres of dispersal and 51 acres of NRF habitat. Eight (8) acres of

NRF habitat would be downgraded to dispersal habitat, and 68 acres of dispersal habitat would be removed. Consultation with the Service was initiated in the fall of 2011 and the BLM submitted a Biological Assessment (Reference Number 01EOFW00-2012-F-0049) on January 10, 2012. The Biological Opinion received from the Service (USDI FWS 2012 Formal-TAILS#: 01EOFW00-2012-F-0049) includes a finding that implementation of the proposed action would not jeopardize the continued existence of the spotted owl.

Conservation Measures implemented that will reduce impacts to spotted owls or key habitat areas:

- Spotted owl habitat assessments were used to reduce impacts to NRF and eliminate treatments in RA-32 habitat
- Protection and buffering of Special Status Species sites found during protocol surveys
- Protection of sensitive plants that occur in the treatment areas
- Placement of riparian area buffers
- Protection and buffering of all known mining adit locations
- Project design that incorporated historic owl survey data assessments
- None of the projects occur in Late-Successional Reserves (USDA and USDI 1994)
- No projects occur with Known Spotted Owl Activity Centers (KSOAC). KSOAC are the best 100 acres around northern spotted owl activity centers that were documented as of January 1, 1994 on Matrix and AMA lands, and are managed as Late-Successional Reserves (LSR). The criteria for mapping these areas are identified on pages C-10 and C-11 of the Northwest Forest Plan Standards and Guidelines (USDA USDI 1994)
- None of the proposed treatments would occur within a NSO nest patch

In summary, Alterative 2 would have minimal impacts to the NSOs found within the planning area given that:

- None of the proposed treatments are located within any NSO nest patches
- Negative impacts to NSO prey are anticipated to only occur in the short term (<5 years) and would be spatially separated and well distributed across the planning area.
- Seasonal restrictions will reduce the likelihood of noise disturbance to nesting owls

Survey and Manage Species

Great Gray Owls

BLM surveys for great gray owl (GGO) in the project area detected no owls.

Alternative 2 proposes treatment in approximately 120 acres of suitable GGO nesting habitat. Thinning treatments are proposed for these stands. The reduction of canopy closure from these treatments will not impact owl nesting opportunities as the majority of broken-topped snags in any given snag will remain in place, post-harvest. These broken-topped snags are the preferred nesting substrate in the Cascade Range in Southwestern Oregon (Godwin 2012).

Long term beneficial effects include accelerated development of late-successional forest habitat suitable for nesting and improved potential foraging habitat as understories respond from increased light penetrating to the forest floor . In addition, implementing required PDFs (seasonal restrictions, retaining snags, cull material, down woody debris, and placing woody debris (logs) in RMP deficient treatment areas) will be beneficial to this species prey base. Less than 0.5 miles of the proposed new road construction associated with Alternative 2 would occur in suitable great gray owl habitat.

Some trees, including snags, will be removed in the process of this road building. The majority of potential nest trees in the stand through which this new road will pass will remain post-construction.

Road construction and timber harvest, as proposed, are expected to have a minimal effect on great gray owls if they are present, and minimal effect on the potential for great gray owls to use this habitat for breeding, foraging, and dispersing in the future.

Terrestrial Mollusks
If 2011 and 2012 surveys result in confirmed Special Status Species mollusks presence in the project, those known sites will receive protection buffers with a radius equal to approximately one average site tree before this project would be implemented. Buffers are installed according to professional judgment, with the goal to preserve microclimate environmental conditions (e.g. canopy, ground cover, woody debris, rocky substrate) around known species' locations to provide for the persistence of the species at these sites.

In the short term, thinning of the canopies could desiccate fine scale habitats, but the canopy would eventually fill back in when shrubs and saplings reestablish the forest floor. Impacts from implementing treatments in Alternative 2 are likely to have minimal effects and will not trend these species towards listing because:

- The dispersed impact of the proposed treatments in relation to the project area and the proximate undisturbed habitat for species to recolonize the impacted areas
- Perennial riparian areas and water sources are buffered
- Large course woody debris will be maintained and in some areas where it is determined to be lacking, cull material will be retained or the BLM could fell trees to help reach RMP standards.
- Any known locations will receive protection buffers or management recommendations

<u>Bureau Sensitive Species</u>

Fishers
Fisher occurrence is closely associated with low to mid-elevation (generally less than 4,100 feet) forests with a coniferous component, large snags or decadent live trees and logs for denning and resting, and complex physical structure near the forest floor (Aubry and Lewis 2003). Forest type is probably not as important to fishers as the vegetative and structural complexity that lead to abundant prey populations and potential den sites (Lofroth et al. 2010). Currently, there is a lack of research of fisher habitat use and preferences in the Oregon Cascade Mountains. The most applicable data available to the BLM where these key structural habitat components are located across the landscape is the northern spotted owl nesting, roosting and foraging (NRF) habitat models.

There is considerable information on the importance of structural elements (e.g., large trees and snags with cavities) for fisher. The strongest and most consistent habitat association observed across all fisher studies in the West Coast Distinct Population Segment was the use of cavities in live trees and snags by reproductive females with kits. Natal dens are typically found in the largest trees available in a stand and there is a preference towards hardwood cavities when present on the landscape. These large trees with cavities and platforms are also used extensively by both sexes for resting sites. Naney et al. (2012) stated that the reduction in structural elements used for denning and resting distributed across the landscape was the highest ranked and geographically most consistent threat to fishers. Currently, there are no empirical thresholds at which the reduction of structural elements may begin to negatively affect fishers (Naney et al. 2012).

Other threats to fishers in SW Oregon include overstory reduction, roads, fragmentation, uncharacteristically severe wildfires, and the reduction of structural elements mentioned above (Naney et al. 2012). These changes in habitat have the greatest effect on fisher new home range establishment. Fishers typically have large home ranges, use habitat at multiple spatial scales, and typically avoid areas with little or no contiguous canopy cover (Lofroth et al. 2010). Fragmentation is primarily influenced by land ownership patterns, management practices, and is a higher threat on commercial timber lands (Naney et al. 2012). These effects likely have the strongest influence on females because males have been known to disperse great distances to settle new home ranges. Although not always successful, dispersing juveniles have been documented moving long distances and navigation across or around landscape features including rivers, highways and rural communities (Lofroth et al. 2010). In a study in the south

Oregon Cascades, juvenile males averaged a dispersal distance of 18 miles (Aubry and Raley 2006). Dispersal into and through the project area probably represents a "pinch point" because it is surrounded on three sides by open agricultural lands and rural development.

According to the closest fisher study (Aubry and Raley 2006) to the project area, fisher male non-breeding home ranges average 24 mi^2 (15,320 acres) and females average 9.6 mi^2 (6,177 acres). These are probably underestimated because the landscape in the project area contains more woodland and grasslands than that encompassing the south Cascades fisher population study. Since female home ranges frequently overlap, the project area has the potential to contain at least two female home ranges and one male home range, and possibly more, depending on their home range juxtaposition on the landscape surrounding the project area. Surveys conducted in the project area failed to detect fisher presence.

A considerable amount of research exists describing denning and resting habitat use and landscape-level selection (Lofroth et al. 2010), but very little is known regarding how forestry practices affect how fishers continue to use previously untreated areas. Historically, a change in habitat is used as a surrogate to determine the effects of habitat modification in lieu of published research. As previously mentioned, the best tool for determining suitable fisher habitat, while not implying a level of fitness, is to use spotted owl habitat models. Field surveys have shown that spotted owl NRF habitat can contain similar decadent attributes or structural elements that fisher use for denning and rest sites. The proposed treatments in Alternative 2 would treat and maintain 51 acres and downgrade 8 acres out of 1874 acres (total) of NRF habitat in the analysis area.

The commercial treatments under Alternative 2 would have short term negative effects to habitat for some fisher prey species due to the reduced vegetation. These effects are relatively short term, as understory vegetation typically returns within 5 years and some of the fishers' prey species take advantage of early-seral stages. The immediate effects to fisher foraging opportunities should be minimal, because the large amount of untreated areas within the project area would continue to provide hunting habitat while canopy cover in the treated stands increases. Additionally, treatments would retain key habitat characteristics such as large snags and coarse woody debris (CWD) to provide existing and future habitat for fishers.

Disturbance from treatment activities would likely be the principal effect to fisher within the project area. However, fishers are highly mobile and with large home ranges, they would likely move to another part of their home range while the activity is ongoing. Unrelated to disturbance, ongoing radio telemetry work in the nearby Ashland watershed has shown that fishers are quick to respond to environmental changes (e.g. heavy snowfall) and move to other parts of their home ranges (Clayton 2012a).

Under Alternative 2, there are Project Design Features that will minimize impacts to fishers. These include the retention of key structural elements such as old-growth and decadent trees, snags, CWD, and large hardwoods for denning. While 7% of the project area is proposed for treatments, 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 fishers. Effects to fishers from implementation of this project are expected to be minimal and not significant.

Bald Eagle

No known bald eagle nest trees are located within the Planning Area. Therefore, no direct effects are anticipated. Bald eagles in Oregon primarily nest within 1 mile of water sources such as lakes, rivers, reservoirs, or oceans (Marshall et al. 2003). If a nest is located prior to (or while) implementing the project, it would be protected under the 1995 and 2008 RMP guidelines and the National Bald Management Guidelines. Even though Alternative 2 could remove some potential nest/roost trees, bald eagles would not be precluded from nesting due to retention of larger suitable nest trees in treatment units and the amount of suitable nest trees located within the project area. With implementation of this project, effects to bald eagles are expected to be minimal and not significant.

Bats

The three Bureau Sensitive bat species (Townsend's big-eared, Pallid, Fringed Myotis) utilize mines, caves, manmade structures, snags and rock outcroppings for roosting and hibernacula sites. No surveys have been conducted for these species. Even though the proposed action may potentially adversely disrupt local bat populations, and may cause the loss of habitat in some cases, this project is not expected to affect long-term population viability of any bat species in the project area. Project design features and marking guidelines requiring the retention of snags, decadent wildlife trees, buffering of mines, 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. With implementation of this project, effects to bats are expected to be minimal and not significant.

