ENVIRONMENTAL ASSESSMENT

for

GALLS FOOT FOREST MANAGEMENT PROJECT

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MEDFORD DISTRICT
ASHLAND RESOURCE AREA

EA No. OR-116-07-02

This Environmental Assessment (EA) for the proposed Galls Foot Forest Management Project was prepared utilizing a systematic interdisciplinary approach integrating the natural and social sciences and the environmental design arts with planning and decision-making.

Public notice of the availability of this EA was provided through advertisement in Medford's *Mail Tribune* and the Bureau of Land Management's Medford District Website.

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

EA COVER SHEET

RESOURCE AREA: Ashland

ACTION/TITLE: Galls Foot Forest Management Project

EA NUMBER: OR-110-07-02

LOCATION: Jackson County Oregon

List of Preparers	Title	Responsibility
Brad Tong	Botanist	Botany & Special Status Plants
Ted Hass	Soils Scientist	Soils
George Arnold	Wildlife Biologist	T&E Animals, Wildlife
Greg Chandler	Fuels Specialist	Fire and Fuels
Chris Volpe	Fisheries Biologist	Fisheries, Riparian, T&E Aquatic
John Samuelson	Forest Manager/Engineer	Forest Management, Engineering and Roads
Frank Hoeper	Forester	Harvest/Logging Systems
Sean Gordon	Silviculturist	Silvicultural Prescriptions Conifer Stands
David Squyres	Hydrologist	Water Resources
Dennis Byrd	Recreation Specialist	Recreation
Dave Knutson	Cultural Resource Specialist	Cultural Resources
Edward Reilly	Environmental Coordinator	NEPA Compliance & Writer/Editor
John Gerritsma	Ashland Resource Area Field Manager	Responsible Official

Table of Contents

Chapter I: Purpose of and Need for Action
Introduction....I-3
Background....I-3
Vicinity Map....I-5
Need for the Galls Foot Project....I-5
Relationship to Statutes, Regulations, and other Plans....I-9
Decisions to be Made....I-13
Scoping and Relevant Issues....I-14

Chapter II: Alternatives including the Proposed Action
Introduction....II-1
Alternative A (No Action)....II-1
Alternative B (Proposed Action)....II-1
Components of the Proposed Action....II-9
Project Design Features....II-14
Alternatives Considered But Not Analyzed in Detail....II-23

Chapter III: Affected Environment & Environmental Consequences....
Introduction and Effects Assumptions....III-1
Vegetation/Silviculture....III-3
Fire and Fuels Management....III-7
Air Quality....III-20
Soils....III-25
Water Resources....III-35
Fish Habitat....III-68
Wildlife....III-90
Botany....III-104
Recreation, OHV, Visual Resources, Cultural Resources, Noise And Traffic....III-116
Critical Elements....III-123
References....III-124

Appendix A: Water Resources....
Appendix B: Past Harvest....
Appendix C: Silvicultural Prescription....
Appendix D: Aquatic Conservation Strategy....

CHAPTER I: PURPOSE AND NEED FOR THE PROPOSED ACTION

A. INTRODUCTION

The Bureau of Land Management (BLM), Ashland Resource Area, proposes to implement the Galls Foot Forest Management Project designed to implement the Bureau of Land Management's Medford District Record of Decision and Resource Management Plan (RMP) (USDI 1995). The overall effects of implementing the Medford District Resource Management Plan were analyzed and disclosed in the Medford District Proposed Resource Management Plan/Environmental Impact Statement (RMP/EIS) (USDI 1994).

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 Galls Foot Forest Management proposal. This document 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 manual guidance on the National Environmental Policy Act of 1969 (516 DM 1-7

B. WHAT IS BLM PROPOSING?

This section provides a summary of BLM's proposal for forest management. The 4,613 acre Galls Foot Forest Management Project would thin and harvest trees in conifer forest stands on BLM-administered lands in portions of the Rogue River - Gold Hill Watershed. A more detailed description of BLM's proposed action is included in Chapter 2, Alternatives.

The proposed forest management would be accomplished through a combination of commercial timber sale contract(s) and service contracts. An estimated 1,743 acres of conifer forest thinning would be accomplished through one or more commercial timber sales. Fuels created from commercial thinning (tree tops and limbs) would be cut, hand-piled and burned. Some material could be removed and used as biomass. An estimated 2,870 acres are proposed for pre-commercial thinning; an estimated 1,055 acres of pre-commercial thinning are within the commercial treatment units described above and 1,815 acres are proposed for pre-commercial thinning only. Slash created from pre-commercial thinning will also be hand-piled and burned to reduce fuel hazard.

To provide vehicle access to timber management units, the BLM proposes to construct an estimated 4.84 miles of new road; 4.6 miles of permanent road and 0.24 miles of temporary road. Temporary road would be removed after harvest, and fuel reduction activities are completed. BLM also proposes to decommission an estimated 6.1 miles of roads; and renovate 6.1 miles of roads (i.e., road grading, rock surfacing, and water drainage improvements).

Two alternatives were considered and analyzed in detail, a No-Action Alternative (Alternative 1) and the Proposed Action (Alternative 2). A detailed description of the Proposed Action is contained in Chapter II, Alternatives.

C. WHERE IS THE PROJECT LOCATED?

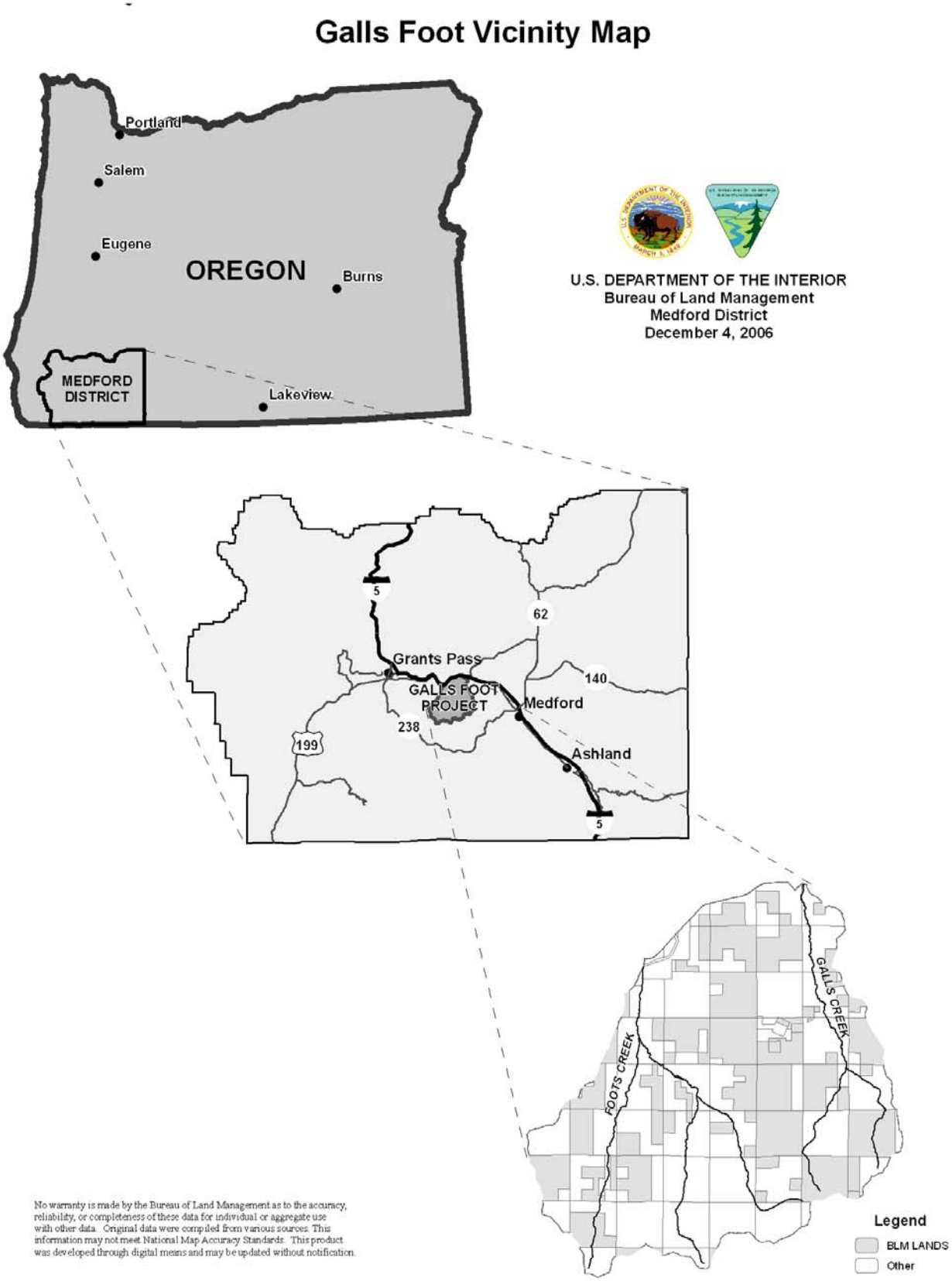
The Galls Foot Forest Management Project is located in the Rogue River-Gold Hill Watershed, the legal description is: T.36 S., R.3 W., in sections 19-21, 28-31 and 33; T.36 S., R.4 W., in sections 24, 25, 35; T.37 S., R.3 W., 3-10, 15, 17, 18; T.37 S., R.4 W., 1-3, 10-15, 22 and 23; Jackson County Oregon. (See Map 1-1).

The Galls Foot planning area encompasses approximately 28,269 total acres. BLM administers approximately 11,113 of these acres. The remainder, approximately 17,121 acres are held by the State of Oregon and a variety of private landowners including timber companies and rural residential landowners.

Jackson County land use planning data within the project planning area shows 88% of the land is zoned forest and woodland resource, 8% exclusive farm use, 3% rural residential, and 1% aggregate mining.

The **project area** is defined as the area where action is proposed. The **planning area** represents the consideration area for assessing current and desired forest, vegetation, and transportation system conditions related to the goals and objectives outlined in BLM's Medford District RMP.

Map 1-1


Galls Foot Vicinity Map
Portland
Salem
Eugene
OREGON
Burns
MEDFORD DISTRICT
Lakeview
U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
Medford District
December 4, 2006
5
62
Grants Pass
140
GALLS FOOT PROJECT
Medford
238
199
Ashland
5
GALLS CREEK
FOOTS CREEK
Legend
BLM LANDS
Other
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

D. WHY IS BLM PROPOSING THE GALLS FOOT PROJECT? – THE NEED FOR ACTION

The Galls Foot Forest Management Project is designed to implement the Bureau of Land Management's 1995 Medford District Record of Decision and Resource Management Plan (RMP) in the Galls Foot Project planning area. Management Actions/Directions set forth in the RMP provide direction for resource management on BLM-administered lands according to various land use allocations. This project proposal is designed to move the current conditions found on the Galls Foot planning area toward the desired forest stand conditions and management objectives identified for lands assigned to the matrix and riparian reserve land allocations. Specifically, this forest management proposal is designed to:

- Maintain and promote vigorously growing conifer forests, and provide timber resources in accord with sustained yield principles,
- Manage and reduce hazardous fuels,
- Provide a transportation system within the project area that serves the management of resource program areas, while reducing delivery of sediments and flow from the roads into nearby streams.

1. There is a need to maintain and promote vigorously growing conifer forests and provide timber resources, in accord with sustained yield principles, on BLM-Administered Matrix lands within the Galls Foot planning area.

One of the applicable laws governing a major portion of BLM-administered lands in the Galls Foot 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. The Medford District's RMP is governed by the statutory mandate for O&C lands and declared an "annual sustained yield capacity" on the Matrix land allocated for timber production, which the O&C Act requires to be offered annually so long as it "can be sold at reasonable prices on a normal market." Since the Galls Foot project area is located on Matrix land in Southern General Forest Management Area (GFMA), timber products produced from this area would be sold in support of the District's Allowable Sale Quantity declared in the RMP.

Matrix land, also described in the RMP as General Forest Management Area, within the Galls Foot planning area is to be managed for commodity production to assure a moderately high level of sustained timber productivity (RMP, Appendix E, p. 192). The Medford District RMP adopted a set of silvicultural treatments for managing conifer forests on Matrix lands including regeneration harvest, commercial thinning (density management), and selection harvest (RMP Appendix E, Silvicultural Systems Utilized in the Design of the Resource Management Plan).

In order to harvest timber under the principles of sustained yield forestry, timber harvest volume to be produced from the timber base needs to primarily come from forest stands that exceed the minimum harvest age used in the RMP for calculating the declared "annual sustained yield capacity." For Southern GFMA lands, regeneration harvest should therefore be scheduled for stands 120 years or older. The BLM's RMP prescribes this to be the age at which forest stands should be converted to vigorously growing young stands in order to meet the statutory requirements of offering the declared annual sustained yield of timber. Forest stands generally between 80 and 120 years old should be scheduled for commercial thinning and selective harvest (RMP p. 194). Forest stands proposed for either regeneration harvest or commercial timber harvest within the planning area meet these minimum harvest age requirements. Forest stand thinning and regeneration harvesting is what directs future stand growth and new forest development to meet the objectives described for Matrix lands under the Medford District BLM Resource Management Plan.

Existing Conditions

An estimated 1,316 acres of forest stands selected for treatment in the project area are overstocked. As trees compete for limited water, nutrients, and growing space they become stressed and more susceptible to mortality from insects, forest pathogens, and drought. Organon (1992), a forest growth model, was

used to analyze data from representative stands throughout the project area. The following forest stand density indicators were used to assess individual stands measured.

- Relative density index is one measurement used to quantify the densities of forest stands. Relative density index represents the ratio of actual stand density to the maximum stand density attainable in a stand. Imminent mortality and stem exclusion (forest stands begin to self-thin) is reached when the relative density index is 0.55 or greater. The average Relative Density Index for the Galls Foot planning area range from 0.38 to 1.14, with an average of 0.64 (Silvicultural Prescription, Appendix C p. 15).
- Basal area per acre is another measurement used to describe forest stand densities. Basal area is the cross sectional area of all stems (measured at breast height) per unit of measure. The basal area per acre for the Galls Foot planning area ranges from 94 to 292 $ft^{2.}$

Another 427 acres are selected for regeneration harvest, these stands

- meet the minimum age requirements for regeneration harvest of at least 120 years old;
- are deteriorating (increased mortality rates, decreased growth and vigor) as a result of age, high stocking levels, bark beetles and disease;
- have understory trees that would respond to release through regeneration harvest of overstory trees.

Desired Conditions

When exposed to drought, wildfire, insect attack, and human-induced changes, these forest stands would remain productive and resilient over time. In order to meet sustained yield forestry objectives in the Galls Foot project area:

- The relative density index of stands within the project area should range between 0.35 and 0.55, depending on site conditions, to maintain tree vigor and growth; Appendix C, Silvicultural Prescriptions p. 16).

To meet desired densities:

- Dry Douglas fir and ponderosa pine sites within the project area should be maintained at 60 to 120 ft^2 BA/AC[1] (Appendix B Silvicultural Prescriptions, p. 20; USDA/USDI 1994 p.68 - Ecosystem Health Assess.).
- Moist Douglas fir sites should be maintained at less than 140 ft^2 BA/AC (Appendix B Silvicultural Prescriptions);

- On harsh sites the species composition of stands should contain at least 25 percent ponderosa pine, which is a drought resistant species. (Appendix B Silvicultural Prescriptions);

- Higher elevation mixed-conifer stands should not have more than 10 percent white fir species as these sites are best suited for Douglas fir and pine species.

Forest thinning prescriptions, designed under the principles of sustained yield forestry, respond to both forest and site conditions to meet the desired long term goals for each forest stand type. A summary of silvicultural prescriptions by forest stand type (i.e. moist Douglas fir, dry Douglas fir, pine) and treatment objective (thinning, regeneration, and disease control) for the action alternatives is included in Chapter 2, Section B, 2.

2. There is a need to treat hazardous fuels to reduce the risk of high intensity, stand replacing wildfires to protect and support land use allocations (RMP p. 91) and to reduce fuel hazards in

[1] Basal area is another measurement that is used to quantify the densities of forest stands.

rural interface areas (RMP p. 89).

Existing Conditions

As a result of the forest continuing to grow over time and the policy to suppress all natural wildfire events, a build-up of fuels and a change to more fire-prone vegetative conditions has occurred. In most of the planning area, surface fuels and ladder fuels have increased, which has increased the threat of fire spreading to the canopies of trees. An estimated 55 percent of the Galls Foot planning area is characterized with a moderate fire hazard and 34 percent as high fire hazard. 11 percent of the area is considered low hazard. These hazard ratings developed for the project area characterize an existing fuel profile which represents a moderate to high resistance to control of fire under average climatic conditions, (see Chapter III, Affected Environment, Fire and Fuels). Within the planning area, both BLM-managed resources and rural residential areas are threatened by the presence of stands with a potential for high-intensity stand replacing wildfires.

Desired Conditions

The following discussion describes the desired conditions with a reduced threat of high intensity, stand replacing wildfires.

A low fire hazard rating usually results in lower fire line intensity in the event of a wildfire, allowing for a more direct approach to fire suppression.

Agee (1996) also describes vegetation conditions that lead to manageable fire behavior:

- Surface fuel conditions that would limit the surface fireline intensity (flame lengths);
- Forested conditions comprised of fire tolerant trees and vegetation, described in terms of species, sizes and structures (arrangement and condition); and
- A low probability for crown fires (fire burning through the canopies of trees) to be initiated or spread through the forest.

The Galls Foot Project is designed in part to retain and promote more fire tolerant tree species such as pine and incense cedar and to alter forest conditions to reduce surface, ladder, and aerial fuels such that the potential fire behavior and the initiation of crown fire is reduced. In addition, other work is both planned and underway to decrease fuel hazard in the drainage and will complement the activities proposed with this action.

3. Design and implement a transportation system within the Galls Foot project area that provides access for the management of resource program areas (RMP p. 86) including timber resources and rural interface areas, while reducing their effects on water, soils, fish and wildlife.

Existing Conditions

The existing transportation system for the Galls Foot Project Area is insufficient to provide access to BLM-administered lands in need of forest management (see Need #1) making the management of those lands difficult and more expensive. Some roads are located in areas no longer serving resource program needs, some of these roads are located within Riparian Reserves, paralleling streams and contributing to sedimentation and riparian habitat fragmentation.

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

Desired Conditions

Road construction, decommissioning and renovation should be designed for the Galls Foot Project to improve road access to areas in need of forest management, reduce road densities in areas where the road system no longer serves resource program needs, and to maintain roads to reduce road related erosion and sedimentation to stream courses.

E. PURPOSES

This section describes other important objectives, or purposes, to be accomplished while implementing the Galls Foot Project. The extent to which each alternative achieves the identified purposes will be considered when evaluating and selecting a course of action among the alternatives; therefore, these purposes are also described as decision factors.

Purpose #1. Design a project that is economically practical. (RMP Appendix E, p. 180).

The RMP directs that all silvicultural systems (forest thinning strategies) applied to achieve forest stand objectives would be economically practical (ROD/RMP p. 180; PRMP/EIS p. 2-62). The economic feasibility of forest management actions is affected by the ease or difficulty of access from the forest road system. Portions of the project area are inaccessible from existing forest roads, which increases the cost associated with forest treatments. The Galls Foot project should be designed to improve the economic efficiency of implementing silvicultural systems to achieve forest health and timber management objectives.