Johnson's Hairstreak

No surveys have been conducted for this species in the analysis area. If present, this butterfly may be impacted through removal of older conifer trees and the mistletoe which they host. As mistletoe will not be eradicated from the area and the proposed action will not remove old-growth trees, suitable habitat will continue to persist in the project area and Alternative 2 should have minimal impacts to the species.

Siskiyou short-horned grasshopper

This species has been documented in a grassland/shrubland area on Heppsie Mountain. This area will not be treated under the Heppsie project.

Western Bumblebee

The grassland/shrubland habitat of this species will not be treated under the Heppsie project.

Pond Turtle

The aquatic habitat of this species will not be treated under the Heppsie project. The upland areas immediately adjacent to this aquatic habitat will be protected by riparian buffers. It is possible that individuals of this species overwintering in forested areas may be disturbed or harmed by the activities planned under the Heppsie project. This sort of impact to individuals would not be expected to contribute to the need to list this species.

Other Wildlife Species of Concern

USFWS Birds of Conservation Concern and Game Birds Below Desired Condition

Some migratory bird individuals other than USFWS species of concern may be disturbed or displaced during project activities. Some nests may be destroyed from timber harvest occurring during active nesting periods. However, there would be no perceptible shift in species composition the following breeding season because of the small scale habitat modifications in relation to the project 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).

As described in the Affected Environment, the five USFWS species of concern (band-tailed pigeon, mourning dove, olive-sided flycatcher, rufous hummingbird and purple finch) known or suspected to occur in the project 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 while the forest matures into a mid- to late-successional seral stage. With implementation of this project, direct effects to these bird species are expected to be minimal and not significant.

Golden Eagles

There are no known golden eagle nest sites in the project area but they are regularly observed in the Little Butte Creek drainage. Due to the suitable habitat available to golden eagles within these watersheds, any impact to the species from the Heppsie Project is expected to be minimal because of the retention of over 97% of older forested habitat types within the project area. These older forests are the most likely to support nesting by golden eagles. Most large suitable nest trees would be retained post-harvest. There are grasslands suitable for foraging in the area (which would not be treated) and will remain usable by golden eagles to their present extent. The most suitable foraging habitat is found in the valleys outside the project area. With implementation of this project, direct effects to golden eagles are expected to be minimal and not significant.

Deer and Elk Winter Range and Elk Management Area

The primary impact of the proposed timber harvest in deer winter range would be the reduction in thermal cover effectiveness due to a reduction in canopy closure in the commercial-sized conifer stands. Thermal cover provides protection from extreme temperatures and thus, reduces stress on these animals. Optimal thermal cover requires conifer/evergreen canopy closure of greater than 70 percent. Under Alternative 2 approximately 206 acres would be treated within the overlapping Big Game Winter Range and Elk Management Area and 50 acres would be treated within the area identified only as Big Game Winter Range. Within these areas, habitat currently rated as NRF will retain approximately 60% canopy cover and all but 10 acres of habitat currently rated as dispersal will retain approximately 40% canopy cover. In addition, new road construction will allow vehicular activity in previously inaccessible areas. Such access increases the likelihood of disturbance and hunting pressure with regard to these big game species.

Several other factors would mitigate this reduction in thermal cover effectiveness:

(1) Post-harvest most project units (except about 43 acres of disease management harvest and approximately 10 acres of dispersal proposed for removal) will have canopy closures of 40-60 percent. Although not optimal, the thermal cover effectiveness of the stands would still be about 50 percent based on data in Thomas et al. (1979).

(2) The loss in thermal cover effectiveness would not be compounded by vehicular traffic. Approximately 75 percent of the deer winter range and elk management area is in a portion of the analysis area located behind locked gates or otherwise inaccessible to motorized vehicles. The deer and elk in these areas do not have to waste energy in avoidance behavior.

(3) The harvest would probably improve forage conditions in the stands by stimulating the growth and abundance of shrub and herbaceous species.

Additionally, the concept that thermal cover moderated weather conditions, and thus, was important to survival and reproduction in ungulates has recently been challenged (Cook et al., 2004a). Cook et al. (2004) conclude that "the primary benefit attributed to cover is probably not operative across a considerable range of climate, including those in boreal ecosystems of the northeastern U.S., maritime ecosystems of the inland Pacific Northwest, and cold, dry ecosystems of the central Rocky Mountains". This finding indicates that the reduction in thermal cover effectiveness would be of little consequence to wintering deer or elk.

Under Alternative 2, the BLM proposes to maintain about 13.18 miles of roads (i.e., road grading, rock surfacing, and water drainage improvements). Approximately 1.24 miles of new road would be constructed under this alternative. There are a number of ways roads affect wildlife in addition to habitat removal. Some of the more common ones are vehicular noise disturbance which affects behavior patterns, increased potential for poaching, increased potential for over hunting along roads due to easy access, and microclimatic changes to the habitat adjacent to roads. Road maintenance has the potential to influence wildlife species through noise, but would be of short duration and subject to wildlife seasonal PDFs. Effects to big game as a result of project implementation are expected to be minimal and not significant.

c. Alternative 3

The effects to terrestrial wildlife in Alternative 3 would be very similar to Alternative 2, except the overall effects would be lessened. Under Alternative 3 there would be no new road construction. Seventy-six (76) acres of forest land proposed for treatment under Alternative 2 would receive no treatment under Alternative 3.

Northern Spotted Owl
Effects to spotted owls, spotted owl habitat, and spotted owl prey species under Alternative 3 would be very similar to the effects of Alternative 2. The analysis in Alternative 2 is reasonable applicable under this alternative. The elimination of treatments in 53 acres of dispersal habitat and the elimination of new road construction both contribute to this alternative being of lesser impact to northern spotted owls (Table 3-30).

Table 3-30. Effects of Alternative 3 Proposed Treatments to NSO Habitat in the Project Area

Habitat Type	Pre-Project Acres	Treat and Maintain	Downgrade	Removal	Post-Project Acres	Percent Change
NRF	1874	31	8	0	1866	0.5
Dispersal-only	675	189	N/A	49	634	6.1

All Other Special Status Wildlife Species
The difference in effects to wildlife species between Alternative 3 and Alternative 2 would be negligible or difficult to quantify and the analysis in Alternative 2 is reasonably applicable under this alternative.

3. Cumulative Effects

Cumulative effects are environmental changes that are affected by more than one land-use activity, and include beneficial changes. Cumulative effects for wildlife species and habitat are reviewed at the watershed level to capture the varying habitats, species home ranges, and varying degrees of species mobility. Technical issues that complicate analysis of cumulative effects include the large spatial and temporal scales involved, the wide variety of processes and interactions that influence cumulative effects, and the lengthy lag-times that often separate a land-use activity and the landscape's response to that activity. Fire suppression, road building, and timber harvest throughout the project area have resulted in habitat modification and fragmentation, and have changed the distribution and abundance of wildlife species surrounding the project area. Timber harvest has occurred on BLM lands in the analysis area for decades. The associated habitat modification has negatively affected late-successional forest habitat-dependent species by reducing stand seral stage and changing habitat structure. However, species associated with younger forested conditions have benefited from these changes due to the increased acres of young stands within the watershed.

Private lands surrounding the project 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. We anticipate some loss of owl habitat on private lands, but cannot predict the rate of loss, or the specific location of harvest.

There are no ongoing or foreseeable management actions occurring on federal lands within the Little Butte Creek watershed analysis area.

The proposed Heppsie project treatment acres represent approximately 10 percent of the total BLM-administered acres in the analysis area.

a. Northern Spotted Owl

The Heppsie project proposes commercial treatments on up to 59 acres of NRF, 295 acres of dispersal-only, and 43 acres of capable NSO habitat. These treatments, coupled with the other recent and reasonably foreseeable projects described above, would increase fragmentation within the watersheds. However, the only activity that is likely to remove NRF habitat within the watersheds would be timber harvest on private lands. This amount of removal at the watershed level would not preclude spotted owls or other late-successional forest species from dispersing within or through the watersheds. Additionally, even when the Heppsie project is combined with current and foreseeable actions, it is unlikely the actions proposed in this project would appreciably reduce or diminish the survival or recovery of the northern spotted owl. This is because of the small percentage of suitable habitat affected at the provincial and the regional population levels. The level of harvest associated with this project would not preclude owls occupying historic home ranges and continuing to reproduce in the project area and watersheds. Although no barred owls have been documented in the project area, it is likely that they soon will inhabit the area and continue to have negative effects on spotted owl. It is anticipated that the protection of RA 32 habitat would provide refugia from the intrusion of barred owls.

Non-Federal lands are not expected to provide demographic support for spotted owls across and between physiographic provinces (Thomas et al., 1990; USDA and USDI 1994). The Medford BLM assumes these past management practices will continue and reduce the amount of NRF habitat for spotted owl on non-Federal lands over time.

b. Fisher

Fishers are likely using the proposed timber harvest units and areas that have received treatments in the past. No habitat management guidelines have been established for fisher, relative to how much of what stand character units should be maintained. Patches of older seral habitat will remain near the project within riparian management zones and spotted owl cores that will provide ample corridors of cover for denning, resting and dispersal. Results from surveys can only be used to make rough inferences on presence and not habitat selection since the fishers are baited in to the survey camera stations.

Impacts of the action alternatives on fishers are predicted to be low, since a patchwork mosaic of stand types and ages would remain in the project area and fishers have been documented in the area. Most coarse down wood and snags, except for those that present a safety hazard, would be maintained. Areas of closed canopy would remain in each section. The Northwest Forest was designed with a network of Late-successional Reserves surrounded by younger, managed forests. Although these reserves may provide suitable habitat that is well-distributed on Federal lands, fisher populations may never respond and be well-distributed because of (1) their apparently low rates of recolonization of restored habitats after local extirpation, (2) the lower amount of Federal land at lower elevations, and (3) their natural rareness (Forest Service and Bureau of Land Management 1994, Appendix J2-470). With implementation of this project, cumulative effects to fishers are expected to be minimal and not significant, and will not lead to further listing of this species.

c. Other Wildlife Species

This section addresses wildlife species (other than northern spotted owl or fisher) listed as Survey and Manage or Bureau Sensitive discussed in the Affected Environment portion of this analysis. There is no evidence that current forest practices on Federal land immediately threaten any terrestrial vertebrate species in Oregon. Even though the proposed actions may potentially adversely disrupt local individuals of sensitive wildlife species and may cause the loss of habitat in some cases, this project is not expected to affect long-term population viability of any Bureau Sensitive, or Survey and Manage wildlife species known to be in the area. Additionally, this project combined with other actions in the watershed would not contribute to the need to Federally list any Bureau Sensitive or Survey and Manage wildlife species, because of the small scope of the proposed action compared to the available habitat within the Little Butte Creek watershed. The combination of all treatments proposed under Alternative 2 and 3 would treat only 7% of the analysis area. Because of the relatively small foot-print of the project, and because of the dispersed distribution of proposed treatments across the analysis area, no significant cumulative effects are anticipated to any Bureau Sensitive or Survey and Manage wildlife species.

I. BOTANY

1. Introduction

Analysis regarding botanical resources within the Heppsie Forest Management Project has been conducted at the 6th Field sub watershed level, and includes the Lower North Fork Little Butte Creek and Lower South Fork Little Butte Creek sub-watersheds in their entirety. All references to the "Heppsie Analysis area" include the areas of these sub-watersheds.

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

- Timber harvest and road construction activities have the potential to affect Bureau Special Status vascular plants, bryophytes, lichens, and fungi.
- 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 terrestrial habitats and associated organisms.

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 Bureau designated Sensitive species. For these species, the BLM implements recovery plans, conservation strategies, and approved project design criteria of biological opinions, and ensures that actions authorized, funded, or carried out by the BLM promotes their conservation and reduces the likelihood and need for their future listing under the ESA.

On July 25, 2007, the Oregon State Office Instruction Memorandum No. OR-2007-072 updated the State Director's Special Status Species List to include species additions and deletions from the application of the most recent scientific data. This list was finalized with the February 7, 2008 Instruction Memorandum No. OR-2008-038.

This project will meet the provisions of 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* with the 2011 update to the species list, as put forth in the settlement agreement in *Conservation Northwest v. Sherman* (Case number 08-CV-1067-JCC). The 2011 Settlement Agreement states:

"For projects with signed Records of Decision, Decision Notices, or Decision Memoranda from December 17, 2009, through September 30, 2012, the Agencies will use either of the following Survey and Manage species lists:

a. The list of Survey and Manage species in the 2001 ROD (Table 1-1, Standards and Guidelines, pages 41-51).

b. The list of Survey and Manage species and associated species mitigation, Attachment 1 to the Settlement Agreement."

The Heppsie Project applies the Survey and Manage species list in the 2011 Settlement Agreement and thus meets the provisions of 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*, as modified by the 2011 Settlement Agreement.

2. Affected Environment

A portion of the Heppsie Analysis area is within the range of *Fritillaria gentneri*, a species listed under the Endangered Species Act with ranges on the Medford District. The Heppsie Analysis area is entirely outside the ranges of other Federally Endangered species found on the Medford District (*Arabis macdonaldiana*, *Limnanthes floccosa* ssp. *grandiflora*, and *Lomatium cookii*). Table 3-24 lists the SSP found within the Heppsie Analysis area, including those sites that are located within or bordering proposed treatment units or haul routes.

Survey Methods and Completion

Surveys are conducted to conform to the *FY 2009-2013 Programmatic Assessment for Activities that May Affect the Listed Endangered Plant Species Gentner's Fritillary, Cook's Lomatium, McDonald's Rockcress, and Large-Flowered Woolly Meadowfoam*, and are valid for 10 years. Survey of unsuitable habitat for federally listed plants is not required, and 2-year surveys in all suitable habitat is required for larger scale projects. For those surveys for *Fritillaria gentneri*, two surveys must occur within a 10-year interval, and are recommended to be within 5 years of each other (USDI 2008).

Surveys are conducted using the intuitive controlled survey method. Field work is conducted during the stage of plant phenological development that assures visibility of characteristics necessary for accurate identification of special status plant species. Timing of fieldwork takes into consideration seasonal climate, elevation, aspect, target species and suitable habitat.

Surveys for all species on the Medford SSP list (current at the time of survey) and the amended 2011 S&M species list were completed in 2010 and 2011 in units 35-3, 1-1, 1-3, 1-7, 1-8, 5-1, 5-7, 5-8, 5-9, 5-13, and 5-14. In some units, the majority of ground has had complete surveys performed, but there are small portions (often equalling less than 1 acre in each instance, and collectively amounting to 12.2 acres) that require future surveys prior to project implementation. Those units include: 1-4, 1-6, 1-9, 5-11, 5-15, 6-1, 7-1, 8-1, 31-1 and 31-2. Surveys, including 2nd year *Fritillaria gentneri* surveys (where appropriate), will be completed prior to ground-disturbing activity, in unit 35-4. Surveys have been scheduled for spring/early summer of 2012 and will be completed prior to issuing a decision for this project. Sites of Special Status Plant sites that are located as a result of future surveys within all listed units will be managed and protected per professional judgement and as directed in BLM IM OR-99-27.

a. Vascular and Non-Vascular Plants

The Analysis area includes areas of varying stand overstory and understory density, due to a history of previous land management activity. There has been previous harvest activity in all proposed units, with the exception of a portion of unit 7-1. Stands are generally mixed in seral-class, and often neighbor (or are interspersed with) oak woodlands, particularly at the lower elevations within the Analysis area. Within conifer stands, ground cover is often minimal, and is primarily comprised of graminoids when present.

Large diameter trees are present in all units, providing more habitat for those species (primarily non-vascular) that prefer conditions associated with late-seral forest conditions.

Surveys have documented 2 occurrences of one Survey and Manage plant species and one Bureau Sensitive species within the Heppsie Analysis area that occur within 330 feet (100 meters) of proposed units. (Table 3-31). There are no documented sites of SSP that occur within 100 feet (or less) of proposed haul routes or proposed new road construction.

Table 3-31. Sensitive Status Plant Species In or Adjacent to Analysis Units or Haul Routes

Scientific Name	Common Name	Lifeform	Survey & Manage Status*	2010 Heritage Rank**	2010 ORBIC List***	BLM Status	Sites
Carex serrotodens	saw-tooth sedge	Vascular	--	G5/S3	4	SEN	1
Cypripedium montantum	Mountain Lady's slipper	Vascular	C	G4/S3S4	4	--	1

***Survey and Manage: as determined by the 2001 amendment to the 1994 Northwest Forest Plan Record of Decision for Survey and Manage, Protection Buffers and related mitigation measures.**

C = Uncommon, and not all known sites or populations are likely to be necessary for reasonable assurance of persistence, as indicated by several factors. Pre-disturbance surveys are practical.

****Heritage Rank: an international system for ranking rare, threatened, and endangered species**

G = Global Rank
S = State Rank
3 = Rare, uncommon, or threatened but not immediately imperiled, typically with 21-100 occurrences.
4 = Not rare and apparently secure, but with cause for long-term concern, usually with more than 100 occurrences.
5= Demonstratably widespread, abundant and secure

*****ORBIC List: Oregon Biodiversity Information Center maintains extensive databases of Oregon biodiversity, concentrating on rare and endangered plants, animals, and ecosystems.**

4=taxa which are very rare but are currently secure, as well as taxa which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered.

BLM Status

SEN=Sensitive (USDI Oregon State Director's List)

b. Special Status Species Plants Within or Adjacent to Treatment Units and Haul Routes

Carex serratodens is a native perennial that is found in California, Oregon and Arizona. Considered to be relatively rare in southwest Oregon, it reaches the northernmost extension of its range in Jackson, Josephine, and Douglas Counties. It usually occurs in moist meadows, hillsides, and seeps, in sun or more often in partial shade, often on serpentine substrates, at low to moderate elevations (Wilson et al. 2008). There is one documented site of the species in the Heppsie analysis area occurring within 330 feet of project units, accounting for 100% of the total sites in the Heppsie analysis area, and 1.2% of the known sites on the Medford District.

Cypripedium montanum is an orchid known from Washington, Oregon and California. It has small and scattered populations that are declining. Effects of logging, collection for horticultural use, loss of habitat on private land, and lack of fire have reduced populations and habitat. The loss of small, isolated populations due to activities such as timber harvest, road and trail construction, soil and litter disturbance, and a decrease of canopy closure to less than 60 percent have been identified as threats to this species (USDA and USDI 2004). There is 1 documented site occurring within 330 feet of a project unit, representing 33% of the total sites within the Heppsie Analysis area, and 0.2% of the total known sites on the Medford District.

c. Fungi

The 2001 Survey and Manage Record of Decision (ROD) Standards and Guidelines establish 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. For the Category B fungal species, the deadline for completion of Strategic Surveys was the beginning of fiscal year 2011. Since an evaluation of Strategic Survey results for Category B fungi has not been completed, equivalent-effort pre-disturbance surveys are required in those stands that meet the criteria for being considered “old-growth” (REIC 2012).

New surveys were not conducted (due to stands within proposed unit areas not meeting the 180-year stand age 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 (USDI 2004).

Of the 12 species of fungi that are on the Medford District Sensitive Species list, 10 are Survey and Manage species whose status determines that pre-disturbance surveys are impractical and not required (Category B). 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. There are no sites of Bureau Sensitive fungi species documented within the Heppsie Analysis area.

Of the 81 Survey and Manage fungi species included in the 2012 Survey and Manage Settlement Agreement, 23 are documented on the Medford District BLM, and 19 are suspected to occur, but are not currently known.

Previous surveys have documented 5 sites of Survey and Manage fungi species within the Heppsie Analysis area, 2 of which are Category B species (Table 3-32). Documented sites do not occur in or within 330 feet of proposed units, or within 100 feet of proposed haul routes.