Purpose #2. Contribution towards the Districts Allowable Sale Quantity

The Galls Foot Project Area is located on BLM-administered lands allocated to produce a sustainable supply of timber. There is a need to sell timber products produced from forest thinning treatments, in support of the District's Allowable Sale Quantity in order to meet Timber Resource Objectives (ROD/RMP p.17, 72-73).

Purpose #3. Consider the interests of rural residential land owners (RMP p. 88).

Managed rural interface areas were designated by the 1995 Medford District RMP. Rural interface areas are BLM-administered lands within a ¼ mile of private lands zoned for less than 20 acre lots at the time the RMP was developed (RMP p. 88, RMP Map 13). The RMP provides guidance to the agency to determine how residential land owners might be affected by management activities on BLM-administered lands and to use project design features or mitigation to avoid or minimize impacts to health, life, property, and the quality of life (RMP p. 88).

Due to hazardous fuels conditions on BLM administered lands (as determined by fire hazard ratings described above), forest resources and residents living in the Rural Interface Areas are threatened by the potential for high intensity stand replacing wildfire. The RMP guides the agency to reduce natural fuel hazards on BLM lands in rural interface areas.

Purpose #4. Improve water quality within streams located within the Galls Foot Planning Area.

Within the planning area Galls Creek and the Rogue River are listed as 303(d) streams for varying reasons. Activities should be designed in a manner that would improve water quality conditions in these streams.

F. CONFORMANCE WITH EXISTING LAND USE PLANS

The proposed Galls Foot Project is designed to conform with and is tiered to the *Medford District Record of Decision and Resource Management Plan* (RMP) as amended by the *Record of Decision Amending Resource Management Plans for Seven Bureau of Land Management Districts and Land and Resource*

Management Plans for Nineteen National Forests within the Range of the Northern Spotted Owl to Clarify Provisions Relating to the Aquatic Conservation Strategy and by the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USDI, USDA 2001). 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).

The Medford District is also aware of following:

1. Ongoing litigation Pacific Coast Federation of Fishermen's Associations et al. v. National Marine Fisheries Service et al. (W.D. Wash.) related to the 2004 supplemental environmental impact statement for the Aquatic Conservation Strategy (ACS). The Magistrate Judge issued findings and recommendations to the court on March 29, 2006. The court has made no final ruling based on these findings and recommendations and thus has not found this amendment to be "illegal," nor did the Magistrate recommend such a finding. Given the court has not yet adopted the findings and recommendations; we will appropriately continue to refer to the current direction as amended in the 2004 ROD, until ordered otherwise. The environmental analysis completed for the Galls Foot Project EA tiers to this document as the clarification of how to address the ACS. Since it was only a clarification, and did not alter any of the on-the-ground components of the standards and guidelines designed for achieving the ACS objectives, whether the court upholds the amendment or not should have no practical effect at the project level. In litigation over the Pickett Snake timber sale, the U.S. District Court of Oregon upheld the agency's interpretation of the appropriate use of the ACS objectives, even without the clarifying amendment. See Klamath Siskiyou Wildlands Center v. BLM (D. Or.).

2. The August 1, 2005, U.S. District Court order in Northwest Ecosystem Alliance et al. v. Rey et al. which found portions of the *Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (January, 2004) (EIS) inadequate. Subsequently in that case, on January 9, 2006, the Court ordered:

- set aside the 2004 Record of Decision *To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern spotted Owl* (March, 2004) (2004 ROD) and
- reinstate the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines* (January, 2001) (2001 ROD), including any amendments or modifications in effect as of March 21, 2004.

3. The November 6, 2006, Ninth Circuit Court opinion in Klamath-Siskiyou Wildlands Center et al. v. Boody et al., No. 06-35214 (CV 03-3124, District of Oregon). The court held that the 2001 and 2003 Annual Species Reviews (ASRs) regarding the red tree vole are invalid under the Federal Land Policy and Management Act (FLPMA) and National Environmental Policy Act (NEPA) and concluded that the BLM's Cow Catcher and Cotton Snake timber sales violate federal law.

This court opinion is specifically directed toward the two sales challenged in this lawsuit. The BLM anticipates the case to be remanded to the District Court for an order granting relief in regard to those two sales. At this time, the ASR process itself has not been invalidated, nor have all the changes made by the 2001-2003 ASR processes been vacated or withdrawn, nor have species been reinstated to the Survey and Manage program, except for the red tree vole. The Court has not yet specified what relief, such as an injunction, will be ordered in regard to the Ninth Circuit Court opinion. Injunctions for NEPA violations are common but not automatic.

The Medford District BLM will reexamine individual project level NEPA documents (environmental assessments) in light of any pertinent court ordered remedy and will make revisions to such documents as necessary following issuance of the court's judgment.

G. RELATIONSHIP TO STATUTES, REGULATIONS, AND OTHER PLANS

The Proposed Action and alternatives are in conformance with the direction given for the management of public lands in the Medford District by 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

H. RELEVANT ASSESSMENTS & PLANS

1. Watershed Analysis

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 analysis 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 Galls Foot Project Area falls within the Rogue River-Gold Hill Watershed. Watershed Analysis generally 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 Galls Foot Forest Management project, has been collected and is considered along with existing information provided by the 2001 Rogue River-Gold Hill Watershed Analysis document. Management Objectives and Recommendations in the Watershed Analysis document were considered and addressed as they applied to the Galls Foot proposal. Information contained in the watershed analysis is incorporated by reference throughout this EA.

2. Water Quality Restoration Plan for the Rogue River-Gold Hill Watershed South of the Rogue River

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 Rogue River-Gold Hill Watershed South of the Rogue River (USDI 2006c:25-26)*. 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 Rogue River-Gold Hill Watershed. The organization of this Water Quality Restoration Plan is designed to be consistent with the DEQ's Rogue Basin Water Quality Management Plan (WQMP) when it is completed, and contains information that will support the Oregon Department of Environmental Quality's (DEQ) development of the Rogue Basin Total Maximum Daily Load (TMDL). A TMDL defines the amount of pollution that can be present in the waterbody without causing water quality standards to be violated. DEQ anticipates the establishment of the Rogue Basin TMDL by late 2007.

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 is designed to attain the Rogue River-Gold Hill Watershed South recovery goals for listed streams on federal lands in the Rogue River-Gold Hill Watershed South. Recovery goals are identified in the *Water Quality Restoration Plan for the Rogue River-Gold Hill Watershed South of the Rogue River (USDI 2006c:25-26)*. 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 Rogue River-Gold Hill Watershed assures that BLM's management in the interim between listing of the stream as water quality limited and the establishment of the TMDL for the stream will not violate the Clean Water Act.

3. 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).

4. 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.

5. Medford District Integrated Weed Management Plan of 1998

The Medford District Integrated Weed Management Plan provides a proactive ecosystem-based approach to reduce populations of alien plant species to a level which will allow for the restoration of native plant species, and provide for overall ecosystem health.

6. Broader Level NEPA Analyses

This environmental assessment tiers to and incorporates by reference where appropriate the *Medford District Proposed Resource Management Plan/Environmental Impact Statement* (USDI 1995b), the 1994 *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl*, the 2000 *Final Supplemental Environmental Impact Statement for Amendment to the Survey & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, and the *Final Supplemental Environmental Impact Statement for Clarification of Language in the 1994 Record of Decision for the Northwest Forest Plan National Forests and Bureau of Land Management Districts within the Range of the Northern Spotted Owl*.

7. Jackson County Integrated Fire Plan / Seven Basins Community Wildfire Protection Plan / Foots Creek Fire Plan

The Jackson County Integrated Fire Plan is the result of a collaborative effort between local citizens and local and federal agencies to develop a strategy for addressing the high fire danger throughout Jackson County. The Seven Basins Community Wildfire Protection Plan was created prior to the Jackson County plan and addressed seven watersheds including Galls and Foots Creek watersheds. The main components of the plans include fire protection and suppression, fuel hazard reduction, and emergency communications. Foots Creek Residents have also created a community fire plan primarily focused on emergency communication but also detailing fuels reduction strategies for the Foots Creek drainage. These community driven fire plans have helped to identify high fire hazard areas of concern to local rural residents. Fuel hazard reduction activities proposed by BLM in this project as well as other projects are in part guided by the recommendations made in these planning documents.

I. DECISIONS TO BE MADE & DECISION FACTORS

This Environmental Assessment will provide the information needed for the authorized officer, the Ashland Resource Area Field Manager, to render a decision regarding the selection of a course of action to be implemented for the Galls Foot Forest Management Project. The Ashland Resource Area Field Manager must decide whether to implement the Proposed Action as designed or whether to select the no-action alternative. In choosing the alternative that best meets the project purpose and need, the Field Manager will consider the extent to which each alternative responds to the purposes identified for this project. The forthcoming decision will document the authorized officer's rationale for selecting a course of action based on the effects documented in the EA, and the extent to which each alternative:

1. Address the balance between positive and negative environmental effects;
2. Addresses the costs both short-term and long-term for managing the lands in the project area (project must be economically practical);
3. Maintains aquatic habitat for recovery of at risk stocks of fish;
4. Maintains and improves water quality within streams located in Rogue River–Gold Hill Watershed;
5. Maintains both short term and long term habitat for special status plant and animal species;
6. Contributes towards the District's Allowable Sale Quantity;
7. Considers the interests of rural residential land owners.

The decision will also include a determination whether or not the impacts of the proposed action are significant to the human environment. If the impacts are determined to be within those impacts analyzed in the Medford District Resource Management Plan/EIS (USDI 1995) and the Northwest Forest Plan (USDA/USDI 1994), or otherwise determined to be insignificant, a Finding of No Additional Significant

Impact (FONASI) can be issued and a 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 and the NWFP SEIS, then a project specific EIS must be prepared.

J. SCOPING AND ISSUES

Scoping is the name for the process used to determine the scope of the environmental analysis to be conducted. It is used early in the NEPA process to identify (1) the issues to be addressed, (2) the depth of the analysis, (3) alternatives to the proposed action, and (4) potential environmental impacts of the proposed action.

Public outreach and scoping has occurred for the Galls Foot Forest Management Project. The Galls Foot Project was first announced the summer of 2005 with the listing of the project in Medford's Messenger, a general project announcement newsletter published quarterly. More focused public outreach also occurred for the Galls Foot Forest Management Project. Outreach included mailings to interested organizations, community groups, other agencies, tribes, adjacent land owners, and other individuals; and meetings with neighbors and organized neighborhood groups. Two separate, outreach by mail efforts were made. The first was sent November 17, 2005, to all private landowners in the Foots Creek and Galls Creek drainages, announcing timber sale and fuels reduction activities were being planned in the area. A description of the activities expected and a map were included in the mailing, along with a request for public input regarding BLM's proposed management activities. BLM also requested that anyone who wanted to continue to be kept informed of project activities return the "Interest Response Form" provided. Organized groups and individuals who in the past had asked to be informed of all BLM land management activities were also included in this first mailing. Approximately 400 letters were sent. On April 6th, 2005, a meeting took place in the field with five interested neighbors.

The second mailing, sent on September 22, 2006, provided the public with an update concerning the development of the Galls Foot Forest Management Project and another chance to provide comments. Two detailed maps and several pages explaining the timber harvest and fuel management objectives, the type of cutting and transportation system objectives were provided in the mailing. Approximately 150 letters were mailed for this second outreach requesting comments to be sent to the BLM by October 30, 2006. Copies of both letters along with large format maps were filed in the reference section of the Gold Hill library.

An interdisciplinary (ID) team of resource specialists reviewed the proposal and all pertinent information, including public input received, and identified relevant issues to be addressed during the environmental analysis. Some issues identified as relevant to this project proposal were analyzed at a broader scale in association with the 1994 *Final Environmental Impact Statement for the Bureau of Land Management Medford District Proposed Resource Management Plan* and the 1994 *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old Growth Forest Related Species Within the Range of the Northern Spotted Owl(as amended)*. This EA will focus on addressing those issues ripe for decision at this level of environmental review, and will incorporate by reference broader level NEPA analysis where appropriate.

Issues were identified through specialist review and public input received. The following issues were determined by the ID Team to be relevant to the Galls Foot project development and/or analysis. Other issues were also identified. Those issues were also considered and addressed during project development (including project design features) and environmental analysis (documented in this EA Chapter III).

K. RELEVANT ISSUES

Aquatic Systems: Hydrology, Water Quality and Fish

The project area is within Rogue River-Gold Hill Watershed. Some streams in this watershed are listed as water quality limited as defined by the Oregon Department of Environmental Quality on the State 303(d)

list. Non-point source pollution (sedimentation) from road construction and other forest management activities could further degrade the aquatic ecosystem (e.g., reduce water quality).

Forest Health & Stand Density
Fire exclusion has resulted in dense vegetation throughout the project area. Dense stands are not vigorous (i.e., slow growth rates, competition for water, nutrients, and sunlight) and are more susceptible to insect infestation and high intensity wildfire. Shade intolerant plants such as ponderosa pine are declining in number.

Soils and Site Productivity
Activities associated with timber harvest and road building, decommissioning, and renovation may have impacts on soils and site productivity from erosion, compaction, displacement, and change in organic matter and soil chemistry.

Wildfire and Fuel Hazard
With effective fire exclusion of low intensity fire, the amount of vegetation (fuel loading) and consequent fire hazard continues to increase. When fires occur, they burn with more intensity and result in more damage.

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

Some people expressed their concern that leaving untreated logging slash, even if only for a short period of time, could lead to increased wildfire behavior and increased risk of escape from initial attack.

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

Young tree plantations burn at high intensities and are more susceptible to severe fire effects especially where thinning slash remains untreated. The number and distribution of plantations can alter fire behavior and the stand and landscape scale.

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

Transportation System
Some of the project area is not currently accessible by existing roads. Increasing access through road construction and road improvements would greatly decrease the cost associated with meeting current long-term management objectives. Some long-term management objectives (i.e. fuels treatments) may not be possible without increased access. New and improved roads may also contribute to increases in other uses (e.g., off-highway vehicles, hunting, and horse back riding) throughout the area. Some roads in the planning area are being considered for decommissioning. Closing roads may affect access to places used historically by the public. Closing roads limit access for wildfire suppression response.

Wildlife
Overall change in the number of snags and forest stand canopy closures across the landscape would reduce habitat for some wildlife species and increase habitat for others. Reductions in canopy closure would affect late-successional species' habitat and could affect dispersal. Proposed road construction could increase human disturbance to wildlife and may fragment habitat. Management activities could result in localized, short-term noise disturbances affecting wildlife such as deer and nesting birds.

Special Status Animal Species
Special status animal species occur in the proposed project area and would need to be protected from project-related activities through buffers and/or seasonal restrictions appropriate to the species in question. Some species habitats are declining and would benefit from restoration activities.

Special Status Plant Species
Special status plant species occur in the proposed project area and would need to be protected from project-related activities through buffers appropriate to the species in question. Some species habitats are declining and would benefit from restoration activities.

Invasive, non-native plants
Non-native weed species are present in the proposed project area. Some kinds of soil disturbance could facilitate the spread of these species.

Silviculture
Forest management activities may affect late-successional habitat and individual large trees. People expressed their concerns for maintenance of old-growth forest and large diameter tree structure capable of becoming old-growth forest over the next century.

Untreated slash could lead to increase in bark beetle activity.

Off Highway Vehicle (OHV)
There is concern that OHV use may increase and as a result, undue resource damage may occur associated with OHV activity. The consideration area for the Timber Mountain/Johns Peak OHV Management Area overlaps the Galls Foot planning area. The BLM is developing the Timber Mountain/Johns Peak OHV Management Plan and EIS, through a separate NEPA process, for the management of OHV activity in the area of Galls and Foots creeks.

Scenic Quality and Recreation
There is concern for the resulting visual character (evidence of management) and attainment of Visual Resource Management Objectives.

Cumulative Effects
A series of land management actions occurring or planned on private, BLM, and other lands in the area may have impacts on the watersheds and their resources.

Air Quality
Concerns for management of smoke during prescribed burning operations and wildfires.

CHAPTER 2. THE PROPOSED ACTION AND THE ALTERNATIVES

I. INTRODUCTION

This chapter describes the Proposed Action developed by the ID Team to achieve the objectives and to respond to the decision factors identified in the Chapter 1, "Why Is BLM Proposing The Galls Foot Project?". In addition, a "No Action" Alternative is presented to form a base line for analysis. Project design features (PDFs), which apply the Best Management Practices as described in Appendix D of the RMP (USDI, 1995), are an essential part of the Proposed Action. The PDFs are included as features of the Proposed Action in analysis of anticipated environmental effects.

II. ALTERNATIVES ANALYZED IN DETAIL

A. Alternative 1 - No Action Alternative

The No-Action Alternative describes a baseline against which the effects of the Proposed Action can be compared. The Proposed Action describes the existing condition and the continuing trends, given the effects of other present actions and reasonably foreseeable actions identified, for the time periods relevant to the resource issues of concern.

Under the No-Action Alternative, the activities outlined in the Galls Foot Forest Management Proposed Action would not take place. The forest management, thinning, timber harvest, road construction, road decommissioning and the young stand (pre-commercial) thinning would not take place.

Selection of the No-Action Alternative would not constitute a decision to reallocate these lands to non-commodity uses. The decision maker does not need to make a specific decision to select the "no action" alternative. If that is the choice, the proposed action would simply be dropped and the decision process would be aborted. Future harvesting, fuels reduction, and road management in this area would not be precluded and could be analyzed under a subsequent NEPA document. On going activites such as road maintenance would still take place.

B. The Proposed Action - Alternative 2

This section describes the Proposed Action in detail. The Proposed Action is described in three sections. Section 1, Summary of the Proposed Action, provides information by treatment type and treatment methods. Section 2, Components of the Proposed Action, provides a detailed description of silvicultural prescriptions, harvest methods, fuels reduction and prescribed fire treatments. Section 3, Project Design Features, describes procedures for protecting resources required by the RMP for the Proposed Action.

1. Summary of the Proposed Action

Alternative 2, the Proposed Action, was developed to achieve the objectives described in Chapter 1, Purpose and Need. The Proposed Action would treat 4,613 acres of vegetation using the various silvicultural prescriptions and treatment methods as described in Section 2, Components of the Proposed Action. Of these acres an estimated 1,743 acres are proposed for commercial timber harvesting using one or more timber sales to accomplish the proposed silvicultural treatments. An estimated 2,870 acres are proposed for pre-commercial thinning; an estimated 1,055 acres of pre-commercial thinning are within the commercial treatment units described above and 1,815 acres are proposed for pre-commercial thinning only. Post harvest fuels reduction would occur in commercial treatment units as described in

Sections 2c, Fuels Reduction and 2e, Follow-up Maintenance Underburning. Table 2-1 summarizes the vegetation treatments and methods to be used. Unit specific information is displayed in Table 2-2.

This alternative would construct 4.44 miles of new road to provide access to proposed treatment areas: 4.2 miles of permanent road and 0.24 miles of temporary road construction. Temporary road would be removed after harvest and fuel reduction activities are completed. An estimated 6.1 miles of existing roads would be renovated to maintain and improve watershed conditions and infrastructure investments. An estimated 6.1 miles of roads are proposed for decommissioning; 3.4 miles would be decommissioned naturally and 2.7 miles would be decommissioned mechanically.