Table 3-32. Medford District Special Status Fungi Species Sites in the Analysis area

Scientific Name	2012 BLM Status	2012 S&M Status*	2010 Heritage Rank**	ORBIC List***	NWFP Sites	Known Sites in Analysis area
Ramaria rubripermanens	--	D	--	--	142	1
Ramaria rubrievanescens	--	B	--	--	51	1
Ramaria thiersii	STR	B	G3/S2?	3	8	2

BLM Status

STR = Strategic (USDI Oregon State Director’s List). No surveys or protection required, but sites are documented to fill in species’ “information gaps”.

***Survey and Manage: as determined by the 2001 amendment to the 1994 Northwest Forest Plan Record of Decision for Survey and Manage, Protection Buffers and related mitigation measures.**

B= Rare, and all known sites are managed. Pre-disturbance surveys are not practical.

D= Uncommon. Manage all known sites until high-priority sites can be determined. Pre-disturbance surveys are not practical or not necessary.

****Heritage Rank: an international system for ranking rare, threatened, and endangered species**

G = Global Rank

S = State Rank

2 = Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation), typically with 6-20 occurrences.

3 = Rare, uncommon, or threatened but not immediately imperiled, typically with 21-100 occurrences.

? = Not yet ranked or assigned rank is uncertain.

*****ORBIC List: Oregon Biodiversity Information Center maintains extensive databases of Oregon biodiversity, concentrating on rare and endangered plants, animals, and ecosystems.**

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.

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

Special Status Plants

Under Alternative 1, fire hazard in dense stands would remain at current levels. Habitat for SSP in these areas would neither improve nor increase, due to continued high stocking levels, low species diversity, and suppressed and/or unnatural light and water regimes.

Without localized vegetation treatment, Special Status Plant populations in those areas with more dense vegetation would continue to decline over time due to the slow degradation of suitable habitat through continued increase of low-growing shrub cover, increased seedling and sapling cover, and for species that prefer more light, increased canopy cover. Plant communities will continue to become overly dense, decadent thickets with increased competition for resources in those localized areas. Fire risk and fire hazard would remain higher in those areas with unnaturally high fuel loading and fuels structure. A resulting high-intensity fire in these areas would destroy potential habitat for SSP species.

With selection of Alternative 1, Sensitive species within the analysis area would not trend towards further listing, and the persistence of documented Survey and Manage species would not be affected.

b. Alternative 2

The following documents the analysis of effects to botanical resources resulting from the implementation of Alternative 2.

The greatest threats to plant community health resulting from project activity would be soil disturbance that could result in nonnative/noxious weed introduction into areas previously not infested, disruption of habitat, and the potential loss of canopy cover for those species dependent on filtered light and/or higher moisture levels for survival. Soil compaction would also be a mechanism for habitat loss and degradation for SSP.

Special Status/Survey &Manage Plants

Silvicultural Prescriptions and Follow-Up Fuels Treatments

Known SSP sites within the Analysis area are protected by location and distance from proposed units or no-activity buffers (in combination with distance from unit and location within a Riparian Reserve). Potential sites identified in future surveys would be protected appropriately, using both professional judgment and (where applicable) District guidance.

Under Alternative 2, there would be no effect on documented sites of SSP located in Riparian Reserves due to implementation of PDFs described in Chapter 2. PDFs establish that activity is prohibited from taking place within the established reserves.

Roads and Landings

There are approximately 14 miles of roads proposed for use as haul routes under Alternative 2. There are no known documented sites that occur within 100 feet of proposed haul routes; consequently, there will be no effect on SSP within the Analysis area with implementation of Alternative 2. If future surveys detect SSP sites (including Survey and Manage species), sites will be protected according to Project Design Features and Management Recommendations based on professional judgment, District guidelines, knowledge of the area, and proposed activity.

In the Heppsie Analysis area, construction of 4 new permanent roads, and extension of one existing road is proposed, with a proposed combined approximate length of 1.24 miles. All roads will be barricaded or closed in some fashion after project activities are completed. There are currently no known sites in areas proposed for new road construction or improvements.

Where improvements are proposed (See Chapter 2, Table 2-3), ground disturbing activity would be limited to the existing road prism. There are no known sites located in these areas.

Due to a lack of SSP presence in areas proposed for road construction or improvement activity, there will be no effect on SSP.

Cumulative Effects
Land ownership in the Heppsie Analysis area is both public (BLM) and private. The condition of the local landscape and its associated sub-watersheds relies heavily on privately-owned land and activities that affect its habitat condition.

Grazing
Approximately 5,730 acres (11.7%) of the Heppsie Analysis area is currently authorized for grazing as part of the Heppsie Mountain grazing allotment, which authorizes 294 Animal Unit Months (AUMs) from May 1st - October 15th. Additionally, the Big Butte allotment occurs in the northern portion of the analysis area, within the Lower North Fork Little Butte Creek sub-watershed. However, because the entirety of the area where ground disturbance and log hauling would occur is outside of this allotment, it will not be considered further for this portion of the analysis.

An effect resulting from grazing is the potential for introduction of nonnative species, which in turn alter the natural and preferred habitat for Special Status Plant species. There is active grazing throughout many of the un-forested areas within the Analysis area; multiple-year surveys and field visits by Botanists confirmed this. Soil disturbance increases the likelihood of movement and introduction of nonnative plant and noxious weed species, particularly in those areas more susceptible to invasion (e.g. oak woodlands and meadows). As with many native grasslands and oak woodlands in Southwest Oregon, conversion to nonnative grass-dominance is well underway throughout the Analysis area in those habitats, as evidenced by the presence of nonnative graminoids in all grasslands in the area. Species with frequencies ≥75% within the Analysis area include silver hairgrass (*Aira caryophylla*), ripgut brome (*Bromus diandrus*), soft brome (*B. hordeaceus*), cheatgrass (*B. tectorum*), bristly dogtail (*Cynosurus echinatus*), and Kentucky bluegrass (*Poa pratensis*). This conversion to a nonnative grass-dominated habitat represents a shift from suitable and desirable habitat for both native and Special Status Species that prefer these habitats. This species shift also presents unintended consequences, including the potential for an increase in fire frequency and intensity (Vitousek et al. 1996).

While the amount of annual grazing in the Heppsie Analysis area is relatively low when compared to either historic levels or other areas where AUMs are greater and grazing season is longer, cattle do affect species composition and seed dispersal in areas where they graze (Bartuszevige and Endress 2008; DiTomaso 2000). Because there is limited human-associated activity not only in the Analysis area, but also specifically in the grasslands and oak woodlands in question (i.e. very limited OHV use that occurs primarily on existing roads, limited recreational usage), ungulate grazing (cattle, elk and deer) is a primary source of soil disturbance in those areas. The lease renewal RHA states that:

> [u]se in the oak woodland portion of the allotment can be categorized as light to moderate with some areas of heavy use... Field visits…suggest exotic annual grasses are not spreading rapidly under current grazing regimes. However, areas of moderate to heavy livestock utilization, congregation areas and loading areas that experience soil and vegetation disturbance within the allotment are at risk for weed colonization. (USDI 2007)

Under Alternative 2, implementation of PDFs to minimize risk of nonnative seed spread or introduction will result in no effect in those areas with canopy cover (harvest units); however, those areas of limited canopy cover and grazing activity (grasslands and oak woodlands) where road construction is proposed have a higher likelihood of long-term effects with regard to native species and special status species habitat conversion, primarily with regard to road-building in Section 35. The combination of both building and closing the roads will increase forage opportunities for cattle in areas where they already congregate (usually areas with a water source) by creating easier travel routes and increasing available forage via post-disturbance seeding (depending on timing of turn-out into those areas). This potential for increased localized use could affect the desired habitat in several ways, including prolonging soil disturbance over the course of the grazing season, increasing disturbance in areas where dispersal was previously more prominent, and increasing cattle presence in areas previously considered more dispersal-type areas (i.e. transitions from open-to-closed canopied habitats or fully-shaded areas). However, when coupled with the small number of animals utilizing the allotment, the implementation of both the Heppsie Mountain Allotment Terms and Conditions (as defined in the as defined in the *Environmental Assessment for the Heppsie Mountain Grazing Lease Renewal* [DOI-BLM-OR-M060-2010-0012-EA, pp. 8-10]) and the Heppsie Forest Management Project PDFs would lessen potential effects, and there would be no significant effects at either the localized or broader subwatershed scales.

In sum, the building of new roads through grassland and oak woodland habitats within the Project Area increases the likelihood that ungulates (specifically, cattle) will congregate in those areas more than they currently do, and for longer duration, resulting in a cumulative impact. The result of this increased localized grazing activity could be increased nonnative seed dispersal and/or introduction, which may result in a decrease in potential SSP habitat in those areas, and additionally, increased risk for more frequent and intense fires. Terms and Conditions, as designated in the allotment EA, and PDFs for the Heppsie Forest Management Project would lessen effects and ensure that, while there would be impacts, they would not be significant.

Private Land-Use Operations

Future proposed timber harvest and other vegetation treatments on private lands are not known. It is assumed that most timber harvest projects and other vegetation treatments on private land will have adverse effects on native plant communities (including SSP) due to timber removal prescriptions, logging methods, and fewer resource protection measures. Federal laws protecting endangered and special status plants do not apply to private land without a Federal nexus.

Recreational Operations

Off-Highway Vehicle (OHV) use is occurring within portions of the Analysis area, though is very limited in scope (0.25 miles of trail that occurs outside of existing road systems), season and intensity of use. Use is documented mostly in the Heppsie Mountain area, primarily occurring during hunting season and remaining primarily on existing road systems (rather than unauthorized trails).

Based on known patterns and locations of use, coupled with the proposed project's components, OHV use is not being analyzed further as a cumulative effect to SSP species within the Analysis area.

Past and Proposed Actions

The Down Wind Blowdown Salvage sale completed harvest operations in 2011, removing downed trees across 230 acres as they occurred (removal was patchy and not continuous). There were no SSP sites associated with this project, and disturbance was addressed in PDFs for the project; therefore, there is no cumulative effect to analyze with regard to the Heppsie Project.

c. Alternative 3

The following documents the analysis of effects to botanical resources resulting from the implementation of Alternative 3 (see Chapter 2 for details).

The greatest threats to plant community health resulting from project activity would be soil disturbance that could result in nonnative/noxious weed introduction into areas previously not infested, and the potential loss of canopy cover for those species dependent on filtered light and/or higher moisture levels for survival. Soil compaction would also be a mechanism for habitat loss and degradation for SSP.

Special Status/Survey &Manage Plants

Commercial Timber Harvest, Pre-Commercial Thinning and Follow-Up Fuels Treatments
In units that are the same between Alternatives 2 and 3, effects to SSP due to timber harvest, PCT and follow-up fuels treatments in the Heppsie Project would be the same with the implementation of Alternative 3 as with the implementation of Alternative 2. Sites documented during Spring 2012 surveys would be protected per proper implementation of Chapter 2 PDFs, resulting in no effect to those sites and species.

The 2 sites of SSP species located near unit 7-1 represent the only sites of SSP that are located within 330 feet of project units. This unit would be eliminated under this Alternative; there would be no effect to these sites with the implementation of this Alternative, and no protection necessary.

SSP that are present in the project area but not protected by buffers, seasonal restrictions, or other mitigation will not be affected by any proposed treatments due to their topographic relationship to, or distance from, areas of proposed activity.

Roads and Landings
There are approximately13 miles of roads proposed for use as haul routes under Alternative 3 (See Chapter 2). Roads used as haul routes would be maintained as needed (ditch cleaning, spot rocking, etc.) to ensure adequate protection. These roads are existing and need treatments that would enable large equipment to travel through. All disturbance activity would occur in the existing road prism. Prior to disturbance activity, all known noxious weed sites located on haul routes or roads proposed for improvements would be treated to prevent further spread of plant material and/or weed seed.

There are no SSP sites that occur within 100 feet of proposed haul routes. Sites documented during Spring 2012 surveys would be protected per Management Guidelines (where applicable and available) and professional judgment (see PDFs in Chapter 2).

Cumulative Effects
Land ownership in the Heppsie Analysis area is both public (BLM) and private. The condition of the local landscape and its associated sub-watersheds relies heavily on privately-owned land and activities that affect its habitat condition.

Grazing
Cumulative effects to SSP and associated habitats would be less under Alternative 3 than Alternative 2, due to the elimination of new permanent road construction. Oak woodlands (considered to be habitat for multiple SSP) would continue to undergo some degree of species conversion (from annual perennial to nonnative annual) with regard to graminoids, as is happening throughout the range of nonnative annual grasses. This process would occur due to a combination of any of the following: wind dispersal, animal (including cow) dispersal or water dispersal. Areas of preferred forage (including meadows and woodlands) would continue to be grazed at the level they currently are, barring any unforeseen changes in stocking levels or future land-management activity.

Private Land-Use Operations
Cumulative effects to SSP due to private land-use operations in the Heppsie Project area would be the same with the implementation of Alternative 3 as with the implementation of Alternative 2.

Recreational Operations

Ridgelines and areas with mild-to-moderate hill slopes are susceptible to unauthorized recreational uses (i.e., trail building, OHV use) due to fewer natural barriers on the landscape, which can lead to weed and nonnative species infestations and SSP habitat degradation.

Areas currently prone to unauthorized use would continue to be problematic due to the lack of natural barriers in those areas. The creation of skid trails and areas of lighter vegetation cover would further increase the risk presented to natural resources with regard to illicit recreational operations, due to the further removal of natural barriers and increased accessibility in areas where slope is mild-to-moderate.

Past and Proposed Actions
Cumulative effects to SSP due to past and proposed actions in the Heppsie Project area would be the same with the implementation of Alternative 3 as with the implementation of Alternative 2.

J. NOXIOUS WEEDS AND INTRODUCED PLANTS

1. Affected Environment

a. Noxious Weeds

Analysis regarding noxious weeds and introduced plants within the Heppsie Forest Management Project has been conducted at the 6th Field sub watershed level, and includes the Lower North Fork Little Butte Creek and Lower South Fork Little Butte Creek sub-watersheds in their entirety. All references to the "Heppsie Analysis area" include the areas of these sub-watersheds.

Issues related to noxious weeds and introduced plants associated with the Heppsie Project have been identified through public scoping or ID team specialists and will be addressed in this document. These relevant issues are:

- Forest management and logging can increase the risk of introduction and spread of nonnative plants and noxious weeds.

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.

Within the Heppsie Analysis area, there are a total of 134 documented noxious weed sites in the Medford BLM weed database, comprised of 7 species (Table 3-33)**.**

Table 3-33. Noxious Weed Species and Occurrences in the HUC6 Heppsie Analysis area

Scientific Name	Common Name	Documented Occurrences in HUC6	ODA Designation*
Centaurea calcitrapa	purple star-thistle	1	A, T
Centaurea pratensis (syn. *C. debeauxii* ssp. *thuilleri*)	meadow knapweed	1	B
Centaurea solstitialis	yellow star-thistle	45	B, T
Circium arvense	Canada thistle	16	B, T
Circium vulgare	bull thistle	5	B
Cytisus scoparius	scotch broom	1	B

Scientific Name	Common Name	Documented Occurrences in HUC6	ODA Designation*
Rubus discolor (syn. *R. armeniacus*)	Himalayan blackberry	65	B

***Oregon Department of Agriculture (ODA) Noxious Weed Control Program: provides a statewide leadership role for coordination and management of state listed noxious weeds.**

A=a weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent.
B= a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties.
T= a priority noxious weed designated by the Oregon State Weed Board as a target for which the ODA will develop and implement a statewide management plan. "T" designated noxious weeds are species selected from either the "A" or "B" list.

Of these database sites, 46 are located within 330 feet of proposed units or 100 feet of proposed haul routes and proposed road construction (Table 3-34). Surveys would have confirmed the presence or absence of these populations within proposed unit boundaries, along roadsides associated with traveling to proposed units, or in lands neighboring proposed units.

Table 3-34. Noxious weed sites located adjacent to or within proposed units, haul routes and proposed road construction.

Species	Common Name	ODA List*	Number of HUC6 Populations	Populations located within 100 feet of haul routes or 330 feet of units	Roadside or Unit-Adjacent Populations ≤ 1 m² OR ≤100 plants**
Centaurea solstitialis	yellow star-thistle	B, T	37	14	16.2%
Circium arvense	Canada thistle	B, T	37	3	33.3%
Circium vulgare	Bull thistle	B	5	5	100%
Rubus discolor (syn. *R. armeniacus*)	Himalayan blackberry	B	64	24	4.2%

***Oregon Department of Agriculture (ODA) Noxious Weed Control Program: provides a statewide leadership role for coordination and management of state listed noxious weeds.**

A= a weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent.
B= a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties.
T= a priority noxious weed designated by the Oregon State Weed Board as a target for which the ODA will develop and implement a statewide management plan. "T" designated noxious weeds are species selected from either the "A" or "B" list.

**Database populations are assigned a single criteria for size (i.e. area or density), but not both. Percentage (%) reflects database entries that are one or the other.

Oregon Department of Agriculture List A Noxious Weeds

Purple star-thistle (*Centaurea calcitrapa*) is an annual or biennial that blooms in midsummer and through the fall. This species is considered to be especially competitive along roadsides and in low-rainfall situations, as well as in wetter pastures where it can displace forage species. Biological agents are not employed for control of List A species, as they are managed for eradication or containment.

Oregon Department of Agriculture List B Noxious Weeds

Meadow knapweed (*Centaurea pratensis*, syn. *C. debeauxii* ssp. *thuilleri*) is native to Europe, and is well-distributed throughout the Pacific Northwest. It can be eradicated through repeated herbicide applications and can be controlled through a variety of biocontrol agents. Meadow knapweed favors roadsides, river banks, pastures, meadows and forest openings.

Yellow star-thistle (*Centaurea solstitialis*) is an annual or biennial with a deep taproot that is a native of Eurasia. Successful control methods include chemical, biological, cultural, and mechanical (including pulling and mowing).

Canada thistle (*Circium arvense*) is a colony-forming (primarily by asexual reproduction) perennial that is a native of Eurasia. Considered to be an aggressive weed, it thrives in areas with soil disturbance and is difficult to control. Successful control methods include biological, chemical, cultural, and some limited success with mechanical methods.

Bull thistle (*Cirsium vulgare*) is a taprooted biennial that is a native of Eurasia. This weed is under-documented within the GeoBob weed database, as active control methods are not usually employed based on the ephemeral nature of populations. Based on recent records and field reconnaissance, BLM botanists verified sites within the Analysis area. Bull thistle is eventually outcompeted by other vegetation for light, moisture, and nutrients.

Scotch broom (*Cytisus scoparius*) is a perennial with an abundant distribution west of the Cascades in a variety of habitats, moisture regimes and ground conditions. It readily invades disturbed sites, as well as natural areas. There are three approved biological control agents, and it can also be eradicated using manual and chemical methods.

Himalayan (Armenian) blackberry (*Rubus discolor*, syn. *R. armeniacus*) is a perennial that is considered by the Oregon Department of Agriculture to be the most widespread and economically disruptive of all the noxious weeds in Western Oregon. Long-term control methods are required for effective eradication. This species is under-reported due to the magnitude of occurrences and improbability of eradication in this area.

b. Introduced Species

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 species pose a threat to natural plant communities in portions of the Heppsie Analysis area. Recorded surveys indicate that there are 84 non-native species documented within the Analysis area (USDI 2000-2008).

2. Environmental Effects

a. Alternative 1

Without vegetation treatment, 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 weed and introduced species' establishment. Weed populations would be limited to existing weed sites and spread would be limited to adjacent areas. New weed establishments 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 Analysis area. Treatments are scheduled by priority and occur based on the potential of the 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 nonnative plant establishment.

b. Alternative 2

Vegetation treatment would increase the amount of disturbed ground and areas of less canopy cover. Both of these conditions favor noxious weed and introduced plant species establishment. Also, the use of harvest equipment presents the opportunity for introduction or spread of noxious weeds and other nonnative species.