Helicopter landings are locations along the road system where trucks can turn around, equipment can be parked and serviced, and harvested material can be stockpiled temporarily awaiting transport. There are 15 existing helicopter landings that would be used and there are 9 potential new helicopter landings planned under the Proposed Action. Five existing landings would be improved. Not all landings are expected to be needed to implement the project but all are analyzed and included in the proposed action.

Table 2-1. Summary of the Proposed Action-Alternative 2:

Commercial Silvicultural Prescriptions	**Est. Acres**
Moist DF Commercial Thin	442
Dry DF Commercial Thin	712
Pine Site	114
DF Understory Reinitiation (Regneration Harvest)	427
Poles	48
Total Acres of Timber Harvest	**1,743**
Non-commercial Prescriptions	**Est. Acres**
Pre-commercial Thinning	
Within commercial units	1,055
Outside of commercial unit	1,815
Total Acres of Pre-commercial Thinning	**2,870**
Commercial Timber Harvest	**Est. Acres**
Helicopter Yarding	842
Cable Yarding	855
Tractor Yarding	46
Total Acres of Timber Harvest	**1,743**
Proposed Road Management	**Est. Miles**
Proposed New Road Construction	
Permanent Road	4.20
Temporary Road	0.24
Total Miles of New Road Construction	**4.44**
Proposed Road Renovation	6.10
Proposed Road Decommissioning	
Mechanical Decommissioning	2.70
Natural Decommissioning	3.40
Total Miles of Road Decommissioning	**6.10**

Table 2-2. Proposed Action – Commercial Harvest Units by Silvicultural Prescription, Yarding System, and Fuels Treatments[1]

Unit Number	Acres	Silvicultural Prescription	Yarding System	Fuels Treatment
1	20	DDF	H	HP/UB/SL
2	20	DDF	H	HP/UB/SL
3	28	DfG	H	HP/UB/SL
4	114	DDF, DfG	PS, H	HP/UB/SL
6	64	DfG	CR, PS, H	HP/UB/SL
7	96	DDF	PS, H	HP/UB/SL
8	14	DDF, DfG	PS, H	HP/UB/SL
9	52	DDF, Pi	H	HP/UB/SL
10	26	DDF, Pi	H	HP/UB/SL
11	11	DDF	H	HP/UB/SL
12	51	DDF, Pi	H	HP/UB/SL
13	6	Pi	H	HP/UB/SL
14	4	Pi	H	HP/UB/SL
15	48	DDF, Pi	PS, H	HP/UB/SL
16	12	MDF	PS	HP/UB/SL
17	54	DDF, DfG, Po	CR, PS, H	HP/UB/SL
18	14	DDF	H	HP/UB/SL
19	5	DDF, Pi	H	HP/UB/SL
20	14	DDF, MDF	H	HP/UB/SL
21	19	DDF	CR, PS, H	HP/UB/SL
22	13	DDF, DfG	H	HP/UB/SL
23	27	DDF	H	HP/UB/SL
24	26	DDF	H	HP/UB/SL
25	43	DDF, MDF	H	HP/UB/SL
26	8	DDF, MDF	H	HP/UB/SL

[1] Unit acres reported in this table are based on Geographic Information System (GIS) data and rounded to nearest whole acre; unit acres may differ from those reported in individual timber sale contracts/prospectuses due to differences in electronic mapping software. Total acres may vary slightly from other tables displayed throughout the analysis file due to methods used for rounding data outputs. The acreage differences that may be detected are within less than (+-)1% of the total project acreage analyzed and would not contribute to any differences in effects reported.

Unit Number	Acres	Silvicultural Prescription	Yarding System	Fuels Treatment
27	43	DDF, DfG, MDF	CR, PS	HP/UB/SL
28	8	DDF	PS, H	HP/UB/SL
29	9	DDF, Pi	PS, H	HP/UB/SL
30	6	DfG	H	HP/UB/SL
31	25	DDF	PS, H	HP/UB/SL
32	18	DDF, Po	PS, H	HP/UB/SL
33	7	DDF, Pi	CR, PS	HP/UB/SL
34	36	MDF, Po	PS, H	HP/UB/SL
35	41	DDF, Pi	H	HP/UB/SL
36	8	MDF, Pi	H	HP/UB/SL
37	14	DDF, MDF, Pi	H	HP/UB/SL
38	59	DDF, DfG, MDF, Pi	PS, H	HP/UB/SL
39	143	DDF, MDF, Pi, Po	CR, PS, H	HP/UB/SL
40	48	MDF, Pi	H	HP/UB/SL
41	152	DDF, DfG, MDF, Pi, Po	CR, PS, H	HP/UB/SL
42	6	DfG	PS	HP/UB/SL
43	5	MDF	H	HP/UB/SL
44	33	DDF, DfG	CR, PS, H	HP/UB/SL
45	7	DDF, DfG	PS, H	HP/UB/SL
46	19	DfG	PS	HP/UB/SL
47	5	DfG	PS	HP/UB/SL
48	19	DDF	CR, PS, H	HP/UB/SL
49	2	DfG	PS	HP/UB/SL
50	14	DfG	PS	HP/UB/SL
51	5	DfG	PS	HP/UB/SL
52	3	DDF	CR, PS	HP/UB/SL
53	7	MDF	PS	HP/UB/SL

Unit Number	Acres	Silvicultural Prescription	Yarding System	Fuels Treatment
54	17	Po	PS	HP/UB/SL
55	8	DDF	PS	HP/UB/SL
56	8	MDF	PS, H	HP/UB/SL
57	41	MDF	PS, H	HP/UB/SL
58	13	DfG	PS, H	HP/UB/SL
59	5	DDF	PS	HP/UB/SL
60	33	DfG, MDF	CR, PS	HP/UB/SL
61	68	DfG, MDF	CR, PS, H	HP/UB/SL
62	19	DDF	PS	HP/UB/SL
Total	1,743			

Silvicultural Prescriptions	Yarding Systems	Fuels Treatment
DDF – Dry Douglas-fir MDF – Moist Douglas-fir Pi – Pine Site Treatment DfG – Douglas-fir Regeneration Po – Douglas-fir & pine poles	CR - Crawler Tractor PS – Cable H - Helicopter	HP – Handpile, cover & Burn UB – Underburn SL – Slashing (understory thinning)

Table 2-3 Existing roads in the planning area used by the Galls Foot project.

Road Number	Approximate Length (miles)	Existing Surface:	Control[2]	Possible Improvements[3]	Seasonal Restriction[4]
		Depth (inches) and Type[1]		Depth (inches)	(for log hauling)
36-3-30.0	2.2	6 GRR	BLM	-	1
36-3-31.0	0.1	6 GRR	BLM	-	1
37-3-8.0	0.6	NAT	PVT	-	1
37-3-9.0 A	0.3	4ASC	BLM	4” ASC (0.3 MI)	2
37-3-9.1 A1-C1	5.7	4 ASC	BLM	4” ASC (4.41 MI)	2
37-3-9.1 C2	0.3	6 ABC	BLM	-	1
37-3-9.1 D-G	1.9	NAT	BLM	-	1
37-3-9.2 A1-D	5.4	6 GRR	BLM	-	1
37-3-11.0 A-C	3.0	4 ASC	BLM	-	1
37-3-11.0 D1-D2	1.4	8 ASC	BLM	-	1
37-3-15.4	0.4	8 ASC	BLM	-	1
37-3-15.5 A	0.1	4 ABC	BLM	-	1
37-3-15.5 B	0.5	NAT	BLM	-	1
37-3-17.0	1.4	6 GRR	BLM		2
37-3-19.0	1.9	NAT	PVT	-	1
37-3-21.0 A	0.8	4 ASC	BLM	4” ASC (0.5 MI)	2
37-3-21.0 B	1.1	NAT	BLM	-	1
37-3-21.0 C	0.3	6 PRR	BLM	-	1
37-3-21.1 A	0.6	6 PRR	BLM	-	1
37-3-21.1 B	0.3	6 ABC	BLM	-	1
37-3-21.1 C	0.2	NAT	BLM	-	1
37-3-21.2 A-B	0.4	6 ABC	BLM	-	1
37-3-21.3	0.2	6 ABC	BLM	-	1
37-3-21.5	0.2	6 ABC	BLM	-	1
37-4-4.0 A	0.1	4 ASC	BLM	-	1
37-4-4.1 A	1.2	4 ASC	BLM	-	1
37-4-4.2 A-B	1.5	NAT	BLM	-	1
37-4-12.0 A	2.0	4 PRR	BLM	-	1
37-4-12.0 B1	0.3	4 PRR	PVT	-	1
37-4-12.0 B2	0.9	NAT	PVT	-	1
37-4-12.0 C	0.2	NAT	BLM	-	1

Table 2-3 (continued) Existing Roads in the planning area used by the Galls Foot Project.

Road Number	Approximate Length (miles)	Existing Surface:	Control[2]	Possible Improvements[3]	Seasonal Restriction[4]
		Depth (inches) and Type[1]		Depth (inches)	(for log hauling)
37-4-13.0	0.3	6 ASC	BLM	-	1
37-4-15.0 A1	0.6	6 ASC	PVT	-	1
37-4-15.0 A2	0.5	6 ASC	BLM	-	1
37-4-15.0 B	0.1	6 ASC	PVT	-	1
37-4-15.0 C1-C2	2.0	6 ASC	BLM	-	1
37-4-21.1	0.2	NAT	BLM	-	1
37-4-22.0 A1-B1	1.5	6 ASC	BLM	4” ASC (1.0 MI)	2
37-4-22.0 B2	0.2	8 ABC	BLM	-	2
37-4-22.0 C1	0.1	8 ABC	PVT	-	2
37-4-22.0 C2	1.8	8 ABC	BLM	-	2
37-4-27.1 A-B	1.6	6 ASC	BLM	-	1
37-4-27.1 C1	0.5	8 ABC	BLM	-	2
37-4-27.2	1.1	6 ASC	BLM	-	1
37-4-27.4	0.1	6 ASC	BLM	-	1
Total mileage	**41.6**			-	

-

Table 2-4 Proposed new permanent road construction in the planning area.

Road Number	Approximate Length (miles)	Existing Surface:	Control[2]	Possible Improvements[3]	Seasonal Restriction[4]
		Depth (inches) and Type[1]		Depth (inches)	(for log hauling)
37-3-5.0	0.3		BLM	6” GRR/ASC	1
37-3-8.0	0.2		BLM	NAT	1
37-3-17.1	3.6		BLM	8” GRR/ASC	2
37-3-19.0	0.1		BLM	NAT	1
Total mileage:	**4.2**			-	

Table 2-5 Proposed road decommissioning in the planning area.

Road Number	Approximate Length (miles)	Existing Surface: Depth (inches) and Type[1]	Control[2]	Possible Improvements[3] Depth (inches)	Seasonal Restriction[4] (for log hauling)
37-3-4.0[5]	0.5	NAT	BLM	ND	1
37-3-15.3	0.3	8 ASC	BLM	MD	1
37-3-15.4	0.2	NAT	BLM	MD	1
37-3-15.5	0.3	6 ABC	BLM	MD	1
37-3-21.0	1.0	6 ABC	BLM	MD	1
37-3-21.3	0.2	6 ABC	BLM	MD	1
37-3-21.4	0.3	NAT	BLM	MD	1
37-4-27.0	0.3	NAT	BLM	MD	1
37-4-27.3	0.3	4 ASC	BLM	MD	1
S1/2, S1//2, SEC 25, T36S R3W[6]	0.3	NAT	BLM	ND	1
SW 1/4, SEC 15, T37S R3W	0.3	NAT	BLM	MD	1
NE 1/4, SW 1/4, SEC 1, T37S R4W	0.2	NAT	BLM	ND	1
NE 1/4, SW 1/4, SEC 1, T37S R4W	0.3	NAT	BLM	ND	1
NW 1/4, SE 1/4, SEC 1, T37S R4W	0.3	NAT	BLM	ND	1
SEC 7 & 8 T36S R3W	1.3	NAT	BLM	ND	1
Total mileage	6.1				

ND=Natural Decommission - Some roads are presently well drained and have vegetation growing on them. They may also have trees and brush encroaching from the sides and trees that have fallen across them. Sections of these roads would be allowed to decommission naturally, but may include some selective ripping, removal of drainage structures, construction of water bars and barricades.

MD=Mechanical Decommission - Roads would be decommissioned mechanically. This would include ripping, removing drainage structures, seeding and/or planting, mulching, constructing water bars and barricades.

Notations:	
1	NAT = natural, GRR = Grid Rolled Rock, PRR = Pit Run Rock, ASC = Aggregate Surface Course, ABC = Aggregate Base Course
2	BLM = Bureau of Land Management, PVT = Private
3	- = no improvement

4	1 = hauling restricted between 10/15 and 5/15; 2 = 11/15 and 4/15
5	Road numbered 37-3-4.0 is not accessible by vehicle.
6	Road in the S1/2S1/2, Section 25, T36S R4W is not accessible by vehicle.

2. Components of the Proposed Action Alternative

a. Commercial Conifer Forest Thinning – Selected conifer stands are proposed for thinning to reduce stand densities to help restore the health and vigor of the remaining trees by reducing competition. Selective tree cutting would consist of the removal of the smaller diameter trees within a stand allowing the larger, healthier trees to grow. Smaller trees marked for removal in commercial conifer thinning must be at least eight inches in diameter at breast height (DBH). Trees are marked for thinning within proposed treatment units by BLM personnel; oversight is provided by the Ashland Resource Area Silviculturist to ensure that treatment units are properly marked according to the silvicultural prescriptions and marking guidelines.

The prescriptions are landscape oriented to respond to variations in forest stand and site conditions. As the BLM tree markers move through a stand, they may transition from homogenous dry Douglas-fir to Moist Douglas-fir forest with scattered old growth trees and an occasional 1-2 acre patch of pine savannah; the prescription would flex accordingly. BLM tree markers implement the silvicultural prescriptions by applying a set of detailed instructions written by a BLM silviculturist to address the variable forest stand conditions encountered as well as special situations as they arise. For example, there will be some "group selections", which would clear the trees out from below the crowns of old growth and/or pine trees. Other examples include specifications to leave canopy over large-diameter Coarse-Woody Debris (to retain moisture), thin to manage the special occurrence of pines with healthy native grass understories, and to leave all large-diameter hardwoods for vertical and horizontal structure. Except within designated understory reintiation prescription areas, BLM will mark no old-growth trees. BLM's tree markers will be instructed to locate group selection areas to avoid the harvest of old-growth trees. We define "old-growth trees" to have the following characteristics:

- Significantly larger and older than the second growth trees in the present day stand; an indication that the tree may be one of the seed trees of the present day stand. These trees may have a bottle-brush shape (non-symmetrical crown).

- Exhibits 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.

- Thick bark; Douglas-fir will have 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.

All of these layered instructions serve to make the prescriptions complex. Prescriptions are applied to treatment areas by a BLM tree marking crew. The Resource Area Silviculturist provides oversight and training to the BLM marking crew. The following summarizes variations in prescriptions based on stand types. Detailed silvicultural prescriptions and marking guidelines are included in Appendix C, Silvicultural Prescription.

Moist Douglas-fir: Moist Douglas-fir sites are typically found on the more northerly facing slopes. The prescription involves thinning from below (the removal of smaller diameter trees within a stand, allowing the larger, healthier trees to grow) and creating or maintaining structural

diversity. The following treatment variations would occur based on existing forest stand characteristics:

(1) Homogeneous large pole-sized (11 to 21 inches DBH) stands would be thinned to 100 to 140 $ft^{2/}$ basal area (.005454 x tree diameter^2 which is calculated for each tree in a plot of designated size), equating to 3 to 15 foot spacing between tree crowns (crown-spacing).
(2) Trees with old-growth characteristics would be retained, and second growth trees would be cut within and surrounding the dripline to create an approximate 25-foot crown spacing surrounding the old-growth tree. Any tree leaning against or with its crown entangled with the old-growth tree would not be cut to prevent damage to the old-growth tree or degradation of wildlife habitat.
(3) Trees of varying crown classes (intermediate, co-dominant, dominant) would be retained to maintain structural diversity.
(4) Small openings (1/7 to 1/6 acre), also referred to as group selection areas, could be created where openings in the crown canopy already exist (group selection areas must be rock and ravel free). This creates space for the establishment and the growth of young healthy Douglas-fir trees already in the understory. Openings would be no closer than 300 feet between the edges of openings. The area between created openings can be commercially thinned using the basal area and crown spacing guidelines discussed above and may also be pre-commercially thinned.
(5) Where small patches (1/5 to 1 acre in size) of old-growth trees are encountered, selectively thin only second-growth trees from below trees with old-growth characteristics. For a radius of 200 feet surrounding the patch of old-growth, selectively thin trees leaving the most vigorous trees within various crown classes. In this area leave an average of 16 to 25 trees per acre to maintain at least a 35-foot spacing between the crowns of trees. This prescription can be applied wherever small patches of old-growth trees are found to help create structural diversity.

Dry Douglas-fir: Dry Douglas-fir sites typically have west, southwest, southeast, and east aspects. The prescription involves thinning from below, creating openings to allow ponderosa pine to become established, and creating or maintaining structural diversity.

(1) Homogenous Douglas-fir stands would be thinned to 80-120 ft^2 basal area per acre; if stands are patchy or have widely spaced trees use crown spacing guidelines and thin stands to 10 to 25 feet between tree crowns. Leave the most vigorous dominant and codominant trees with the best crowns (greater than 30 percent crown ratio).
(2) Trees with old-growth characteristics would be retained.
(3) Create 1/5 to 1-acre openings around individual pine or old-growth trees; leave 20 to 40 ft^2 basal area per acre of healthy pine or incense cedar when they are available in the created opening. Adjacent to openings, for a distance of the average tree height of the stand being treated, thin trees to 80 ft^2 basal area per acre. Openings should be naturally spaced depending on the location of good seed trees, and should be no closer than 100 feet between the edges of openings. For the remaining area between openings, thin trees using the basal area and crown spacing prescription described above.
(4) Where small patches (1/5 to 1 acre in size) of old-growth trees are encountered, selectively thin only second-growth trees from below trees with old-growth characteristics. For a radius of 200 feet surrounding the patch of old-growth, selectively thin trees leaving the most vigorous trees within various crown classes. In this area leave an average of 16 to 25 trees per acre to maintain at least a 35-foot spacing between the crowns of trees.

Pine Site Prescription (Dry Ponderosa Pine): These sites are typically small in size and found on dry ridges and low elevations. Sites have south, southwest, and southeast aspects. These sites are

also identified by the presence of ponderosa pine, black or white oak, and white leaf manzanita (either live or dead) in the understory. Poison oak may or may not be present. These stands may have developed understories of Douglas-fir as a result of fire exclusion. The objectives of treatment on these sites is the retention of existing large ponderosa pine, the development of young pine, and to reduce stand basal area to reduce competition and improve tree vigor and growth.