Silvicultural Prescriptions and Follow-Up Fuels Treatments

Known noxious weed sites within units proposed for treatment would be treated prior to project implementation per project PDFs (see Chapter 2: Project Design Features—Botanical Resources). With proper implementation of PDFs, there would be no noxious weed spread as a direct result of project activity.

Roads and Landings

There are approximately 14 miles of roads proposed for use as haul routes under Alternative 2. There are 46 documented noxious weed populations (6 species) that occur within 100 feet of proposed haul routes or new road construction. If future surveys detect other noxious weed populations, populations will be treated according species priority, location and available funding.

In the Heppsie Analysis area, construction of 4 new permanent roads, and extension of one existing road is proposed, with a combined approximate length of 1.24 miles. All roads will be barricaded or closed in some fashion after project activities are completed. There is 1 known noxious weed population (Himalayan blackberry) within 100 feet of areas proposed for new road construction or improvements.

With proper implementation of PDFs (as described in Chapter 2), known noxious weed populations would not spread further, and could diminish in size as treatments are applied per PDF stipulations. New populations would not be introduced (as a result of road construction or improvements) with the implementation of PDFs designed to prevent new seed from entering the area (e.g. equipment cleaning, seeding of disturbed soils, etc.).

Cumulative Effects

Land ownership in the Heppsie Analysis area is both public (BLM) and private. The condition of the local landscape and its associated sub-watersheds relies heavily on privately-owned land and activities that affect its habitat condition.

Grazing

See Section I.3.b: Cumulative Effects: Grazing for cumulative effects of Grazing with regard to Noxious Weeds and Introduced Species within the Heppsie Analysis area.

Private Land-Use Operations

Future proposed timber harvest and other vegetation treatments on private lands are not known. It is assumed that most timber harvest projects and other vegetation treatments on private land will have adverse effects on native plant communities (including SSP) due to timber removal prescriptions, logging methods, and fewer resource protection measures. Federal laws protecting endangered and special status plans do not apply to private land without a federal nexus.

Recreational Operations

Off-Highway Vehicle (OHV) use is occurring within portions of the Analysis area, though is very limited in scope (0.3 miles of trail that occurs outside of existing road systems), season and intensity of use. Use is documented mostly in the Heppsie Mountain area, primarily occurring during hunting season and remaining primarily on existing road systems (rather than unauthorized trails).

Based on known patterns and locations of use, coupled with the proposed project's components, OHV use is not being analyzed further as a cumulative effect to noxious weed spread/introduction within the Analysis area.

Past and Proposed Actions

The Down Wind Blowdown Salvage sale completed harvest operations in 2011, removing downed trees across 170 acres as they occurred (removal was patchy and not continuous). There were no SSP sites associated with this project, and therefore, no cumulative effect to analyze with regard to the Heppsie Project.

The creation of new roads also increases the risk of spread of weeds into otherwise weed-free areas on the landscape. Roads and streams promote the introduction of nonnative species by acting as corridors or agents for seed dispersal, as well as providing for suitable habitat and reservoirs of propagules for future invasions. The increase of light availability, bare soil and road traffic is correlated to the increase of nonnative species diversity and population numbers (Parendes and Jones 2000; Gelbard and Belnap 2003).

Project Design Features as described in Chapter 2 are incorporated into the proposed action to minimize the risk of spread of noxious weeds and nonnative plant species. Noxious weeds would not be spread as a direct result of executing the proposed actions with the implementation of the Project Design Features. However, weed seed can be transported into the Analysis area by human actions not associated with the project and by wind, water, and animals.

Weed Risk Assessment Field Review and Field Reconnaissance Results

Surveys for all species on the Medford Weed list were conducted through 2011 in most areas proposed for ground-disturbing activities. Those areas not surveyed prior to 2011 will be surveyed in 2012 for all weed species on the Medford Weed List. Surveys were not (or will not be) conducted on private land but general occurrences were noted as casual observations. Noxious weeds are found throughout the Analysis area on BLM and adjacent private lands, with populations varying in size and density. Noxious weed populations in the Analysis area and on BLM are mostly associated with roads. The Weed Risk Assessment was conducted using the survey results, as well as previous surveys on file.

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 record check and surveys of areas that may be affected by the proposed project resulted in 1 site of purple starthistle, which is located outside of proposed project activity. (However, due to the nature of this species and that it is the only site on the Medford District, it will continue to be included in this analysis.)

Class "B" Weeds

Those noxious weeds that are non-native (exotic) plant species that are 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.

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. Class C Weed species commonly found on the Medford District BLM primarily include nonnative annual grasses and nonnative buttercup species, and are not typically managed for due to widespread occurrences and unmanageable populations sizes.

Twenty-five (25) nonnative species are located within the Heppsie Analysis area that meet the following criteria: they are exotic, have a high frequency from recent survey lists (Class C species with frequency >50%), and have the potential to cause ecological damage.

If weed work is funded, the weed risk rating under Alternative 2 would be Low to Moderate.

With suitable weed habitat increasing initially as a consequence of the Proposed Action, total exclusion of new weed establishments is unattainable due to indirect effects. Particularly vulnerable areas would be new road construction (1.24 miles permanent), landings (less than ¼ acre each), road maintenance sites as listed in Chapter 2 (Tables 2-2 and 2-3), yarding corridors, and openings created for disease management cuts. With adequate funding for vegetation inventory and weed treatment, existing noxious weed population sizes are expected to decrease and new establishments are expected to be minimized.

c. Alternative 3

The Weed Risk Assessment yields the same weed risk analysis and rating for Alternative 3 as for Alternative 2 (Low to Moderate), based on the current conditions on the landscape and the location of existing weed populations. The implementation of PDFs to prevent weed introduction and spread remain in place (see Chapter 2), as do the indirect effects (i.e. spread and introduction as a result of non-project activity). While the amount of ground disturbance is reduced under Alternative 3, the locations of known weed sites are outside of those areas that would have been affected by new road construction or associated units.

K. RECREATION

1. Affected Environment

Recreation use across the Medford District BLM is described in the Medford District Proposed Resource Management Plan/Environmental Impact Statement. BLM lands fall into two recreation management categories, special recreation management areas and extensive recreation management areas. Extensive recreation use areas are all BLM-administered lands not included in Special Recreation Management Areas identified in the RMP (RMP/EIS, p. 3-71) that provide for dispersed recreation opportunities across the Medford District BLM. Special Recreation Management Areas are those areas identified with high concentrations of recreation use and developed facilities.

Dispersed Recreation

An estimated 799,243 acres provide for dispersed recreation use across the Medford District (RMP/EIS, p. 3-84). The Heppsie Project Area is described by the RMP as an extensive recreation use area, which provides for dispersed recreational activities. Extensive recreation use areas are characterized as low-use recreational areas where no developed or designated recreational sites or activities exist. Dispersed recreation in the project area includes hiking, horseback riding, sightseeing, OHV activities, driving for pleasure, hunting, target practice, dispersed camping, and vegetative gathering.

2. Environmental Consequences

a. Alternative 1

In the No-Action Alternative, recreation opportunities would remain unchanged. Dispersed recreational activities such as hiking, horseback riding, sightseeing, OHV activities, driving for pleasure, hunting, target practice, dispersed camping, and vegetative gathering would continue.

b. Alternatives 2 and 3

Dispersed types of recreation within the Heppsie project area would receive adverse short-term intermittent impacts as a result of the Heppsie Proposed Action. Recreational users of the area would encounter log trucks, equipment, noise from machinery, and limited traffic congestion. However, some of the safety risks associated with project activities would be mitigated through increased signage on major travel routes. The types of prescriptions called for in each unit of the Heppsie 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 skid roads and trails along with opening up of the forest could provide an opportunity for increased OHV use in the area. However, due to the existence of open meadows, a relatively open understory, and the current lack of substantial OHV use within the project area, it is unlikely this increase would occur.

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 were scenery quality ratings, public sensitivity ratings and distance zone-seen area mapping criteria.

Approximately 60 percent of the viewsheds in the Medford District RMP planning area have fragmented land ownership patterns with private lands dominating the viewed landscape (RMP/EIS p. 3-70). All the project units in the Heppsie Project Area are classified as VRM Class III.