(1) Thinning treatments would leave the best, healthiest pine and remove the majority of Douglas-fir trees to allow the pine to once again dominate the site. Suppressed, damaged, or beetle infested pines would be thinned. Approximately 16 to 25 trees per acre minimum would be left; an additional 10 to 20 square feet of basal area per acre of conifer trees, 7 to 11 inches DBH would also be left if available. The spacing in between the crowns of trees would be approximately 15 to 35 feet. Older Douglas-fir trees that developed as open grown trees along with older pine trees would be favored as leave trees.
(2) Leave all hardwood trees; thin conifers shading oak species.
(3) Create 1/5 to 1-acre openings around individual large pine or old-growth trees. Post harvest evaluation would determine the need for inter-planting where natural regeneration is not present and/or where needed to establish desired pine regeneration.

Douglas-fir Understory Reinitiation (Regeneration Harvest): Forest stands proposed for understory reinitiation or regeneration harvest are stands that have poor vigor, severely declined health, and have overstory trees that are 120 years of age or older. Selective harvest prescriptions focus on maintaining a portion of the largest trees while opening up stands to encourage the establishment and growth of young healthy trees and the creation of multi canopied characteristics. Post harvest evaluation would determine the need for inter-planting where natural regeneration is not present and/or where needed to establish desired species regeneration such as pine.

Three situations are encountered in the these stands: 1) stands with only older large diameter trees; 2) Stands with a variety of age classes including old trees, smaller second growth trees, and seedlings to pole sized trees; and 3) patches of second growth only within a regeneration harvest unit boundary.

(1) For situations 1 and 2, select a minimum of 16 trees per acre (bole spacing 45 to 52 feet) that are 20 inches or larger diameter breast height (DBH) for leave trees when available. When the older trees are widely spaced, then healthier second-growth trees would be left to prevent spaces more than 35 feet between tree crowns. In openings between trees, leave an additional 10 to 20 square feet of basal area per acre of seedlings through large pole-sized trees. (2 to 250 trees per acre depending on tree size).
(2) Where natural regeneration exists or is desired, openings (66-foot tree bole spacing) can be created.
(3) In situation 3, where patches of younger second growth trees occur, thin trees to appropriate spacing/basal area based on site encountered. For moist Douglas-fir sites, thin trees to 3 to 10 foot crown spacing (100 to 160 square feet of basal area per acre; 35 to 55 trees per acre); for dry Douglas-fir sites, thin trees to 10 to 25 foot crown spacing (80 to 140 ft^2 basal area per acre; 30 to 45 trees per acre). Select trees from various crown classes (intermediate, co-dominant, dominant) as leave trees to create as much stand diversity as possible.
(4) In all situations, where healthy pine seed trees are encountered (18 inches DBH or greater) on west and northwest slopes, group selection openings (1/5th to 1 acre in size) may be created to maintain the health of the pines and to encourage pine regeneration.

Pole Stands: Three situations commonly occur: 1) dense, decadent pole stands on aspects that receive sun for most of the day; the Douglas-fir is short in height and poison oak and grasses are common in the understory; 2) decadent patches of trees with the majority of trees with crown ratios of 30% or less; and 3) thrifty, young stands with good crown ratios (30% or more) on cool, moist sites.

For the first two situations, trees with crown ratios of 30% or more will be marked to leave on a crown spacing of 3 to 15 feet. Trees with crown ratios of less than 30% will be removed. Sometimes openings less than 1-acre in size may result. Thrifty stands should also be marked to 3 to 15 foot crown spacing, but due to better site conditions and trees with high crown ratios, more basal area per acre will probably remain.

b. 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 helicopter, cable, and tractor yarding methods.

(1) **Helicopter Yarding:** lifts trees bunched together by a cable, moving the trees from the treatment unit to a landing area near a road. Helicopter yarding allows for full suspension of the trees from the treatment unit to the landing area and does not create skid trails or corridors.

Existing helicopter landings would be used whenever possible. Landings shall not exceed one acre in size. The actual shape of the landing depends on the specific site location. Some existing landings are proposed for improvement; improvements include the removal of encroaching vegetation, widening of clearing limits to meet safety regulations, and smoothing landing surface. Landings would be treated as described in the project design features discussed later in this chapter for helicopter landings. Helicopter landings would be located on stable locations only. New landings would be located on ridges or in saddles. New landings are primarily located on the proposed road construction and would be incorporated into the new road construction design.

(2) **Skyline Yarding:** drags trees with one end suspended, and one end on the ground, up the slope to a landing area on or near a road. This requires narrow skyline corridors about every 200 feet, and parallel to each other, through the treatment unit to operate the skyline cable. Corridors are about 9 to 15 feet wide, depending on the size of trees to be removed and the terrain, and are pre-located and approved by the BLM. Trees removed are end-lined (dragged) to the corridor.

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

c. Fuels Reduction -Although fuels reduction is not the primary purpose for every stand treatment proposed, fuels reduction is an important component and project design feature incorporated into the proposed action. Commercial forest thinning would be followed by post treatment fuels reduction**.** This involves cutting and disposing of small diameter (sub-merchantable) trees that are contributing to ladder fuels, along with cutting, piling, and burning of slash created from forest thinning. Post harvest evaluations would determine the extent and method (hand pile and burn versus underburning) needed. The majority of units would be handpiled and burned then maintained with underburning (see follow-up

maintenance underburning below). The fuels reduction component of this project is best described in three categories: surface fuels, ladder fuels, and crown fuels. The following describes each of these categories:

(1) **Surface fuels** include dead and down wood on the forest floor along with understory vegetation (shrubs and small trees 6 to 8 feet tall). This component of forest structure is managed to reduce the intensity of surface fires. The higher the fire intensity and the higher the flame lengths, the greater the potential for a crown fire to be initiated. By treating the surface fuels, the intensity of surface fires is reduced, along with the potential for crown fire initiation and the severity (fire effects) of wildfire on forested stands.

(2) **Ladder fuels** include vegetation (live and dead) that span between the surface fuels and the canopies of trees that would allow for the vertical spread of fire from the forest floor into tree canopies, initiating a crown fire. The thinning of understory vegetation (shrubs, small conifers, and some hardwoods) and smaller diameter conifer trees to meet forest health prescriptions will also reduce fuel ladders reducing the likelihood of crown fire initiation within the forest stands treated.

(3) **Canopy fuels** include the portion of the forest canopy interacting in the crown fire process. As forest stands are thinned to reduce densities for the purpose of improving tree vigor, crown fuels are also reduced.

(1) d. Pre-commercial thinning - is used to thin young conifer stands for the purpose of increasing the growth rates and vigor of trees remaining and to accomplish fuels reduction treatments in conifer forest, woodlands, and shrublands. Pre-commercial thinning would cut small trees (those less than 8 inches in diameter) and shrubby vegetation with chainsaws and dispose of the material by handpiling and burning. Follow-up prescribed fire would be used as a maintenance treatment after the initial treatments have reduced the density of hazardous fuels. This practice is also referred to as non-commercial thinning or young stand management.

(2) Detailed Pre-commercial Thinning Prescriptions

Conifer/hardwood Communities

Thin conifer trees 2-feet tall and taller to a 16 to 25 foot spacing. The spacing of sub-merchantable sized trees is independent of trees eight inches DBH and larger. Trees larger than eight inches DBH are not considered in the spacing.

When considering a group of trees for thinning, select leave trees by the following order of species preference from most desirable to least desirable, sugar pine, ponderosa pine, incense cedar, Douglas-fir, and white fir.

Select trees for leave with good form and vigor (non-chlorotic) that are free of disease, fire damage, cankers, or blister rust.

When overstory canopy closure is 90 to 100% for trees 8 inches DBH and larger, cut all understory, suppressed trees less than 8 inches DBH with live crown ratios of less than 30%.

Thin madrone trees less than 10 inches diameter to 45 by 45 foot spacing; thin all other hardwoods less than 6 inches diameter to a 35 by 35 foot spacing;

When acceptable leave trees are not available, shrub clumps at least one foot high and 3 to 10 feet in crown diameter shall be selected as leave vegetation.

Hand pile the material generated from thinning. Burn material during conditions that provide for safety and low risk of escape.

e. Follow-up Maintenance Underburning would involve the controlled application of fire to understory vegetation and downed woody material when fuel moisture, soil moisture, and weather and atmospheric conditions allow for the fire to be confined to a predetermined area at a prescribed intensity to achieve the planned resource objectives. Maintenance burning usually occurs within 2 to 5 years following harvest but can occur up to 8 years following harvest. Various ignition patterns are used depending on resource objectives and site and weather conditions. The most common ignition technique used is referred to as strip-head ignition. Beginning on the uppermost end of a unit along a control point such as a road or ridgeline, fire is ignited in narrow strips running along the contour of the slope. Working down slope, strips are ignited at intervals and the fire burns upslope toward the previously burned strip of fuels. The speed at which fire is applied and the width between strips adjusts the intensity of fire to address variations in fuel conditions (amount, type, and moisture content), weather, and topography as needed to meet resource objectives.

Prescribed underburning usually occurs during late winter to spring when soil and duff moisture conditions are sufficient to retain the required amounts of duff, large woody material, and to reduce soil heating. Occasionally, these conditions can be met during the fall season.

To meet State of Oregon 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.

3. Project Design Features

Project Design Features **(**PDFs) are an integral part of the project design for each alternative. 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, the retention of snags, and delineate many measures for protecting Riparian Reserves throughout the project. Most PDFs reflect Best Management Practices and 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. BMPs would be monitored and where necessary, modified to ensure compliance with Oregon Water Quality Standards. The PDFs listed below apply to the Proposed Action (Alternatives 2).

a. Riparian Reserves

Northwest Forest Plan (NWFP) Riparian Reserves, as incorporated by the Medford District RMP, are located on federal lands throughout the project area. BLM conducted stream surveys within the Galls Foot planning area in order to ensure that all areas needing Riparian Reserve protection were identified. The stream condition was assessed, the location of wetland and unstable areas was documented, and stream channels were classified as perennial, intermittent, or dry draws (USDA and USDI 1994:C30-C31). Stream maps were updated with the new information.

Riparian Reserve widths were determined site-specifically using the NWFP Standards and Guidelines (USDA and USDI 1994:C-30-31) and the *Rogue River-Gold Hill Watershed Analysis* (USDI 2001). Riparian Reserve widths in the Galls Foot project area are as follows:

(1) Fish streams: from 320 to 400 feet slope distance on each side of the stream.
(2) Perennial nonfish-bearing streams: from 160 to 200 feet slope distance on each side of the stream.
(3) Intermittent nonfish-bearing streams and unstable and potentially unstable ground: from 100 to 200 feet slope distance on each side of the stream or draw.
(4) Springs, seeps and other non-stream wetlands less than one acre in size: 100 feet slope distance from the edge of the wetland and associated vegetation. (USDI 2001:133**)**

b. Applicable Harvest and Yarding PDFs

Objective 1: Protecting Riparian Reserves

(1) No commercial harvest in Riparian Reserves. *
(2) No use of skid trails in Riparian Reserves. *
(3) No yarding corridors in Riparian Reserves. *
(4) Trees would be directionally felled away from Riparian Reserves. *
(5) No logging slash would be piled within Riparian Reserves.

Objective 2: Reducing or Eliminating Surface Soil Erosion and Soil Productivity Loss

(1) When operationally feasible, all units would be yarded in such a way that the coarse woody material remaining after logging would be maintained at or greater than current levels in order to protect the soil surface and maintain soil productivity. *
(2) Wherever trees are cut to be removed, directional felling away from dry draws and irrigation ditches would be practiced. Trees would be felled to the lead in relation to skid trails. Irrigation ditches in the project area would be protected from damage and kept free from slash. *
(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%. 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 percent and areas with high water tables. The intent is to minimize areas affected by tractors and other mechanical equipment (disturbance, particle displacement, deflection, and compaction) and thus minimize soil productivity loss. *
(4) All skid trails would be waterbarred according to BLM standards. Main tractor skid trails would be blocked with an approved barricade where they intersect haul roads. 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 would not occur during the wet season, typically between October 15 and May 15. Approval is required by the Contract Administrator before starting operations. Some variations in these dates would occur, dependent upon weather and soil moisture conditions. Timber harvest would be shut down immediately if water quality degradation would exceed state standards. The intent is to minimize off-site erosion and sediment delivery to local waterways.*

(6) Skyline and tractor yarding would be avoided up and down dry draws. The intent is to minimize the occurrence of erosion and compaction in existing areas of concentrated surface or substrate flow. Waterbars would be constructed according to District guidelines (RMP:167).*

Objective 3: Protecting Water Developments and Water Quality

(1) Unit 6 located within the Millers Gulch drainage in 36s-3w Section 31has private water rights and a right-of-way containing a water tank and pipe within the unit; all operations in the vicinity of Unit 6 must be aware of the location of these facilities and protect them from damage during the implementation of the project.

c. Applicable Manual Pre-Commercial Thinning PDFs

Objective 1: Protecting Riparian Reserves

(1) Manual treatments vegetation treatments would *not occur* within 30 feet of long-duration intermittent streams or within 50 feet of perennial and/or fish-bearing streams (Table 2-6). *
(2) Riparian hardwood species such as willow, ash, maple, alder, pacific yew, and black oak would not be thinned.
(3) Down large woody debris over 16" diameter would not be damaged, driven over, or used for fire wood.
(4) Crossing stream channels or riparian areas with vehicles or equipment (including ATVs), would be limited to existing system roads shown on EA maps. *
(5) Piles would not be placed in channel bottoms. *

Objective 2: Reducing or Eliminating Surface Soil Erosion and Soil Productivity Loss

(1) Vegetation would be thinned using manual techniques. Slash created by the project would be hand piled or lopped and scattered. No handpiles within 50 feet either side of perennial or long-duration intermittent streams and no piling in short-duration intermittent channels or dry draws would be allowed. *
(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. Dry draw crossings would not involve any soil disturbance. *

Objective 3: Protecting Water Development and Water Quality

(1) Pre-commercial thinning activities in 36s-3w Section need to prevent damage to two independent and separate spring developments and associated pipelines during treatment activities.

Table 2-6: Riparian Reserve (RR) Buffer Distances for Manual Non-Commercial Treatment Areas

Riparian Reserve Type	Manual Treatments	Handpiles
Fish-bearing	50 ft. no treatment buffer either side of stream channel	Not allowed within 50 ft. each side of stream channel
Perennial	50 ft. no treatment buffer either side of stream channel	Not allowed within 50 ft. each side of stream channel
Long-duration intermittent	30 ft. no treatment buffer either side of stream channel	Not allowed within 50 ft. each side of stream channel
Short-duration intermittent and unstable draws	Where necessary (treating through is okay, as prescribed)	Not allowed within stream channel or draw bottom
Springs/seeps/wetlands	Not allowed in RR	Not allowed in RR

d. Applicable Prescribed Fire PDFs

Objective 1: Protecting Riparian Reserves

(1) With underburns, no ignition would occur within Riparian Reserves. Fire lines would be avoided in Riparian Reserves. *
(2) Pile burning would not occur within 50 feet of either side of the stream channel in Riparian Reserves for fish-bearing or perennial streams. No pile burning would occur within Riparian Reserves of springs/seeps/wetlands. Pile burning would not occur within 50 feet of long-duration intermittent streams or in short-duration intermittent channels (Table 2-4). No pile burning would occur within the draw bottom of dry draws. *
(3) No Mechanical piling allowed off of roads or landing areas. No mechanical piling would occur within Riparian Reserves. *

Table 2-7: Riparian Reserve Buffer Distances for Prescribed Fire Treatment Areas

Riparian Reserve Type	Underburning	Pile Burning
Fish-bearing	No ignition	Not allowed within 50 ft. either side of stream channel.
Perennial	No ignition	Not allowed within 50 ft. either side of stream channel.
Long-duration intermittent	No ignition	50' buffer
Short-duration intermittent and unstable draws	No ignition	No piles in the channel
Springs/seeps/wetlands	No ignition	Not allowed in RR

Objective2: Reducing or Eliminating Surface Soil Erosion and Soil Productivity Loss

(1) Underburns would be conducted only when a light to moderate burn can be achieved (spring-like conditions when soil and duff are moist).
(2) Firelines for underburns would be constructed manually on all slopes greater than 35 percent.
(3) Waterbars on tractor and hand firelines would be constructed according to District guidelines (RMP:167).
(4) Piles would be dispersed across treatment areas. Piles would be burned when soil and duff moisture are high.

Objective 3: Preventing Chemical Water Pollution

(1) Foam retardant would not be used in Riparian Reserves.*

e. Applicable Road/Landing Construction and Renovation PDFs

Objective 1: Protecting Riparian Reserves

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

Objective 2: Reducing or Eliminating Surface Soil Erosion

(1) Road and landing construction and renovation would not occur during the wet season (Typically October 15th to May 15th) when the potential for soil erosion and water quality degradation exists. This restriction could be waived under dry conditions Dry conditions are defined as 18% or less soil moisture measured adjacent to the road prism and at a 3 inch depth. All construction activities would be stopped during a rain event of 0.2 inches or more within a 24-hour period or if determined by the Administrative Officer that resource damage would occur if construction is not halted. If on-site information is inadequate, measurements from the nearest Remote Automated Weather Station would be used. Construction activities would not occur for at least 48 hours after rainfall has stopped and on approval by the Contract Administrator. *
(2) All new permanent roads would have six to eight inches of rock surfacing or be closed with a gate or barricade. *
(3) Landings would be treated to reduce soil erosion. Treatment of the running surface would be dependent on site conditions and would include one of the following: subsoil, till, or rip, then mulch and seed with native grasses or other approved seed; surface with durable rock material; or leave "as is" where natural rock occurs. *
(4) Bare soil due to road and landing construction/renovation would be protected and stabilized prior to fall rains. *
(5) Fill slopes on all new roads and landings would be seeded with native or approved seed, fertilized and mulched, except where rock occurs. No fertilizer would be applied within Riparian Reserves.*
(6) Slash would be windrowed at the base of newly-constructed fill slopes to catch sediment. *
(7) Temporary roads would be constructed, used, and decommissioned in the same year during the dry season, usually May 15th to October 15th. Temporary roads would be decommissioned at the completion of log haul and within the same season as constructed.
(8) All natural surface roads would be closed during the wet season. *
(9) On the midslope section of new road construction in Left Fork Foots Creek drainage, design all crossings of dry draws and swales so that any surface and subsurface flow in the draws or swales is not captured or concentrated by the road or roadside ditch, and down slope of the road, prevent any delivery of concentrated flow. Where flow may be routed over or under the road, use appropriate measures to ensure that concentrated flow is re-spread down slope of the road to allow infiltration. Ensure that the road design will not concentrate flow or route flow into draws or swales; design to meet this objective up to the 100-year return interval event.

Objective 3: Protecting 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 1995:177) 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, erodible soil, or steep slopes.

f. Applicable Culvert Installation/Replacement and Ford Installation PDFs

Objective 1: Protecting Stream Banks and Stream Channel Integrity

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

Objective 2: 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 15. Exposed soils would be seeded and mulched. 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) Sediment and erosion controls would be used during construction to minimize stream sedimentation as much as possible. Sediment control techniques may include, but are not limited to, settling ponds, silt fences, straw bales, or 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. *
(4) Streams would be diverted around the work area in a manner (e.g. a pipe or lined ditch) that would minimize stream sedimentation. The contractor would be required to submit a plan for water diversion before instream work begins. The diverted stream would not be returned to the channel through the project area until all instream work had been completed. The resource area fisheries biologist would be consulted before deviating from this practice. If it is impractical to dewater a stream channel, the work would be scheduled toward the end of the instream work period. *

Objective 4: Minimize impact on aquatic species.

(1) Culverts would be designed to ensure upstream movement of aquatic species.

g. Applicable Hauling PDFs

Objective 1: Reducing or Eliminating Surface Soil Erosion

(1) A seasonal hauling restriction would be required on natural surfaced roads prohibiting wet season hauling (typically October 15th to May 15$^{th)}$. This would protect the road from damage and decrease the amount of sedimentation that would occur. This restriction could be waived under dry conditions Dry conditions are defined as 18% or less soil moisture measured adjacent to the road prism and at a 3 inch depth. *
(2) Dust abatement would include water, lignin, magnesium chloride, or bituminous surface treatment (BST). Magnesium chloride would not be used on roads identified near botanical plant populations requiring protection.*

h. Applicable Quarry PDFs

Objective 1: Protecting Riparian Reserves

(1) No quarry development or expansion would be allowed in Riparian Reserves.

Objective 2: Reducing or Eliminating Surface Soil Erosion

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

i. Applicable Road Decommissioning PDFs

Objective 1: Reducing or Eliminating Surface Soil Erosion

(1) Road decommissioning in the Max Gulch area of Left Fork Foots Creek would be completed prior to or concurrent with road construction in that same drainage. This road decommissioning would be completed prior to October 1 of the year road construction commences. Road decommissioning would remove all culverts and fill, water bars would be constructed according to RMP standards. Disturbed soil would be seeded and mulched. The road access would be block, and camouflaged.
(2) Some road sections proposed for natural decommissioning have natural regenerated trees, brush, and downed wood that are beneficial for long-term erosion control. This material would be preserved as much as possible but the priority would be to convert all existing man-made drainage structures such as ditches, culverts and dips to a long-term no maintenance drainage configuration such as large dips, outsloped road surface, and well drained, high-capacity waterbars. Barricades, additional planting, seeding (with native or approved seed), and mulching would be done as needed to reduce erosion. Open areas would be ripped where feasible.*
(3) The primary objective for roads proposed for mechanical decommissioning would be to establish a stable, long term drainage configuration that would be self-maintaining. Existing road drainage structures such as ditches, culverts and dips would be replaced with a long-term no maintenance drainage configuration such as large dips, outsloped road surface, and well drained, high-capacity waterbars. Barricades, additional planting, seeding (with native or approved seed) and/or planting, and mulching would be done as needed to reduce erosion. The road surface would be ripped to the extent feasible without compromising the cross drainage. *
(4) Decommissioned roads would be waterbarred on each side of stream crossings in order to adequately filter road surface runoff and minimize sediment transport to streams. *
(5) In order to reduce the amount of road-related soil disturbance occurring in one season, decommissioning would occur the final dry season (usually May 15 to October 15) of the contract, while road construction and renovation would occur the first year of the contract. *
(6) Unless specifically designated, OHV use on decommissioned roads would be discouraged by placement of woody material or other appropriate barriers.
(7) All decommissioned roads within Riparian Reserves would be closed to OHV use and posted as closed all areas of road decommissioning.

j. Applicable Culvert Removal PDFs

Objective 1: Reducing or Eliminating Surface Soil Erosion

(1) During instream work, perennial streams would be diverted around each work area in a manner (e.g. a pipe or lined ditch) that would minimize stream sedimentation, unless the resource area fisheries biologist approves a deviation from this practice (i.e. if the stream is just a trickle and too small to physically divert). The contractor would be required to submit a plan for water diversion before instream work begins. The diverted stream would not be returned to the channel through the project area until all instream work had been completed. If it is impractical to dewater a stream channel, the work would be scheduled toward the end of the instream work period. *
(2) The use of settling ponds, straw bales, geotextile fabric or coconut fiber logs/bales would be used to reduce movement of sediment downstream from the project site. *
(3) Excavated material from removing stream crossings would be removed from the stream crossing area and placed in a stable location where it would not be able to reenter the stream. If necessary, sediment and erosion controls would be placed around all stockpiled material. *
(4) Stream crossings would be reestablished to the natural stream gradient. Stream side slopes would be reestablished to the natural contour then seeded (with native or approved seed) and mulched. *
(5) Sediment trapping materials (such as straw bales) would be placed at the toe of the stream adjacent side slopes.

(6) Streambanks would be seeded (with native or approved seed), mulched, and planted (with native tree species) to stabilize exposed soils as soon as possible after construction has been completed, before October 15. Tree planting would occur the following spring. 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. *
(7) Waste stockpile sites would not be located within Riparian Reserves. *

k. Chemical Water Pollution Prevention and Riparian Protection PDFs

The purchaser or contractor would be responsible for meeting all state and federal requirements for maintaining water quality. Standard contract stipulations would include the following:

- All project activities must comply with State of Oregon DEQ OAR 340-142, *Oil and Hazardous Materials Emergency Response Requirements*
- Heavy equipment would be inspected and cleaned before moving onto the project site in order to remove oil and grease, noxious weeds and excessive soil. *
- Hydraulic fluid and fuel lines on heavy mechanized equipment must be in proper working condition in order to avoid leakage. *
- Waste diesel, oil, hydraulic fluid and other hazardous materials and contaminated soil would be removed from the site and disposed of in accordance with DEQ regulations. Areas that have been saturated with toxic materials would be excavated to a depth of 12 inches beyond the contaminated material or as required by DEQ. *
- Equipment refueling would be conducted within a confined area outside Riparian Reserves. *
- Use spill containment booms or other equipment as required by DEQ. *
- Equipment containing toxic fluids would not be stored in or near (within 300') a stream channel anytime. *

l. Applicable Silviculture PDFs

Objective 1: Protecting Residual Leave Trees

(1) In pine series forests where the single tree and group selection methods are used, logging slash should be handpiled outside of the driplines of individual pine trees and burned (swamper burning).
(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.
(3) No more than 25% of the pine tree live crown should be scorched for trees 8 inches DBH and larger.
(4) Implement prescribed underburning when soil and duff moisture and weather conditions allow for low intensity burning in order to minimize tree stress and adverse effects on tree roots and foliage.

Objective 2: Create growing sites and reduce competing vegetation for natural and planted seedlings

(1) In pine site and mistletoe treatment units, where the single tree and group selection methods are used, treat logging slash and fuel loading to prepare suitable seedbeds for reproduction.

Objective 3: 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 crop 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 (7 inch DBH and smaller trees) timber should be slashed within the dripline of the old-growth trees that were released with the 15 to 25-foot crown space.

m. Applicable Terrestrial Wildlife PDFs

Objective 1: Reduce disturbance (noise & habitat) impacts to the Northern Spotted Owl (listed as Threatened under ESA)

(1) Work activities that produce noise above ambient levels would not occur within specified distances (see table below) of any nest site or activity center of known pairs and resident single between March 1 and June 30 (or until two weeks after the fledgling period) unless protocol surveys have determined the activity center to be unoccupied, non-nesting, or failed in their nesting attempt.

Table 2-8 Northern Spotted Owl Operating Restrictions

Type of Activity	Zone of Restricted Operation
Blast of more than 2 pounds of explosive	1 mile
Blast of 2 pounds or less of explosive	360 feet
Impact pile driver, jackhammer, or rock drill	180 feet
Small helicopter or single-engine airplane	360 feet
Helicopter, Type 1 or 2	1320 feet
Chainsaws	195 feet
Heavy Equipment	105 feet

(2) Prescribed burning during the nesting season within 0.25 miles of occupied habitat would be dependent upon area biologist review and concurrence. The Service will be notified of all such occurrences.
(3) Tree felling and yarding would not occur within 0.25 miles of any **known** nest site or activity center from March 1- September 30, unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in a nesting attempt. Waiver of the seasonal restriction is valid until March 1 of the following year.

Objective 2: Provide wildlife trees and habitat for cavity dependent species

(1) Retain 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) Do not target large, broken-top trees and large snags with loose bark for removal. Retain and protect these structures where possible.

o. Applicable Botanical Resources PDFs

Objective 1: Minimize or avoid impacts to Special status plant species

(1) Federal listed, State listed, Bureau Sensitive, and Bureau Assessment species within proposed treatment areas would be protected by establishing variable radius botanical reserves or seasonal restrictions (Table 3-13). Botanical reserve boundaries will be based on evaluation of species habitat needs, assessment of site and micro-site conditions, and impact of proposed treatments.
(2) In commercial units no timber harvest would occur within reserve boundaries and trees will be directionally felled away from reserve edges.
(3) Pre-commercial thinning may occur during the dormant season (varies based on species) within reserves for species that are adapted to more open light conditions. No piles or slash within reserves.
(4) Slashing of fuels may occur within reserves between July 1st and March 15th (during the dormant season). All slashed material will be piled outside the flagged reserve.

Objective 2: Minimize the spread of noxious weeds

(1) Vehicle and equipment use off existing roads in the project area would be limited to the dry season. Dry season is typically May 15 to October 15.
(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 will be field washed before moving. Field washing station would include a high pressure pump, containment mat, filter system, and a holding tank.
(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 areas proposed for quarry development would be treated prior to ground disturbance and as funding is available.

p. Implementation Monitoring

The majority of actions described under the alternatives would be implemented through a timber sale, service, or stewardship contract. Implementation monitoring is accomplished through the contract administration process. Project design features included in the project description are carried forward into contract specifications. Agency 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 deficiencies. If deficiencies are not corrected work stops.

D. ACTIONS AND ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

This section describes actions and/or alternatives that were considered during analysis but were eliminated from detailed analysis under Alternatives Analyzed in Detail.

No Helicopter Logging: This alternative would have eliminated helicopter yarding as an option for moving trees from forest stands to landing areas.

Rationale for Elimination: This alternative would have required increased roading to access units not currently accessible from existing forest roads, thus increasing road densities and impacts on resources in the project area in comparison to the proposed action. This alternative was therefore eliminated from

detailed study. While the proposed action actually shows a net decrease in the amount of roads due to proposed road decommissioning, increases in sedimentation associated with forest management activities is attributed mostly to roads (See Chapter 3, Water Resources). One of the objectives identified in the purpose and need statement is to "Design and implement a transportation system within the Galls Foot project area that provides access for the management of resource program areas (RMP p. 86) including timber resources and rural interface areas, while reducing their effects on water, soils, fish…" therefore, an alternative that would eliminate helicopter yarding and greatly increase road construction and the potential for increased sediment was eliminated from detailed study.

No new road construction: This alternative would have eliminated any new road construction needed to improve vehicle access for the purpose of managing forest stands.

Rationale for Elimination: The RMP directs that all silvicultural systems (forest thinning strategies) applied to achieve forest stand objectives would be economically practical (ROD/RMP p. 180; PRMP/EIS p. 2-62). The economic feasibility of forest management actions is affected by the ease of access from the forest road system. An alternative that would eliminate all new road construction would have made it operationally infeasible and/or uneconomical to manage areas of the forest stands selected for thinning treatments to meet the stated purpose and need (Chapter 1) due to the distance from road systems. This would have resulted in no treatment of lands that are designated for permanent forest production under the Medford District RMP. Therefore, this alternative was eliminated from detailed study.

No helicopter logging - No new roads: This alternative would have eliminated any new road construction needed to improve vehicle access for the purpose of managing forest stands and would have eliminated helicopter yarding as an option.

Rationale for Elimination: Under this alternative it would have been operationally infeasible to manage some forest stands within the project area; management of some stands would have been economically impractical. This would have resulted in no treatment of lands that were selected for forest thinning to meet the stated purpose and need (Chapter 1) due to the distance from road systems. This would have resulted in no treatment of some lands that are designated for permanent forest production under the Medford District RMP. Therefore, this alternative was eliminated from detailed study.

Imposed Diameter Limit: Based on public opinion, this alternative would have imposed a diameter limit ranging from 6 inches to 20 inches.

Rationale for Elimination: Silvicultural systems prescribed for this project are based on the existing stand structure and species composition compared to the desired stand structure and species composition and the ability, based on site characteristics (soil characteristics, elevation, aspect, etc) to achieve and maintain the desired conditions over time. There is no proven scientific basis for the use of a 17-inch diameter limit (or others suggested) to meet the identified purposes and needs for the Galls Foot Project. The use of a diameter limit would arbitrarily limit the use of the silvicultural prescriptions to meet the prescribed objectives. Some examples of when the removal of trees greater than 17 + inches is required (also see Appendix C, Silvicultural Prescription):

- ✓ When a reduction in stand density is needed to improve the growth and resiliency of the remaining trees and where insufficient smaller trees are available to decrease density to necessary levels. In other words, it may be required to harvest larger diameter classes, from below, to reach the level of density reduction required to induce the desired response.
- ✓ Where the removal of a particular species is desirable in order to enhance the growth and survival of another, more desirable species. For example, where Douglas-fir has encroached onto sites

where ponderosa pine and sugar pine are more stable in their environment. An unrestricted ability to manipulate species composition is essential to the silviculturist.

- ✓ Where the management objective is to recruit regeneration into the stand. Openings, large enough to allow sunlight to reach the forest floor are required to promote a new generation of seedling establishment.
- ✓ Where forest pathogens and insects are creating undesirable stand conditions. Often, stand manipulation becomes desirable to control, reduce or inhibit the spread of damaging forest insects and disease, such as dwarf mistletoe and bark beetle outbreaks.
- ✓ Where over-stocking has weakened trees causing imminent mortality among those trees considered large. Frequently, where density is high, drought and insects exacerbate forest decline in older stands, thus the removal of dead and dying trees is desirable. This also contributes to a reduction in surface fuel as dying limbs and tops are recruited onto the forest floor fuel bank.
- ✓ Where young tree growth or the growth of shade intolerant species is being compromised by adjacent larger trees. A reduction in stand density, that includes the harvesting of larger trees, is often necessary to promote growth of a younger stand cohort.
- ✓ When a particular stand structure, to improve wildlife habitat and enhance stand biological diversity is favorable, the removal of select individual trees independent of diameter size, is warranted.

An alternative setting a diameter limit on harvesting trees would not be supported by scientific evidence, is not required by any law or regulation, and would cause the project to fail to meet one or more of the stated objectives in the statement of purpose and need for the proposed action.

Maximize economic return by utilizing more aggressive harvest prescriptions for the units proposed for thinning or increae the number of units to be treated.

Rationale for Elimination: The Medford District RMP adopted a set of silvicultural treatments for managing conifer forests on Matrix lands including regeneration harvest, commercial thinning (density management), and selection harvest (RMP Appendix E, Silvicultural Systems Utilized in the Design of the Resource Management Plan). While a more aggressive approach to forest management may meet the economic and wood supply goals of the project, it would not meet the balanced ecological approach to supply wood products while providing for species habitats sought after in the RMP (RMP p. 16-17). Intensive harvest could limit the acres treated by concentrating harvest on fewer acres. It would not provide the opportunity to treat additional acres of the landscape to restore forest stand health, vigor and reduce fuel loading over a wide area. Not treating understory ladder fuels and young stands would not provide the reduction of fuel hazard and increase of vigor expected from those treatments. Therefore, this action was eliminated from detailed study.

Multiple routes of new road construction were considered but eliminated from the proposed action.

Rationale for Elimination: Many alternative routes were considered to provide road access to the areas proposed for treatment but ultimately rejected from the Proposed Action. The ID Team worked to review numerous options and routes and chose those which met the multiple resource goals the best for incorporation in the Proposed Action. The team chose routes that minimize the resource impacts and the amount of new road construction required to treat the areas proposed. Other routes initially considered would increase the density of roads in the project area beyond acceptable limits and may have chosen locations of new roads in potentially unstable terrain. New roads originally considered were dropped because of the trade off between economics, access and potential for unwanted resource impacts.

No harvesting within existing northern spotted owl nesting roosting and foraging habitat:
Some people do not support and have requested an alternative that would not harvest timber within stands currently functioning as nesting, roosting or foraging habitat for the northern spotted owl within the Galls Foot project

Rationale for Elimination: Northern spotted owl habitat within the project area is designated as Matrix lands allocated to the production of a sustainable supply of timber and other forest commodities. This land designation was the culmination of both Regional and local planning; the issuance of 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) and the *Medford District Record of Decision and Resource Management Plan,* which incorporated the Northwest Forest Plan. Late-successional Reserve and Riparian Reserve land allocations were also designated with the implementation of the Northwest Forest Plan and Medford District RMP to protect and enhance late-successional and old-growth forest ecosystems which serve as habitat for late-successional and old-growth related species including the northern spotted owl.

Prior to the implementation of the Medford District RMP (which incorporated the Northwest Forest Plan), the US Fish and Wildlife Service (USFWS) designated critical habitat as critical habitat units (CHUs) across Washington, Oregon, and northern California to provide additional protection for the northern spotted owl. Consultation has been conducted with US Fish and Wildlife Service (see Chapter III, Environmental Consequences, Wildlife Section) to ensure compliance with the Endangered Species Act in regards to the northern spotted owl. Silvicultural prescriptions proposed under the Galls Foot Project could contribute to long-term maintenance of large tree structure and trees with old-growth characteristics over time in the Rogue River-Gold Hill Watershed by reducing overly dense stands which reduce the potential for stand replacing wildfires and large-scale loss to competition and disease.
No harvesting of existing late-successional forests: This alternative is very similar to the alternative proposed above (no timber harvest in northern spotted owl nesting, roosting, and foraging habitat).

Rationale for Elimination: Late-successional habitat within the project area is designated as Matrix lands allocated and scheduled for the production of a sustainable supply of timber and other forest commodities. This land designation was the culmination of both Regional and local planning; the issuance of 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) and the *Medford District Record of Decision and Resource Management Plan,* which incorporated the Northwest Forest Plan. Late-successional Reserve and Riparian Reserve land allocations were also designated with the implementation of the Northwest Forest Plan and Medford District RMP to protect and enhance late-successional and old-growth forest ecosystems which serve as habitat for late-successional and old-growth related species including the northern spotted owl. Silvicultural prescriptions proposed under the Galls Foot Project could contribute to long-term maintenance of large tree structure and trees with old-growth characteristics with the over time in the Galls and Foot Creek Watersheds.

Using only prescribed fire to thin and achieve forest management objectives. This alternative would have treated vegetation within the planning area using only prescribed burning to reduce vegetation densities and hazardous fuels.

Rationale for Elimination*:* In conifer stands, using prescribed fire alone would not be effective in

reducing stand densities to improve the vigor and health of stands. The energy release from prescribed fire (underburning) as the initial treatment would exceed desired intensity levels and have undesirable effects on vegetation and soil. A combination of manual treatments with prescribed fire is necessary to insure all resource objectives are met. Prescribed underburning alone would not meet one purpose identified for this project which is to supply timber in contribution of the Medford District's Allowable Sale Quantity.

Wildland Fire Use for Resource Benefits: The use of wildland fire for resource benefits is the method of allowing naturally ignited (lightning-caused) fire to burn assisted by fire management response to meet prescribed resource objectives for an area.

Rationale for elimination: The use of natural-caused fires in southwest Oregon is very limited if at all possible. Lightning usually results in fire ignitions during the period from late spring through fall when soil and fuel moistures are dropping or very low. The low fuel moistures combined with heavy fuel loads increase the likelihood of large forest replacing wildfires. BLM lands within the planning area are located within Wildland Urban Interface; there is a high level of concern for protecting lives and property. The use of prescribed fire, during periods when fuel and soil moistures allow for its controlled application, remains the preferred option for reintroducing fire to meet both ecological and social objectives.