Class III Objective: The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

2. Environmental Consequences

a. Alternative 1—No Action Alternative

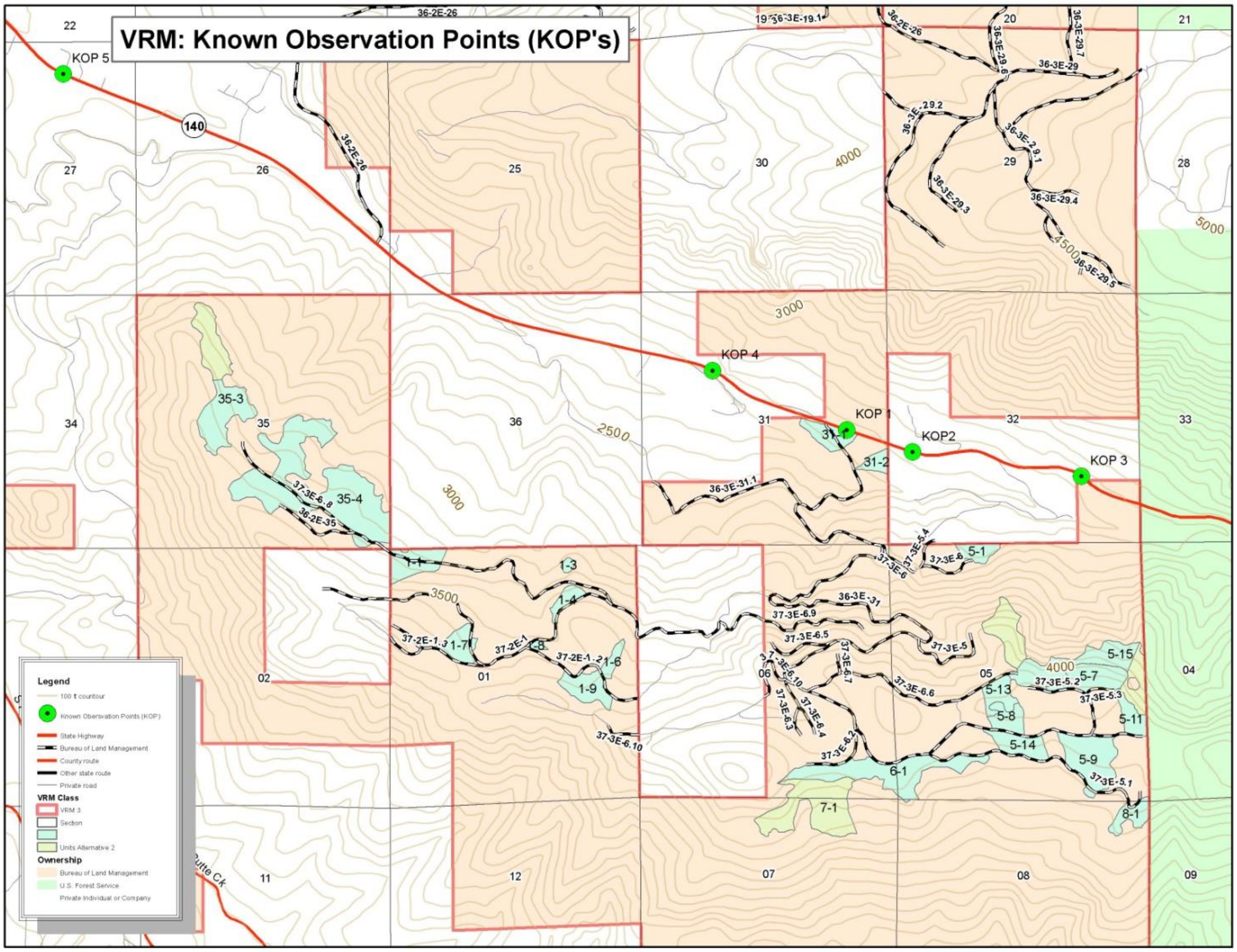
Visually, the units would remain the same. There would be no changes to the existing landscape.

b. Alternatives 2 and 3

Resource development patterns that disrupt the land surface (road construction) and vegetative patterns (vegetation thinning) can have adverse effects on visual resources (RMP/EIS p. 4-86). Units of the Heppsie project are classified as VRM Class III, or IV (USDI 1995, Map 10; Heppsie Forest Management Project EA, Chapter 3, Visual Resource Management). All the units in the Heppsie Project are classified as VRM Class III. The management objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate and not dominate the view of the casual observer.

In accordance with the RMP, a visual resource contrast rating system analysis was completed for the Heppsie Project. Three Known Observation Points (KOPs) on Oregon State Highway 140 in VRM Class III management areas were used to complete the visual resource contrast rating system analysis (Map 3-7). Views of the landscape from this major travel route adjacent to the project area were used to determine if any changes in landscape character from the point of a casual observer traveling this road would occur. Highway 140 was used as the primary route due to the location of the units and their proximity to the highway.

Map 3-7. Known Observation Points (KOPs) in the Heppsie Forest Management Project.



From this major road, most project units will not be visible due to the topography of the landscape and the units' location on the hillside slope. 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, and the nature of the proposed project, the units will not be the primary focus of the observer.

The two units directly adjacent to the highway are units 31-1 and 31-2. The thinning prescription for unit 31-1 will be that of a pine site. The goal on these sites is the retention of existing large ponderosa pine and the subsequent development of young pine. The thinning prescription for unit 31-1 will be that of a Douglas-fir site. The larger healthier trees would be favored as leave trees creating a more open understory. To observers who turn from Highway 140 on to Heppsie Mt. Road, the thinning project would be more obvious due to the lower speeds of travel on this gravel road. The character of the landscape would not effected VRM Class III management areas allow for moderate changes in landscape character. Project units 1-1, 1-3, 1-4, 1-7, 1-8 have been selected for an insect and disease management prescription. The silvicultural strategy here includes the use of a single tree selection method whereby, insect damaged and diseased white fir and Douglas-fir trees would be removed and non-diseased pine and cedar trees would be retained on drought prone sites. These stands consist of numerous standing dead and dying trees. From the casual observer, the removal of the trees from these sparse stands would go relatively unnoticed and would be consistent with VRM III management objectives.

The five KOPs (Map 3-7) used for analysis are near project units 31-1, unit 31-2; however, a major portion of the project viewshed is visible from each of the KOPs. The five KOPs were chosen because these locations receive high traffic counts and would provide the best representation of the most frequently viewed portions of the project area.

KOP 1

From KOP 1, on Highway 140 looking at unit 31-1 and 31-2, the thinning project 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 fire scared and contain numerous dead and down trees with little to no vegetation. An observer living in the area or more familiar than the casual observer with the landscape may notice the slight changes in character of the landscape as a result of the Heppsie project; however the project will meet visual resource management objects in the proposed alternative.

KOP 2

From KOP 2, on Highway 140, project unit 15-5 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 project. The level of change to the landscape would be low and would not attract the attention of the casual observer from the road. The added visual buffer provided by the 80 ft. tall trees along the highway further obscures the unit from the observer.

KOP 3

From KOP 3, on Highway 140, no project units appear to be visible from this location. No effect to the landscape character elements of form, line, color, and texture would be noticed by the casual observer. An observer living in the area or more familiar than the casual observer with the landscape may notice the slight changes in character of the landscape as a result of the project; however the project will meet visual resource management objects in the proposed alternatives.

KOP 4

From KOP 4 on Highway 140, looking towards units 36-3 and 36-4, the thinning project 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. While the units are visible for 20-30 seconds at highway speeds, the units are in the background of the view from this KOP. The hillside vegetation is made up numerous meadows and clumps of trees. The results of the thinning of these stands at such a distance and elevation from the casual observer's point of view would go unnoticed. 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 project will meet visual resource management objects for VRM Class III objectives.

KOP 5

KOP 5 is on Highway 140 looking towards the western most tip of the project area. Unit 35-3 varies in size depending on alternative. In alternative 2, Unit 35-3 is approximately 38 acres. The northwestern most tip of the unit traverses down the hillside toward the highway. In Alternative 3, Unit 35-3 decreases by approximately 16 acres, to approximately 22 acres. The largest portion of the unit (which is visible from KOP 5) is removed and reduces the visible area of unit 35-3. While the unit is visible for 10-20 seconds at highway speeds, the unit is in the background of the view from this KOP. The hillside vegetation is made up of numerous meadows and clumps of deciduous and coniferous trees. The prescriptive treatment in this unit would leave the best, healthiest and largest pine trees and remove the majority of Douglas-fir trees to create a pine-dominated stand. This activity would produce 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. The results of the thinning of this stand at such a distance and elevation from the casual observer's point of view would go unnoticed. An observer living in the area or someone more familiar than the casual observer with the landscape may notice the slight changes in character of the landscape as a result of the project; however, the project will meet VRM with implementation of either Alternative 2 or 3.

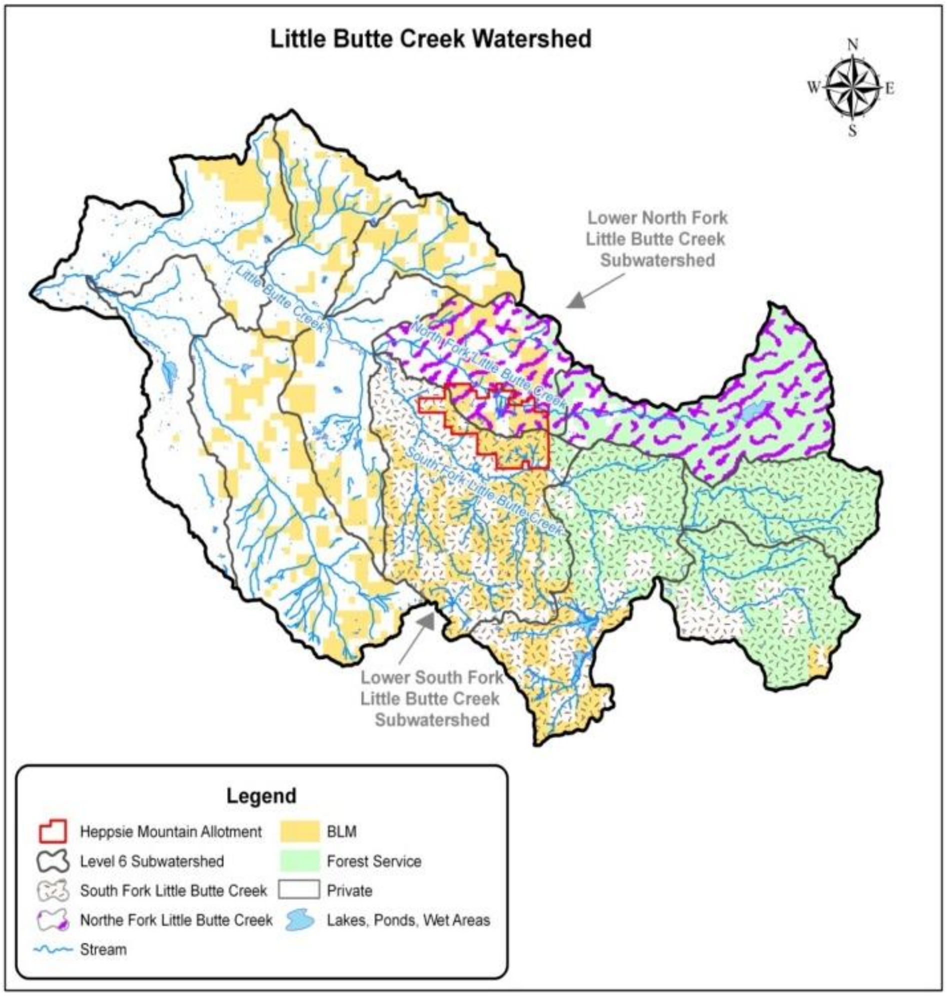
It was determined the Heppsie project will meet VRM objectives under proposed Alternatives 2 and 3. The project treatments consist of various forms of thinning, and the level of change to the landscape character will be low. The casual observer would likely not notice the changes in landscape character as a result of the thinning projects.