Additionally, the use of fire alone would not meet the need to supply timber in contribution of the Medford District's Allowable Sale Quantity and to provide sustainable forest products from lands managed under the Oregon and California Lands Act.

A. INTRODUCTION

This chapter presents a description of the anticipated effects of implementing the proposed action along with the existing (baseline) physical, biological, human social and economic environment that may be affected by the Proposed Action. The discussion of Affected Environment describes the existing conditions within the Project and analysis areas associated with the implementation of proposed actions and provides a basis for understanding the consequences associated with implementation of alternatives considered in detail. Only substantive site-specific environmental changes that would result from implementing the proposed action are discussed in this chapter. If an ecological component is not discussed, it should be assumed that the resource specialists have considered effects to that component and found the proposed action or alternatives would have minimal or no effects.

The Council on Environmental Quality (CEQ) regulations direct agencies to succinctly describe the environment that could be affected along with describing the importance of the impacts (40 CFR 1502.15).

For this discussion a direct effect on a resource is considered to be an immediate observable change that occurs at the time and place of project implementation. Indirect effects are changes caused by the action that occur later in time or are farther removed in distance but are still reasonably foreseeable

Within this Chapter, the terms “effect” and “impact” are used interchangeably. An effect/impact is described as any physical, biological, or human social change, which directly or indirectly results from implementation of an action being considered. Impacts may be adverse or beneficial, depending on the type of change and the resource being considered. The focus of this consequence discussion is on the relevant issues identified in Chapter I, and their associated environments.

Effects Assumptions

The current conditions on the lands affected by the proposed action result from a multitude of natural 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 will 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 easier, more accurate, and less costly ways to obtain the information concerning 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 definition of “cumulative impact” in 40 CFR § 1508.7.)

A description of the current state of the environment inherently includes the effects of past actions and serves as a more accurate and useful starting point for a cumulative effects analysis, than attempting to establish such a starting point by “adding” up the described effects of individual 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. Here the cataloguing and analysis of the effects of other present and reasonably foreseeable actions relevant to the effects of the proposed action is necessary, and has been described below. By comparing this total effect of the “no action” alternative to the effects described when adding the proposed action, we can discern the “cumulative impact” resulting from adding the “incremental impact” of the proposed action to the current environmental conditions and trends.

Watershed analysis, a component of the Aquatic Conservation Strategy developed under the Northwest Forest Plan and incorporated into the Medford District RMP, is a useful analysis for gaining an understanding of ecological processes and how those processes are functioning within a given watershed. Watershed analysis characterizes the human, aquatic, riparian and terrestrial features, conditions, processes, and interactions within a watershed. Knowledge gained through watershed analysis enhances the agency's ability to estimate direct, indirect, and cumulative effects of our management activities (REO Federal Guide to Watershed Analysis p. 1). The 2001 South Rogue-Gold Hill Watershed Analysis provided a coarse filter analysis generally using existing data and information, but is useful in identifying issues of importance to analyze in greater detail during project specific analysis. Some issues identified during watershed analysis have been analyzed and addressed at broader scales in association with regional and land use plans; the link from this site specific project to these broader analyses have been noted where applicable in this Environmental Assessment.

Direct, indirect, and cumulative effects analyses completed for resources affected by the Galls Foot project describe indicators of importance along with the spatial and temporal scale of importance (analysis area) 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. For example:

- Road densities occurring within the planning area or various analysis areas and the attributes of the road system (surfaced or unsurfaced, location related to streams, slope position, general condition, etc.) are important for understanding the potential for cumulative effects of the proposed action. This information can easily be obtained from the Districts GIS system, aerial photos, and field reconnaissance. To catalogue each road by year of construction and name of the project would be irrelevant detail for understanding the incremental impact of the Galls Foot project when added to other past, present, and reasonably foreseeable future actions.
- Knowing whether a plantation was created in 1975 or 1985 and with what project does not contribute to knowing how that plantation will influence fire behavior, as fuel specialists recognize plantations as a certain fuel type and they are addressed accordingly in the analysis of fuel hazard mapping.
- Silvicultural information is obtained for stands within a planning area providing information on species composition, stand age, growth, vigor, and presence of disease and insects needed to prescribe treatments to maintain productive forest stands. Having the exact stand history does not lead to better silvicultural prescriptions and decisions and would be unnecessary detail.
- Information on vegetation structural components (tree size, canopy closures, snags and coarse woody material, etc.) and species composition can easily be obtained from aerial photography, silvicultural surveys, and vegetation and habitat data layers contained in GIS combined with on-the-ground reconnaissance. This information is used by wildlife biologists to assess current conditions from past actions and determine the effects of a proposal on various wildlife habitats and species.

For the reasons described above, this document does not contain a detailed catalogue (or chronology) of past actions; to do so would provide irrelevant detail and would not contribute to a better understanding of conditions which are to be addressed through this analysis. Rather, the analysis of direct, indirect and cumulative effects contained in this EA focuses on cause and effect relationships deemed important for determining the impact on the environment which may result from the incremental impact of the Galls Foot Project when added to other past, present, and reasonably foreseeable future actions and whether or not there is potential for this proposal to contribute to significant cumulative effects beyond those addressed in programmatic land use plans.

B. VEGETATION/SILVICULTURE

This section discloses effects on vegetative composition and structure, insects and diseases. Noxious weeds are covered in the Botany section.

Issues/Concerns

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

- Density of forest stands are too high for long term forest health
- Declining vigor of forest stands
- Loss of shade intolerant species such as ponderosa pine and sugar pine
- Concern for loss of old growth

Affected Environment

The present day landscape pattern of the vegetation in the Galls-Foot project area is a result of topography, fires, wind events, timber harvesting, and agricultural/residential land development. There is a natural diversity of vegetation condition classes within stands and between stands whose boundaries are generally dictated by slope, aspect and past disturbance. Aspect is an important determinant in vegetation changes. Ridges with westerly to southerly aspects and areas with shallow soils have severe growing conditions with shrubs and grasses dominating these sites. As a result, the majority of the timber stands are separated by grasslands, shrublands or oak woodlands. These influences create a coarse-grained pattern across the landscape with a mosaic pattern of different vegetation types and seral stages.

BLM administered land within the planning area is presently composed of the following vegetation types: grassland, 126 acres; shrubland, 372 acres; hardwood/woodland, 3,291 acres; seedlings/saplings (0 to 4.9 inches DBH), 669 acres; small conifer timber (5 to 11 inches DBH), 1,729 acres; large conifer timber (11 to 21 inches DBH), 2,626 acres; and mature timber, 2,255 acres.

Approximately 4,614 acres of forestland are proposed for timber management in the Proposed Action. 2,870 acres are proposed for young stand density reduction by pre-commercial thinning. 1,743 acres are proposed for commercial timber harvest using thinning and regeneration silvicultural prescriptions. Most of the planning area is below 4,000 feet elevation and is composed of dry Douglas-fir and pine tree series forest. Grasslands, shrublands, and woodlands comprise 33 percent of the total project area. Only 5 percent of the forestland base is considered moist Douglas-fir site where large trees could persist for centuries. The majority of the existing forest stands were created as a result of large scale fires in the nineteenth and early 20th centuries. Only relatively small forest stands, ranging from 3 to 68 acres or clumps of trees with old-growth characteristics can be found. The better growing conditions in the streamside riparian areas serve as corridors of larger diameter trees across the landscape. These occur along Foots Creek and Galls Creek and the larger gulches that flow into them. The diverse topography and aspect changes tend to keep the forest stand size very small across the landscape. In most of the dry Douglas-fir and pine forest there is less than one old-growth tree per acre. One old-growth tree per acre does not necessarily make an old-growth forest. The sites are dry and not conducive to high stocking levels of old trees especially on south facing slopes.

Some of the forest lands within the Galls-Foot planning area have been previously harvested. A variety of harvest techniques have been used from clear cutting to individual tree selection methods. Six percent of the planning area is in an early seral stage. Natural mortality has also created openings in the canopy layer. Natural mortality is a result of Douglas-fir dwarf mistletoe, bark beetles, and windthrow. The understory of these stands consists of dense pockets of conifer regeneration, hardwoods, and shrubs. The regeneration ranges from seedling to small pole size trees, with many of these suppressed. These stands would benefit from pre-

commercial thinning. There are approximately 2,870 acres of natural stands that have been selected for pre-commercial treatment in the project area.

In the planning area, many of the commercial forest stands originated from fires between 1803 and 1963. Most of the forest stands became established within 10 years after a fire, although the harsher sites may have taken 30 to 40 years to become forested. Because the fires were stand-replacing in nature, individual forest stands now tend to be even-aged. This means that there are many stands with trees of the same age class and almost equal in height, with few older trees scattered throughout. The majority of the trees in the project area are between 28 and 124 years old. However, there are 146 to 300 year old trees in fewer numbers. The oldest trees found were 340 and 400 years old. The age classes greater than 170 are the least frequently found. These older stands or patches of older trees are in the understory reinitiation stage of forest development and vertical stand structure is diverse. Understory reinitiation occurs when the existing trees die off and create openings in the canopy large enough for light to penetrate and new young trees to start growing. The oldest forest stands are found in riparian areas with north to east aspects.

There are young, healthy forest stands (28 to 75 years of age) scattered among the older, overstocked stands. Some pole stands are suppressed; diameter growth on over 70% of these stands is very slow with less than 1 inch per decade. These stands are still in the stem exclusion stage. They are characterized by a closed canopy and high stocking levels (sometimes more hardwoods than conifers) with many suppressed trees, resulting in poor individual tree vigor. The average canopy closure for the Galls-Foot project area is 86 percent and ranges from 34 to 100 percent. Some forest 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. Most silvicultural activities resemble particular natural disturbances that are inherent to forests and therefore do not create entirely unnatural stands (Oliver & Larson, 1996).

There are three tree series in the Galls-Foot project area: Douglas-fir, ponderosa pine, and white oak. Plant association descriptions within these series can be found in *Preliminary Plant Associations of the Siskiyou Mountain Province* (Atzet and Wheeler, 1984) and *Field Guide to the Forested Plant Associations of Southwestern Oregon* (Atzet et.al., 1996: Table 1).

On the drier sites the PSME (Douglas-fir)/RHDI (poison oak) and PSME/RHDI-BEPI (Piper's Oregongrape) plant associations are most prevalent. Pine and white oak series forests are usually found on south and west aspects and the lowest elevations ((PIPO-QUKE (California black oak) and QUGA (Oregon white oak)-PSME/RHDI)). When rainfall is more abundant, or the aspect is more conducive to cooler temperatures, plant associations most often found include PSME-PIPO (Douglas-fir/ponderosa pine), and PSME/BENE ((Douglas-fir /dwarf Oregongrape). At higher elevations PIPO-PSME sites are found.

Subtle changes in species composition and stand structure are occurring over the landscape. Many second growth trees and trees with old-growth characteristics are dying as a result of high tree stocking levels and competition for moisture. Douglas-fir, referred to as the climax species, is replacing ponderosa pine, sugar pine and incense cedar because of its more shade-tolerant nature. Douglas-fir is encroaching upon the edges of the oak woodlands, and mortality of Douglas-fir along these edges has been noticeable during the last few years. Whiteleaf manzanita and ceanothus species are migrating into the oak woodlands and grasslands replacing the oaks, pines, and native grass species. In the shrublands, mountain mahogany and serviceberry are mostly in the mature stage with little of the early life stage represented. This is because of the lack of fire disturbance. In the mid-size vegetation condition class, suppressed shrubs and hardwood trees beneath the dominant tree canopy layer are dying. Pacific madrone and oak species have dropped out of conifer stands where light and water have become limiting. Dead whiteleaf and greenleaf manzanita may be found in the understory of some conifer stands and is indicative of a vegetation shift from shrubs to trees. This may also indicate that manzanita is the species that will pioneer the site following future disturbance. Other shrub species dying out of the conifer stands include deerbrush ceanothus, creambrush oceanspray, and serviceberry.

Currently, the stocking levels of stands throughout the project area are high. This is primarily due to the lack of natural disturbance and fire exclusion. Trees per acre range from 217 to 1,580. The overall average for the Galls-Foot project area is 530 trees per acre. Average radial growth for the last decade at the time of inventory is .68 inches. The average relative density for the area is .64 and indicates that physiologically the trees are at the point of suppression and mortality. Vegetation densities are also extremely high in the shrublands and woodlands and indicate an increased potential for fire. The average tree vigor index, as measured by leaf area index is 53. Trees with vigor indices below 30 will succumb to attack from bark beetles of relatively low intensity. Trees with vigor indices from 30-70 can withstand progressively higher attacks but are still in danger of mortality from the insect attacks. Trees with vigor indices from 70-100 can generally survive one or more years of relatively heavy attacks and trees with indices above 100 generally cannot be killed by bark beetles (Waring, 1980).

Bark beetle infestations are present in the project area. Western pine beetles *(Dendroctonus brevicomis*) and pine engraver beetles (*Ips emarginatus*) are attacking the pines while flatheaded fir borers *(Melanophila drummondi*) and Douglas-fir beetles *(Dendroctonus pseudotsugae*) are killing Douglas-fir. Drought conditions and high tree stocking levels are severely stressing the trees physiologically, enabling the beetles to enter and kill the trees.

Forest pathogens are also changing the forest stand structure and forest development pattern. *Phellinus pini* (red ring rot) is affecting Douglas-fir and ponderosa pine. It appears to be more common on dry sites when trees are stressed. Some of the infected trees are beginning to die or are subject to stem breakage thus allowing light to reach the forest floor and the understory reinitiation stage to begin. *Phaelous schweinitzii* (brown cubical butt rot) is also present. Douglas-fir dwarf mistletoe is the most significant pathogen throughout the project area with approximately 140 acres infected to some degree.

In the project area, the overall average amount of coarse woody material (CWM) is approximately 6.8 tons per acre (range: 0 to 19.8 tons/acre). The coarse woody material stem diameters are concentrated in the 8 to 39 inch classes at the large end and average 1,082 feet per acre for all decay and diameter classes. Coarse woody material is most often found to be in a decomposition class 3 (twigs and branches gone but bole is still round, hard and in large pieces) and 4 (bark and branches are gone and bole is now round to oval). Mid sized class stands (11 to 21 inches DBH) have an average of 20 snags per acre with an average DBH up to 16 inches, and mature stands (21 inches DBH and larger) have 10 snags per acre with an average DBH of 22 inches. Snags over 40 inches DBH were found.

Environmental Consequences

Alternative 1 - No Action

No action would allow forest stands to remain at very high densities. Stand densities would continue on this trajectory and competition levels would increase. The current average relative density for the planning area is .64 and indicates that physiologically the trees are at the point of 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.

Without action, forest structure and species composition could not be controlled. On pine sites, Douglas-fir would remain the most prevalent species and stands would remain in the stem exclusion stage of development if mortality does not occur. Average radial growth for the last decade at the time of inventory is .68 inches. As a general rule, stands where growth rates are greater than or equal to 1.5 inches of diameter growth per decade are less prone to pine bark beetle attack (USDA, 1998).

Without management action, individual old-growth ponderosa pine, old-growth sugar pine, and old-growth Douglas-fir trees, with seedlings through poles within their dripline, would continue to die from competition for water. Pine and oak species would continue to decline in number from competition with Douglas-fir because of

their shade intolerance. 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 reinitiation stage. This is a transition phase when trees in the main canopy layer start to die, either singly or in small groups, from lightning, wind-throw, or insects and disease. 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 and unhealthy forest structure, prone to insect infestation, catastrophic fire, and eventual dieback from intense competition. The hundreds of trees per acre also present a high fuel hazard across the landscape. The Medford District RMP describes the Forest condition (Forest Health) Resource Condition 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, 1994). No action contradicts the Medford District Resource Management Plan forest condition objectives in regard to forest health.

With no forest stand density reduction, slow tree growth and vigor will result in individual tree and perhaps stand mortality. A decrease in stand vigor is expected with continued overstocking and increasing stand age. A relative density index rating of .55 for any given stand marks the point of imminent mortality and suppression; crown closure occurs at a RDI of .15 (Drew and Flewelling, 1979). The current average relative density for the area is .64 and indicates that physiologically the trees are at the point of suppression and mortality. In regard to stand growth and vigor the forest is unhealthy. All environments with finite resources can only support a finite amount of living biomass (Oliver and Uzoh, 1997). Future silvicultural options diminish when severe stand mortality results. Bark beetles may disperse to adjacent non-thinned watersheds and kill more conifer trees. Conversely, hardwood tree, shrub and forb species would become more abundant.

Pine species would continue to decrease in number if large openings are not created for these shade intolerant species. The more shade tolerant Douglas-fir would continue to dominate the forest and species diversity would decline.

Leaving the commercial forest land untreated could increase the occurrence of bark beetle attack even in nearby treated stands. Mortality of untreated stands could cause epidemic levels of bark beetle species that could infect adjacent thinned forest stands. Leaving these acres untreated would also decrease the effectiveness of fuels hazard reduction in adjacent treated stands leaving forested stands at greater risk of loss to stand replacing fire events. (See Section C, Fire/Fuels Management).

Where dense forest stands persist overtime, canopy closure would remain at 80 to 100 percent. When tree mortality is singular or in small patches, canopy closure may approach 50 to 80 percent. In pockets of mortality, canopy closure would range from 0 to 40 percent. Without reducing the number of trees per acre, some forest stands will fall below 60 percent canopy closure naturally.

Fire hazard would increase with the abundance of dead vegetation and ladder fuels, and would be at maximum levels.

Alternative 2 - Direct and Indirect Effects

The proposed prescriptions to be applied across the forest landscape are based upon the present vegetation structure, species composition, aspect, and vegetation condition class, to allow for the creation of more vigorous, drought and fire resilient forest structure and the desired tree series over time. Through forest stand treatments, tree densities are reduced thus allowing for improved individual tree vigor and growth, and improved forest health. Forest stands receiving commercial thinning treatments would also be less subject to crown fires. Table 2 of the silvicultural prescription (Appendix C) shows projected 20-year diameter growth for treated and untreated stands (projections from the southwest Oregon ORGANON growth analysis model). Table 4 (Appendix C) shows the projected growth of one large conifer stand (11 to 21 inches DBH) and one mature conifer stand with and without management. In the mid sized stands hundreds of trees per acre are lost through

natural mortality versus being utilized through timber harvesting at a specified rate as recommended in Appendix C, Table 3. Table 2 in Appendix C, also shows that 10-year diameter growth will increase substantially versus the no treatment alternative if the stands are treated accordingly. Trees will then be vigorous enough to withstand bark beetle attacks. Leaf area index values should begin to increase after the stands are thinned.

With the group selection prescription, pine and cedar species will be favored to increase their prevalence in the forest stands thus enhancing species diversity.

The various prescriptions meet the specifications of restoration thinning and density management as outlined in the Medford District Resource Management Plan.

. Proposed road construction would reduce the cost of pre-commercial thinning because of better accessibility. The excess, small diameter trees less than 8 inches DBH cut from under the drip lines of old-growth trees would improve their long term survival. Elsewhere, the excess tree stems thinned to a desired stocking level would improve the growth and vigor of the remaining trees and would achieve the desired species composition goals..

Forest stand thinning and regeneration harvesting is what directs future stand growth and new forest developmental to meet the objectives described for Matrix lands under the Medford District BLM Resource Management Plan. Forest stands that would be commercially thinned under this proposal would have a greater value per acre in future entries (in 20 to 70 years) in comparison to the No-Action Alternative. As a result of the prescriptions applied, drought resistant conifer species such as ponderosa pine and incense cedar will be present in future stands where appropriate in regard to site conditions. Maintaining species that are best adapted for site conditions also provides for long-term maintenance of forest stands that are more resilient to disturbance agents such as insects, disease, and fire.

The Medford District Record of Decision and Resource Management Plan (1994) specifies that forests be managed toward a variety of stand structures, stands containing trees of varying age and size, and stands with an assortment of canopy configurations. Over time, forest should be managed for a balance of seral stages. Silvicultural prescriptions address individual stand variation therefore retaining canopy closure and structural variation across the landscape (see Chapter II, Components of the Proposed Action Alternative and Appendix C, Silvicultural Prescriptions). On Douglas-fir sites, including pole stands, canopy closure would be 51 percent or greater. On pine and Douglas-fir regeneration harvest sites, canopy closure would be approximately 40 percent. Pine species are shade intolerant so canopy closure must be lower to allow for successful regeneration and growth of young pine trees.

The proposed road construction would facilitate pre-commercial thinning on 2,870 acres to achieve species composition goals and to improve the growth and vigor of the younger trees. Pre-commercial thinning would also help to reduce the fire hazard by reducing ladder fuels reducing the risk of loss of forest stands across the landscape due to stand replacing wildfire (see Section C, Fire/Fuels Management). Pre-commerical thinning is proposed in Riparian Reserves and the thinning of young trees in the reserves will accelerate development of needed tree size and structure contributing to long-term Aquatic Conservation Strategy goals.

C. FIRE/FUELS MANAGEMENT

This section discloses impacts to fire regimes from fuels and forest health activities such as prescribed fire, thinning, logging, and fuels reduction treatments, and from activities associated with the construction and use of roads. Smoke impacts, as a result of prescribed fire, are discussed in "Air Quality".

Issues/Concerns

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

- Timber harvesting would increase surface fuels over the short-term (6 months to 2 years) in stands treated. Some people expressed their concern that leaving untreated logging slash, even if only for a short period of time, could lead to increased wildfire behavior and increased risk of escape from initial attack.

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

- Young tree plantations burn at high intensities and are more susceptible to severe fire effects especially where thinning slash remains untreated. Some people expressed their concern that the Galls Foot Project would increase the amount of area in young tree plantations.

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

- New road construction could increase fire risk by increasing vehicle access to areas previously inaccessible by road. New roads, along with opening forest stands and brushfields, can also lead to increased off-highway vehicle use, which could result in additional fire risk.

The following fire and fuels management issue was found to not be relevant to the Galls Foot project.

- The potential cumulative effect of livestock grazing and opening forest canopy was not considered because there is no active livestock grazing or plans to have livestock grazing where timber harvest is being proposed.

Affected Environment

Fire Disturbance History

Fire is recognized as a key natural disturbance process throughout southwest Oregon (Atzet and Wheeler 1982) (Agee 1993). The landscapes that comprise the planning area evolved with frequent fires affecting the vegetation and other key components of the ecosystem. Human-caused and lightning fires have been a source of disturbance to the landscape for thousands of years. Native Americans influenced vegetation patterns to enhance values that were important to their culture (Pullen 1995). Early settlers to this area used fire to improve grazing and farming and to expose rock and soil for mining. Fire has played an important role in influencing successional processes. Large fires were a common occurrence in the area based on fire scars and vegetative patterns and were of varying severities (USDI 2001: 26).

Historically, frequent, low intensity fires maintained dry Douglas-fir and pine forest types in more open conditions than exist today (Agee 1993). Frequent, low intensity fires served as a thinning mechanism, thereby, naturally regulating the density of the forests. A more open crown structure would have allowed fire to travel more rapidly across the site with intensities that were short-lived. The light flashy surface fuels (grasses, shrubs, and conifer/hardwood litter), the repeated reduction of conifer reproduction underneath the overstory, and the repeated consumption of large fuels and duff build-up, would have reduced the post-fire effects (also described as fire severity) found on these sites historically. The qualities of the open crown structure would also provide better avenues for the heat intensity to vent out of the site without scorching the crowns to the lethal limit. However, there is evidence that stand replacement fires did occur historically (South Rogue-Gold Hill Watershed Analysis, p. 27), 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.

Fire Exclusion

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

In ecosystems that historically burned frequently, particularly the ponderosa pine and the dry mixed-conifer forest types found in the lower and mid elevation areas of the Medford District BLM (Sensenig 2002; Huff and Agee 2000), the exclusion of fire combined with periods of higher than normal precipitation has promoted increases in fuel quantity and changes in fuel continuity and arrangement.

Historically frequent, low intensity fires maintained these forest types in an open condition which were dominated by large-diameter trees. Forest stand attributes have changed to a denser and more closed canopy situation with more surface fuels at any given time through the decomposition cycle. Trees facing such intense competition 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. Increased tree mortality contributes to increased dead and down fuel loadings. High intensity fires can damage soils and often completely destroy riparian vegetation. The fire behavior type that these sites would support has also changed. 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.

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

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

Past Logging Practices

Commercial timber harvesting has occurred in the Galls Foot planning area on BLM managed lands since the early 1960's. Harvest techniques that have contributed to the current moderate/high fire hazard are clear cut the harvesting, which created younger more flammable stands of trees, and harvesting that focused on the overstory removal of large diameter trees which reduced the fire resiliency of some stands. Clearcutting was last done on federal lands in Galls Foot area in the mid 1990's.

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 hardwood forests of southwest Oregon and Northern California Siskiyous prevents generalizations about fire and its ecological effects (Agee 1993 p. 283-284). This is also true for the lower to mid elevations of the Galls Foot planning area which is characterized by steep terrain, Douglas-fir and pine forest types, and a history of anthropogenic fire use (South Rogue-Gold Hill Watershed Analysis p. 26). 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's to the change from historical to current vegetative structure. The change in vegetation also helps to describe the difference in fuel loading (dead fuels and live in the form of increased vegetation) from historical to current conditions.

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

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

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

Typical climax plant communities include ponderosa pine, pine-oak woodlands, and oak woodlands. Large stand-replacing fire can occur under certain weather conditions, but are rare events (i.e. every 200 years). Approximately 826 acres proposed for treatment are classified as Fire Regime 1.

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. Approximately 315 acres proposed for treatment are classified as Fire Regime 2.

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

Typical plant communities include mixed conifer and very dry westside Douglas-fir. 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. Approximately 1,336 acres proposed for treatment are classified as Fire Regime 3.

Predicted climate changes

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

Condition Class

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

> **Condition Class 1 -** Fire regimes are within or near an historic range. The risk of losing key ecosystem components is low. Vegetation species composition and structure are intact and functioning within an historical range.
>
> **Condition Class 2 -** Fire regimes have been moderately altered from their historical range (more than one return interval). This change results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns.
>
> **Condition Class 3 -** Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. This change results in dramatic changes to fire size, frequency, severity, or landscape patterns.

Plant communities proposed for treatment in this project area such as ponderosa pine and oak woodlands (fire regime 1) are in condition classes 2 and 3. The pine sites proposed for treatment have a dense understory of Douglas-fir and brush due to the absence of fire and the Oakwoodlands have a dense brush understory..

The dry westside Douglas-fir stands (fire regime 3) proposed for treatment are in condition class 2. There are small portions of these stands that are in condition class 1 and 3. Stand densities are extremely dense due to the absence of fire.

The shrublands (fire regime 2) are in condition classes 2 and 3.

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, 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 1967 to 2004 show a total of 138 fires occurred throughout the project area. Lightning accounted for 12 percent of the total fires and human caused fires accounted for 88%. The following table is a break down of the fires within the project area:

Table 3-1 Fire Number by Size

Total Number of Fires	*Size Class*	*Size*
97	*A*	*<.25ac*
37	*B*	*.26-10ac*
4	*C*	*10.1-100ac*
0	*D*	*100.1-300ac*

Only 18% or 26 fires started on BLM managed lands. Of these fires, lightning started 23% and the remaining fires were human caused.

Fire Hazard

Fire hazard assesses vegetation by type, arrangement, volume, condition and location. These characteristics combine to determine the threat of fire ignition, the spread of a fire and the difficulty of fire control. Fire hazard is a useful tool in the planning process because it helps in the identification of broad areas within a watershed that could benefit from fuels management treatment. Hazard ratings were developed for the project area. In general the existing fuel profile within the project area represents a moderate to high resistance to control under average climatic conditions. The following table summarizes the percent of acres in each fire hazard rating category for the entire project area.

Table 3-2

Fire Hazard Ratings for Planning Area	
Fire Hazard Rating	Percentage of Acres in each Category
Low hazard	11%
Moderate hazard	55%
High hazard	34%

The hazard rating of areas that are proposed for treatment under this project is summarized in the following table:

Table 3-3

Fire Hazard Rating	Percent of acres treated in this category
High hazard	61% (commercial harvest units)
Moderate hazard	39% (commercial harvest units)

ENVIRONMENTAL CONSEQUENCES

For the purposes of this analysis the planning area boundary was used to assess direct, indirect, and the potential for cumulative effects. It is also assumed for this analysis that fire suppression activities would continue on federal and non federal lands. 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.

While current policy requires the continuance of fire suppression activities in the Galls Foot project area, BLM has been successful in achieving the reintroduction of fire to landscapes across the Medford District through prescribed burning and fuels reduction programs. While it is known that wildfires will occur annually throughout southwestern Oregon, it would be speculative to try to predict exactly where and when they will occur and the size of area impacted. Therefore, the assumptions described below are provided for informational purposes as they are common to all alternatives and are not used to compare differences among alternatives.

There are stipulations within the protection agreement that allows the BLM to designate areas that require special fire management activities during suppression efforts in order to insure impacts to resources are

minimized. It is recognized that restrictions could increase the cost of suppression which the Bureau of Land Management would incur requiring a modification of the contract. During suppression activities on BLM lands the following guidelines would be followed:

- BLM resource advisors would 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 would be used as a starting point for burn-out or backfire operations designed to stop fire spread. Backfires would be designed to minimize fire effects on habitat. Natural barriers would be used whenever possible and fires would be allowed to burn to them.
- In the construction of fire lines, minimum width and depth would be used to stop the spread of fire. The use of dozers should be minimized and resource advisors would be consulted when appropriate. Live fuels would be cut or limbed only to the extent needed to stop fire spread. Rehabilitation of fire lines would be considered.
- The felling of snags and live trees would only occur when they pose a safety hazard or would cause a fire to spread across the fire line.
- The construction of helispots should be minimized. Existing helispots or natural openings should be used when possible. Helispots would not be constructed within Riparian Reserves, or areas of special concern.
- Retardant or foam would not be dropped on surface waters or on occupied spotted owl nest sites.
- Resource advisors would determine rehabilitation needs and standards in order to reduce the impacts associated with fire suppression efforts.

One objective of vegetation treatments in Galls Foot project area is to reduce horizontal and vertical vegetative structure to decrease the probability of large scale stand replacing fires. The number of acres receiving treatments that reduce hazardous fuels by reducing surface fuels, ladder fuels, and aerial fuels serves as a measure of each alternatives effect in reducing the potential fire behavior and the threat of a large scale stand replacing wildfire in the Galls Foot analysis area.

The following effects analysis reflects the direct, indirect, and cumulative impacts of the alternatives.

Alternative 1 (No Action)

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 Galls Foot project described under the affected environment above. This section will highlight key findings related to the question "What would it mean to not meet the objective of fire hazard reduction.

The current trend of increasing stand density which results in increased mortality to the timbered stands would continue. The transition from ponderosa pine stands to excessively dense fir stands would also continue at the lower elevations within the project area. 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 114 acres of ponderosa pine which are in condition classes 2 and 3 would not be treated and fuels reduction objectives for these areas would not be accomplished. The Douglas-fir stands proposed for treatment which are in condition class 2 would not be treated. Without treatment the condition class of these stands would 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. Ponderosa pine, mixed conifer and dry Douglas-fir forests in the lower to mid elevations of the project area would have a higher potential for large scale stand replacing fires in comparison to

Alternative 2, the proposed action. These forest types are experiencing fires today that are uncharacteristic of historic fires (Agee and Skinner 2005).

The majority of the project area would remain in moderate to high fire hazard resulting in a continued high chance that when a wildfire occurs, a large portion of the burn would exhibit high severity fire effects, especially in the commercial timber harvest stands. Under the No-action Alternative, high fire hazard would remain in the project area, with a higher potential than the action alternative for increased fire behavior if predicted climate changes (discussed above) do occur.

With no forest management, changes in canopy closure would occur only as a result of natural events such as insect infestation, windstorms, mortality from competition/drought, and wildfire. Where natural disturbances create more open stand conditions there would be more wind and solar radiation resulting in a drier microclimate compared to closed canopy stands. A drier microclimate generally contributes to more severe fire behavior. Under the no action alternative there would be no treatment of existing surface, ladder or crown fuels to help mitigate the effects of microclimate changes caused by natural disturbances. Ladder, surface fuels and aerial fuels (crown density) would also increase within these stands. Increasing stand densities and fuel loadings would increase the chance of more acres that would burn in high intensity fires within the project area. Fire fighter safety would continue to be an issue as well as the potential of resource damage.

The entire project area is within the wildland urban interface. Approximately 3,698 acres of non-commercial fuels reduction work, analyzed under separate NEPA documents, is ongoing or planned for the reasonably foreseeable future. The majority of these acres are adjacent to privately owned land. This work is currently on going and should be completed over the next several years. Under Alternative 1, the landscape scale effectiveness of other ongoing fuels reduction work would be reduced since fuels reduction work planned under this EA would not be realized. 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. The effect of reducing home ignitions by reducing forest fuels around structures has been demonstrated by Cohen (2000). He found that even severe fires will not directly ignite structures at distances beyond 200 feet. However, fire brands from beyond 200 feet may land on combustible surfaces and ignite structures.

Fire suppression would continue because there are no policies in place or being proposed that will allow fires to burn naturally within the Galls Foot project area. There are no private industrial lands that are known to be scheduled for timber harvest. There are no other known timber harvest projects in Galls Foot by the BLM. Defensible space and driveway treatments will continue by private land owners, but the amount is unknown. As a result of ongoing programs to implement defensible space around structures, driveways and roads for potential escape/evacuation routes, the risk of structure and human loss during wildfire events continually decreases.

Based on trends in the last 35 years, humans will continue to be responsible for the majority of wildfires (88%), but be responsible for only a small portion of the total acres burned. Most of the human-caused fires will continue to be associated within about 300 feet of roads. There are no expected significant gains in the miles of new roads, except for an occasional private driveway.

Air quality would be impacted in the event of a large wildfire. Emissions from wildfires are significantly higher than from prescribed burning. The wildfires which occurred in southern Oregon in 1987 emitted as much particulate matter as all the prescribed burning that occurred within the state that year.

Alternative 2 – Proposed Action

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 windspeed 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 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 is 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 temps, low RH, windy unstable atmospheric conditions) fires often don't spread except under unusual wind conditions, due to the lack of continuous fuels. Thinning treatments proposed under the Galls Foot Project are based ***not*** on restoring historic conditions, but on meeting the objectives of Matrix land allocation while reducing fire hazard, the risk of large-scale stand replacing fire, and increasing fire resiliency (see Chapter 1 Purpose and Need statement).

Increased activity fuels from timber harvest

Timber harvest can increase fire severity, if not accompanied by adequate reduction of fuels, by increasing dead surface fuels (SNEP, pp 61-72). 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 are represented by a Timber Group fire behavior fuel model. Fuel amounts are measured in tons per acre for different size material. Material up to 3 inches in diameter has the greatest influence on the rate of spread and flame length of a fire, which has direct impacts on fire suppression efforts.

It is anticipated that fuel loadings (material 3 inches and less) after logging would be temporarily increased by approximately 3-11 tons to the acre prior to the scheduled fuel disposal activities to be completed. This would change the existing 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, recent 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 less than one year for that is the time period that it takes to implement the fuel treatments to dispose of the surface and ladder fuels in these stands.

Treatment of slash created from commercial thinning as well as the treatment of noncommercial size material (ladder fuels) and existing surface fuels are proposed for stands that are commercially thinned. By treating the noncommercial sized material in these stands, ladder fuels would be reduced. The reduction of this material along with the treatment of surface fuels 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 these stands would be greatly reduced. Also, mortality of the smaller diameter conifers would be reduced. The reduction of flame length would also increase the chance that direct attack of a wildfire could occur which would reduce acres burned in the event of a wildfire.

Thinning and regeneration treatments are followed with prescribed burns. The reduction in stand density would make it possible to use prescribed fire as a tool to further reduce fire hazard in these stands. Fuels treatments for stands that are commercially harvested are proposed for treatment within two years after a unit is harvested. Treatments would take place where slash three inches in size and less exceeds 5 to 6 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.

In a study on the effects of thinning on fire behavior, Graham and others (1999) concluded that "depending on intensity, thinning from below and possibly free thinning can most effectively alter fire behavior by reducing crown bulk density, increasing crown base height, and changing species composition to lighter crowned and

fire-adapted species." Thinning accompanied by removal of thinning residues and slash and followed by periodic prescribed burning are effective (Omi and Martinson 2002; *Pollet and Omi 2002;* Agee 1993; Graham 1999; VanWagtendonk 1996). Treatments that result in forests with a lower density and larger trees show lower potential for crown fire initiation and propagation and for less severe fire effects (Pollet and Omi 2002).

Anecdotal evidence on the effectiveness of thinning on fire spread and intensity has been mixed. Interpretations and observations of the same fire (e.g. Squires Peak Fire in the Little Applegate Watershed of southwest Oregon) yield stories of both the success and failure of thinning treatments. This mix of observations cannot be called scientifically valid nor should they be applied as scientific justification, but they can be interpreted as a trend. Anecdotal evidence on Squires fire in Southern Oregon, the Hayman fire in Colorado and Rodeo-Chediski fire in Arizona all show that treatments to reduce fire behavior may have merit.

Fire weather conditions during the Squires Peak Fire as measured by the Energy Release Component Indices was in the 89th to 90th percentile during the Squires fire event as measured by the Star and Provolt RAWS stations. This percentile is recognized as high but not extreme fire weather conditions. Even though winds were reported the evening the fire reached the treated area in the Kin's Wood project area, fire behavior decreased when it reached the treated area.

Figure 3-1. Wildfire in the treated Kins Wood Project Area moved from a crown fire to a low intensity surface fire.

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 *In Press*)(Agee 1996)(Agee 1993).

The implementation of Alternative 2 would promote fire resilient forest stands by thinning from below, removing suppressed and/or over crowded intermediate and co-dominant trees while retaining the larger co-dominant and dominant trees within treated stands. This alternative would thin approximately 1,316 acres of timbered stands that are in condition class 2 and 3. Forest thinning prescriptions (see Chapter 2 and Appendix C, Silvicultural 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 so there would be less tree mortality in the event of a surface fire. Commercial thinning would also favor more fire tolerant species such as pine. Lowering basal area through thinning and prescribed fire can increase the long term vigor in the residual trees within a stand (Huff and Agee 2000).