M. RANGELAND RESOURCES/GRAZING

1. Affected Environment

The Heppsie Mountain Grazing Allotment includes 4,085 acres of federal land administered by the Bureau of Land Management (BLM) and 1,632 of interspersed privately-owned land. The lands within the allotment drain into the South and North Forks of Little Butte Creek. The Heppsie Mountain Allotment is located in the Lower South Fork Little Butte Creek and Lower North Fork Little Butte Creek Level 6 Subwatersheds, two of the six subwatersheds that comprise the North and South Forks Little Butte Creek within the larger Little Butte Creek Level 5 Watershed (Map 3-8).

Map 3-8. Heppsie Mountain Allotment and Analysis area



Federal agencies manage 41% (35 % BLM, 6%Forest Service) of the analysis areas associated with the Heppsie Mountain Allotment. Private lands encompass 59% of the analysis areas and include land owned by industrial forest companies, residential landowners, and cattle ranches.

The renewed lease, with modified terms and conditions that reflected the findings in the Rangeland Health Assessment for the Heppsie Allotment, was approved August 9, 2010, and is active for a period of 10 years, expiring February 28, 2021. The lease allows 35 cattle to graze from May 1st through October 15th for a total of 294 AUMs of forage use. The lessee has requested and been approved to take nonuse on his 2012 annual grazing authorization and has agreed to accept nonuse for the 2013 grazing season. The lessee has accepted this option to eliminate potential changes to livestock use patterns within and adjacent to harvest units, haul routes, riparian and seeded concern areas.

2. Environmental Consequences

a. All Action Alternatives

The Heppsie Forest Management Project harvest units are located within and throughout the Heppsie Mountain Grazing Allotment. Harvest and hauling activities as defined in Alternative 2 and 3 could influence known patterns of grazing use and distribution. Where timber harvest and hauling occurs, ongoing monitoring in areas of concern will continue when allotment use resumes (following nonuse in 2012 and 2013). Monitoring will primarily focus on areas in T. 37 S., R. 02 E., Section 1, and T. 37 S., R. 03 E., Sections 5 and 6 and will aim to detect any effect associated grazing activities.

In Alternative 2 there are proposals for 5 areas of short, new road construction and one area of road improvement. Alternative 3 eliminates new road construction but retains the same road improvement planned in Alternative 2. It is anticipated that most road construction and improvements proposed under Alternative 2 will not influence livestock distribution or use patterns; however, the proposed construction of road 36-2E-35.01 is likely to improve access for livestock within the general area. This could result in increased use of uplands and wetlands by livestock in the NW ¼ of Section 35, dependent on factors including slope, timing of livestock turnout and local water availability. With the elimination of new road construction under Alternative 3, there would be no anticipated change to livestock usage patterns or grazing intensity related to road construction or renovation.

While the Ashland ID Team has identified areas of concern with regard to riparian functional condition, no Heppsie Forest Management Project activity will occur with riparian reserves. Ongoing monitoring established in areas of concern will identify any increases to grazing effects resulting from the implementation of Heppsie project activity. The Heppsie Forest Management Project will have no effect on grazing activity through calendar year 2013 due to the nonuse of the allotment during that time.

Effects following timber harvest and hauling activities are expected to remain as currently authorized; however, usable forage will increase in areas where the forest canopy has been reduced and forage availability may draw and spread livestock into harvested units that were previously unused. This will disperse grazing intensity over a broader area of the allotment, which should result in reduced pressure on meadow and riparian resources as cattle move into areas previously unused.

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 action or alternatives are likely to significantly impact the human environment with respect to greenhouse gas levels (i.e., atmospheric carbon levels). Changes in greenhouse gas levels affect global climate (Forster et al. 2007, pp. 129-234) which is incorporated here by reference, reviewed scientific information on greenhouse gas emissions and climate change and concluded that human-caused increases in greenhouse gas emissions are extremely likely to have exerted a substantial warming effect on global climate. Because forests store carbon, they affect the atmospheric concentrations of carbon dioxide, a greenhouse gas. Forest management can change the amount of carbon stored in a forest.

Scientific knowledge on the interrelationship between greenhouse gas levels and climate change is rapidly changing, and substantial uncertainties and several key limitations remain. One limitation is the inability of current science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. This limitation was identified by the U.S. Geological Survey in a May 14, 2008 memorandum to the U.S. Fish and Wildlife Service, which summarized the latest science on greenhouse gases. That memorandum is incorporated here by reference.

Treatments of the project action alternatives were compared to treatments in another recent project and found to be similar. Carbon storage and carbon emissions of the project action alternatives are 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 was 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 were calculated using site specific data and the ORGANON Growth Model (Hann

2003). Stand volume in cubic feet per acre per year was used to calculate tonnes of carbon stored per year. Carbon emissions (carbon dioxide) were calculated from timber harvest activities (including fuel consumption) and post-harvest fuel treatments. Net carbon storage was calculated by subtracting carbon emitted from carbon stored.

The 2008 FEIS described current information on predicted changes in regional climate (pp. 488-490), and is incorporated here by reference. That description concluded that the regional climate has become warmer and wetter with reduced snowpack, and continued change is likely. That description also concluded that changes in resource impacts as a result of climate change would be highly sensitive to specific changes in the amount and timing of precipitation, but specific changes in the amount and timing of precipitation are too uncertain to predict at this time. Because of this uncertainty about changes in precipitation, it is not possible to predict changes in vegetation types and condition, wildfire frequency and intensity, stream flow, and wildlife habitat. The analysis in this EA therefore does not attempt to predict changes in the project area due to existing or potential future changes in regional climate.

2. Affected Environment

In the Heppsie Project Area, Douglas-fir and ponderosa pine stands that are 80 to 160 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 and 3

Live Tree Carbon Storage
Similar to treatments in the Rio Climax Project, Heppsie Timber Project treatments would reduce carbon stores temporarily but would result in net increases over time. In the Rio Climax Project, Selective Thinning/DSP units would be similar to the Density Management units in the Heppsie Project. Continued forest growth following management is predicted to increase carbon storage approximately 262 cubic feet per acre per decade (Hann 2003) which is equal to about 3.2 tonnes of stored carbon per acre per decade or 0.32 tonnes per year. Within 17 years after thinning the carbon emission level (5.2 tonnes/acre) for the 20 year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pre-treatment levels after about 100 years of tree growth (Rio Climax EA pp. 3-115).

The Selective Thinning units would be similar to the Selective Thinning/NRF units in the Rio Climax Project. Continued forest growth following would increase carbon storage approximately 725 cubic feet per acre per decade (Hann 2003) which is equal to about 8.9 tonnes of stored carbon per acre per decade or 0.9 tonnes per year. Within 4 years after harvest the carbon emission level (2.9 tonnes/acre) for the 20 year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pre-treatment levels after about 25 years of tree growth.

The Insect and Disease Management units would be similar to the Density Management/NH units in the Rio Climax Project. Continued forest growth following would increase carbon storage approximately 300 cubic feet per acre per decade (Hann 2003) which is equal to about 3.7 tonnes of stored carbon per acre per decade or 0.37 tonnes per year. Within 10 years after harvest the carbon emission level (3.7 tonnes/acre) for the 20 year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pre-treatment levels after about 75 years of tree growth.

Carbon Dioxide Emission

Density Management treatments would result in the emission of about 5.2 tonnes of carbon per acre or about 17 tonnes of carbon dioxide per acre during the 20 year analysis period. Thinning 235 acres would result in the emission of 3,995 tonnes of carbon dioxide. The carbon dioxide emission represents 0.00000067 percent of current U.S. emissions.

Selective Thinning treatments would result in the emission of about 2.9 tonnes of carbon per acre or about 10 tonnes of carbon dioxide per acre during the 20 year analysis period. Thinning 51 acres would result in the emission of 148 tonnes of carbon dioxide. The carbon dioxide emission represents 0.000000024 percent of current U.S. emissions.

Insect and Disease Management treatments would result in the emission of about 3.7 tonnes of carbon per acre or about 13 tonnes of carbon dioxide per acre during the 20 year analysis period. Harvesting 111 acres would result in the emission of 411 tonnes of carbon dioxide. The carbon dioxide emission represents 0.000000068 percent 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 (DOE, 2009).

O. OTHER EFFECTS

1. Cultural Resources

In accordance with the Protocol for Managing Cultural Resources on Lands Administered by the Bureau of Land Management (BLM) in Oregon, and the National Historic Preservation Act of 1966 (specifically section 106), as amended, a literature review and archaeological reconnaissance was conducted for the Heppsie project area.

The Heppsie project area was reviewed for the potential for adverse impacts to cultural resources. The area was surveyed previously in conjunction with the Heppsie timber sale project in 1998 (AH98-50). During these previous surveys, 6 prehistoric sites, 2 historic sites, and 6 isolated finds were recorded within the boundary of this current project. Of these 14 sites and isolates, only one is located within a unit being proposed for treatment (35JA682/OR110-1427). This site was formally evaluated for inclusion to the National Register of Historic Places and was found to be NOT eligible to the Register. Concurrence from the State Historic Preservation Office was received on April 18, 2011. Proposed management direction includes protecting and managing the integrity of any historic/prehistoric sites identified in the cultural survey, and not formally evaluated to the National Register of Historic Places.

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 and fuel hazard reduction methods. No cultural sites have been identified within the units proposed for treatment. No effects on cultural resources are anticipated; therefore, there is no potential for cumulative effects.

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 lb. 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%) remain 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 nonattainment 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 collocated 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…
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. 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 January 11, 2012. 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. A copy of this Environmental Assessment was sent to those individuals and organizations who responded to the scoping notice. The following organizations were among those who received a paper copy of the Heppsie Forest Management Project Environmental Assessment.

Organizations and Agencies
American Forest Resource Council
Cascadia Wildlands Project
Indian Hill LLC
Klamath Siskiyou Wildlands Center
Little Butte Watershed Council
Oregon Wild
Plum Creek Timber Company, Inc.
Rogue Riverkeeper

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