Regeneration harvesting is necessary to provide renewal of forest conditions that will grow the next stand of trees for timber harvest (Medford District RMP, p. 181,194). In the short-term (about 10 years) 427 acres of regeneration harvest units would be more fire resilient. This is because regeneration harvest prescriptions call for leaving the larger healthier trees (16 to 25 trees per acre 20 inches diameter or greater), thinning existing understory trees (which reduces ladder fuels) and treating post harvest slash (surface fuels). In the long term (after 10 years) these stands would begin to increase in flammability and decrease in fire resiliency as young trees begin to establish and grow beneath the overstory.

While the silvicultural prescriptions and objectives vary by prescription type (i.e. Dry Douglas fir, pine site, mistletoe treatment, regeneration harvest), 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 due to insect attacks, 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 due to road construction and for logging operations (landings and cable corridors) the fire resilience for the planning area as a whole is improved due to the overall reduction in fire hazard across the planning area that would result from thinning, post harvest fuels treatments, and planned maintenance underburning.

Under Alternative 2, the landscape scale effectiveness of all fuels reduction work in the planning area would be improved by modifying through fuels reduction work on a larger proportion of the planning area. The entire project area is within the wildland urban interface. Approximately 3,698 acres of non-commercial fuels reduction work, analyzed under separate NEPA documents, is ongoing or planned for the reasonably foreseeable future. The majority of these acres are adjacent to privately owned land. This work is currently on going and should be completed over the next several years. 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 ongoing fuels reduction work in woodlands and shrublands within the urban interface 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.

Changes in micro-climate and effectiveness of fuels treatments

Management of forest stands can result in altered micro climates (Agee 1996). Increasing spacing between the canopies of trees can contribute to increased wind speeds, increased temperatures, drying of topsoil and vegetation (Countryman 1955) (Countryman 1972), and increased shrub and forb growth (Agee 1996). Therefore, it is important to manage surface fuels so that potential fire line intensities remains at a manageable level as is proposed with this project (see Chapter 2).

A more open stand allows more wind and solar radiation resulting in a drier microclimate compared to a closed stand. A drier microclimate generally contributes to more severe fire behavior. The degree of effects of microclimate change on fire behavior is highly dependent on stand conditions after treatment, mitigation to offset the effects of microclimate change, and the degree of openness. For example, Pollet and Omi (2002) found that more open stands had significantly less fire severity, while Weatherspoon and Skinner (1995) found greater fire severity. In Pollet and Omi's study, more open stands had significantly less fire severity compared to the more densely stocked untreated stands. The degree of openness in the studied treated stands may not have been sufficient to increase fire activity. Weatherspoon and Skinner found commercially thinned stands in a mixed-conifer forest in the South Fork Trinity River watershed of the Klamath NF in northwest CA burned more intensely and suffered higher levels of tree mortality than unlogged areas (Weatherspoon and Skinner 1995). The partial cuts they examined were typically overstory removals, where large (mature and old growth) trees were removed leaving smaller trees. The study simply validates that smaller trees, due to thinner bark and crowns closer to the ground, will suffer more damage than large trees. Logging slash was not treated in the study areas. The Galls Foot project proposes to treat all slash generated by the treatments as well as understory ladder fuel reduction efforts. The follow-up of maintenance under story burning will also assist in the reduction of surface 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).

Silvicultural treatments followed by fuels reduction and maintenance underburning (see Chapter 2, Components of the Proposed Action Alternative, Fuels Reduction and Follow-up Maintenance Underburning), create sites that more closely represent historical open stand conditions and promote low intensity fire spread. The vegetation components maintained are more fire resilient, and will in most cases, aid the prevention of large-scale high severity wildfire. These conditions also contribute to the abilities of fire managers to exercise a better measure of control of wildfires (the lower the flame length and fire intensity allow for direct attack fire suppression strategies) and future prescribed fire treatments.

Spring versus fall burning

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 fire intensity. A common method to reduce fuel loadings before underburning is implemented is to use manual treatment (slashing, 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 tends to be higher. Mortality to the residual stand as well as other vegetation is higher due to higher intensity fires low live fuel moisture. 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 (1/4" - 3") and retain the majority of large down woody debris due to the higher dead fuel moistures. Soil moisture is also higher in the spring so duff consumption is also minimal. Burning under these conditions keep fire intensity low so impacts to 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 six years 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 in width 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, and benefits from prescribed fire will be maximized.

Future maintenance of all areas treated in the project area would be needed in order to maintain low fuel loadings and species dependent on fire. Underburning is the preferred method for maintaining these areas.

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 allowed under this EA or amendments to this EA.

Impact of Road Construction:
The roads proposed would access major ridge lines. Theses roads would access areas that are proposed for commercial harvest and shrublands and oak woodlands proposed for treatment. The road proposed in section 17 and 20 also will access areas proposed for fuels treatment in the Galls and Foots drainages. The cost of burning can double when access is limited because it raises the complexity of the burn. Also maintenance burning of the previously treated stands would have less risk of escape due to better access to the top of these units. These roads are above private land residents in the Galls Foot area and would give access for suppression efforts in the event of a wildfire. Faster response time of suppression forces to an area is a major factor in keeping wildfires small in size.

Studies which indicate roads are not needed for successful prescribed fire occurred in different vegetation types (Southern Sierras). These burns targeting natural fuels, which is not the case in this project area. Activity fuels are being targeted which have higher rates of spread, greater flame lengths and a higher resistance to control. These studies were also not burning in the wildland urban interface and adjacent to private property. In this project the roads proposed for construction have a distinct role to play in the tactics of successful prescribed fire operations for this area. The ecological impacts of proposed new roads are discussed in other sections of this document.

This alternative builds 4.2 miles of new system level roads, 0.24 miles of temporary road and closes 6.1 miles. There will be a net loss of open roads in the project area. While roads provide opportunities for human caused fire ignitions, roads also provide quick access to fire suppression forces. Because the total miles of open roads are less, there is no increase in fire risk due to the construction of new roads.

OHV use is not expected to be increased significantly because the net effect of road construction and closing roads is a net gain of roads resulting in minimal, if any, additional access. It is unknown whether vegetation treatments in the project area will increase OHV use. Primarily, no significant connection has been made between OHV use and increased fire risk, especially since the project area is not a destination overnight area for OHV's. Consequently camping and associated use of campfires is limited. Emission of sparks is regulated by laws, as is offroad use (and campfire use) during times of extreme fire danger. Fire records for the last 35 years (as OHV use has increased) indicate a very low number of fires that might even be construed to be related to

OHV use with very low number of acres burned. Therefore, OHV use is not expected to have an impact on increased fire risk.

Effects of Climate
Forecasts for predicted climate changes discussed above may have a more dramatic impact on wildland fire extent and severity. One option land managers have to affect the change, protect private property, and ecosystems are through silvicultural and fuels management treatments. Alternative 2 could mitigate the effects of predicted climate changes, if they occur, on the extent and severity of wildland fires in the project area.

Effects of Fire Suppression
Fire suppression will continue to increase potential fire behavior in stands which are not treated by Alternative 2. Since thinned stands are placed on a maintenance schedule, fire suppression would not have noticeable effects on treated stands because fire would be continually applied over time, as needed continually reducing accumulated forest debris and new plant growth.

D. AIR QUALITY

This section discloses the impacts to air quality from prescribed fire and activities related to the construction and use of unpaved roads and trails.

Issues/Concerns

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

Some are opposed to road construction, because new roads are perceived to attract more OHV use, which is perceived to decrease air quality.

Excessive smoke in the air as a result of fuel reduction and slash disposal poses a nuisance and a health risk to humans in the area.

Fuels management activities generate particulate pollutants (smoke) 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. Fine particulates in smoke can travel many miles downwind potentially 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.

Other activities that contribute to particulates in the air include use of unpaved roads and trails, and road construction.

The *No Action Alternative* describes anticipated effects of not implementing an action at this time.

Past Actions

Prior to Euro-American settlement, Native Americans created long periods of smoke by frequently burning the forests to create the necessary conditions to satisfy food, ceremonial, and cultural needs. With the advent of mining in the 1850's, miners burned off large tracts of forest generating smoke. In the 1930's to present day, organized wildland fire suppression resulted in much less smoke than prior to organized firefighting, except during wildfire events, especially in 1987 and 2002. As community development occurred in the Medford/Ashland Air Quality Management Area, increasing amounts of smoke (wood stoves, agriculture, and dust, from users on forest roads) increased particulates reducing air quality. Industrial particulates increased as lumber mills and the agricultural industry grew. An increase in the use of prescribed fire for fire and fuels management in the 1980's added smoke to the Medford/Ashland area.

In the recent past, the population centers of Grants Pass, Medford/Ashland (including Central Point and Eagle Point), and Klamath Falls have been 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 nonattainment area is smoke from woodstoves, 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 eight years the population centers of Grants Pass and Medford/Ashland have been in compliance for the national ambient air quality standards for PM-10.

Air Quality

Air pollutants--called particulates--include dust, dirt, soot, and smoke. Particulates are emitted directly into the air by sources such as motorized vehicles, construction activity and fires, natural or prescribed. 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.

<u>Smoke Aloft</u>
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.

Nonattainment Areas

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 nonattainment area is smoke from woodstoves, dust, automobiles 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 (instrument 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 smoke management and air quality conditions.

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 Galls Foot project. Discussions for Alternative 2 reflect the direct and indirect impacts of the alternatives' newly proposed actions. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable.

Alternative 1

Though sources of particulates vary, air quality standards measure particulates regardless of their source.

Prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan (OSMP) and the Visibility Protection Plan. Therefore, air quality standards for the communities of Grants Pass and Medford/Ashland will continue to be met, as current pollution standards and air quality measures continue to control the amount of PM-10 emissions.

Dust from unpaved roads and trails will occur concurrent with the levels of use, but their effects are very localized. Some homes may be affected. Localized effects from such dust would be greatest during the summer (dry) months. As observed by lack of dust on vegetation far from the edge of forest roads in the planning area, dust from unpaved roads, new road construction and maintenance of older unpaved roads normally settles within a short distance from the point of origin. Thus, effects are limited to those immediately adjacent to forest roads. Effects range from being a nuisance (more effort to keep home clean) to affecting people's breathing.

Alternative 2 – Proposed Action

This alternative proposes to use prescribed fire so consequently there would be some smoke related impacts.

Under this alternative, prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan (OSMP) and the Visibility Protection Plan. Prescribed burning under alternatives 2 is not expected to affect visibility within the Crater Lake National and neighboring wilderness smoke sensitive Class I areas (Kalmiopsis and Mountain Lakes) during the visibility protection period (July 1 to September 15). Prescribed burning is not routinely conducted during this period primarily due to the risk of an escape wildfire.

Prescribed burning emissions, under these alternatives is not expected to adversely effect annual PM10 attainment within the Grants Pass, Klamath Falls, and Medford/Ashland non-attainment areas. Any smoke intrusions into these areas from prescribed burning are anticipated to be light and of short duration.

The greatest potential for impacts from smoke intrusions is from underburning to localized drainages within and adjacent to the project area. Underburning requires a low intensity burn that would not have 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.

Prescribed burning would be scheduled primarily during the period starting in January 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.

Other measures to reduce the potential level of smoke emissions from proposed burn sites would include mop-up to be completed as soon as practical after the fire and covering hand piles to permit burning during the rainy season where there is a stronger possibility of atmospheric mixing and/or scrubbing. The use of aerial ignition

(helicopters) in broadcast burn units reduces the total emissions by accelerating the ignition period and reducing the total combustion process due to the reduction in the smoldering stage.

Prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan (OSMP) and the Visibility Protection Plan. Prescribed burning is not expected to effect visibility within the Crater Lake National and neighboring wilderness smoke sensitive Class I areas (Kalmiopsis and Mountain Lakes) during the visibility protection period (July 1 to September 15) because the burning is not routinely conducted during this period primarily due to the risk of an escape wildfire.

Prescribed burning emissions are not expected to adversely effect annual PM10 attainment within the Grants Pass, Klamath Falls, and Medford/Ashland non-attainment areas because . Any smoke intrusions into these areas from prescribed burning are anticipated to be light and of short duration.

The greatest potential for impacts from smoke intrusions is from underburning 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 January 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 effects are further reduced because 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. Furthermore, the use of aerial ignition (helicopters) in broadcast burn units reduces the total emissions by accelerating the ignition period and reducing the total combustion process due to the reduction in the smoldering stage.

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 Alternative 2 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. Relief for these individuals is simply leaving the area for a short time. While smoke effects to these individuals are real, the effect of smoke from this alternative is very minor because it may affect only a few out of 150,000+ people (approximate population in the Medford/Ashland area).

Truck traffic associated with the logging and road construction of this alternative will increase, but dust abatement measures as part of the timber sale contract (see Project Design Features, Chapter II) will negate dust caused by this alternative to minimal levels.

In addition, Alternative 2 results in 1.5 miles of fewer open roads than exist currently. Therefore, dust impacts from new roads are reduced simply because there are fewer miles of total roads.

Because smoke impacts are well within PM-10 standards, and because dust impacts are reduced below current levels, 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.

E. SOILS

This section lists issues associated with timber management and the soil resource. It is followed by a description of the existing condition of the soil and disclosure of potential impacts resulting from actions that may result in ground disturbance affecting soil erosion and soil productivity. While this section discloses disturbances resulting in erosion and possible sediment production, the "Water Resources" section discusses the fate of those sediments as they relate to water quality. The "Water Resources" section also discloses the effects of altered hydrological functions as a result of soil compaction and disturbance.

Issues

- Some people are opposed to vegetative treatments that would require the use of ground-based logging equipment because of perceived consequences of soil disturbance and compaction, which leads to soil erosion and reduced soil productivity.

- Some people are opposed to road construction due to perceived increase in soil erosion and production of sediments that may affect water quality. Additionally, roads provide access to Off-Highway Vehicles (OHV) which create additional trails that may lead to further soil disturbance and erosion.

Anticipated Effects

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

Logging, using ground based machinery, is perceived to disturb and compact the soil, which has been demonstrated to result in increased erosion and reduced soil productivity.

Under undisturbed forest conditions, surface erosion processes are generally unimportant and considered a natural part of the ecological processes. Because of the importance of surface protection, the degree of soil disturbance has often been used as an index to compare surface erosion hazards for alternative log yarding systems. Studies have shown that in the western United States, the degree of soil disturbance is closely correlated to the amount of activity on the site. In a study of thinnings and partial cutting by yarding systems, tractor logging causes soil disturbance on about 21 percent of the site resulting in 13 percent displacement and 8 percent compaction. Skyline cable yarding disturbed about 7 percent of the site, with 7 percent displacement and <1 percent compaction (Landsberg, 2003, p.29). Helicopter yarding in a clearcut showed 2 percent deep disturbance, 17 percent slightly disturbed and no measurement for compaction (Clayton, 1981, p.6). It is estimated that the natural erosion rates for soils in the Applegate, the adjacent drainage geomorphological erosion response unit (GERU) is approximately 0.7 yd^3/ac/yr. Erosion rates increased slightly in harvest areas to 0.8 yd^3/ac/yr (Amaranthus, 1985, p.230).

Many studies have shown that compacted soils often have characteristics that are generally considered unfavorable for plant growth. These characteristics include high bulk density and reduced porosity, aeration, and drainage. Root penetration and growth is often decreased in soils of high density, since the relatively high strength of these soils offers physical resistance to expanding root systems. Supplies of air, water, and nutrients that roots need can also be unfavorably changed when compaction decreases soil porosity and drainage (Adams and Froehlich, 1981, p.5). In studies comparing tree growth on compacted sites from the time they were seedlings, Power (1974) estimates a 40 percent reduction in volume growth on heavily compacted sites while Perry (1964) found approximately 50 percent less cubic volume in trees growing on compacted sites (Froehlich and Berglund, nd, p.3). Persistence of compacted soil and, presumably, long-term consequences of compaction for tree growth depend on the severity of the initial compaction, the ability of the species to cope with

compacted soils, and rates of processes that de-compact the soil. Recovery processes vary greatly with soil texture and clay type, and their interaction with climatic processes such as cycles of freezing-thawing and wetting-drying. Soil compaction endured for at least 70 years in soils derived from volcanic ash (Landsberg, 2003 p.30). When soil compaction occurs under western Oregon conditions it is likely to be a long-term impact. A study in Evans Creek (Jackson County, OR) suggests that the granitic soils will take from 35-40 years to recover from natural forces (Froehlich, nd). Preplanned trails with trees felled for most efficient skidding would aid in reducing the amount of area compacted (Froehlich and Berglund, nd. p.15).

Logging may have a high correlation to landslides.

Part of a soil mass's strength is due to anchoring effect of tree roots. Therefore, it seems reasonable that susceptibility to landslides would gradually increase as these roots decay after logging. A review of the scientific literature, including research from Alaska, Utah, Oregon, and Japan, demonstrated that clearcutting on slopes increased the frequency of mass soil movement events (landslides, earthflows, slips, etc.). The cutting of trees, by itself, does not significantly increase erosion, but clearcutting on steep unstable slopes may lead to increased mass erosion. Therefore, on steep slopes, slope stability requirements as well as silvical considerations should weigh heavily in the selection of silvicultural systems (Rice, 1972. pgs.326-328).

Road construction is perceived to result in increased soil erosion and loss of productivity.

The amount of disturbance created by road construction depends upon its design standard, steepness of slope, and total mileage of road. Frequently, they cross steep topography of varying degrees of stability, where they often are a major source of erosion. On steep mountainous topography, roads undercut upslope soils and may alter the natural drainage from the hillside. By exposing formerly buried material to weathering they may also change the strength of the slope. Road fills place additional weight on the underlying soil mass. The fills themselves are frequently over-steepened slopes of reduced strength and are prone to failure. Consequently, it is not surprising that roads are frequently associated with landslides. On unstable geological formations, roads can trigger mass movements even on less steep topography. On gentle, stable topography roads may cause little disturbance (Rice, 1972. pgs.323, 326).

Geomorphic effects of forest roads range from chronic and long-term contributions of fine sediment into streams to catastrophic effects associated with mass failures of road fill material during large storms. The interactions of roads and land surfaces are often complex; for example, on one part of the hillslope, roads may trigger mass failures, and roads downslope from them may trap material derived from these failures. Roads affect geomorphic processes by four primary mechanisms: accelerating erosion from the road surface and prism itself by both mass and surface erosion processes; directly affecting channel structure and geometry; altering surface flow paths, leading to diversion or extension of channels onto previously unchannelized portions of the landscape; and causing interactions among water, sediment, and woody debris at engineered road-stream crossings (Gucinski et.al.,2001 pg.12). In the nearby Applegate geomorphological erosion response unit (GERU), in areas where roads and landings were constructed on steep unstable slopes, it was estimated that erosion rates were about 7.28 $yd^3/ac/yr$. (Amaranthus, 1985. p. 232).

Roads are also perceived to allow increased use of OHVs, which results in trails that are compacted and result in erosion.

Off-Highway Vehicle (OHV) impact on the landscape includes the destruction of vegetative cover, soil compaction and increased runoff followed by increased erosion. Hillclimb gullies can have a significant loss of soil fertility due to accelerated erosion. Soil texture and slope length are dominant factors controlling soil erodibility (Tuttle, 1987. p.111).

Prescribed fuel treatments are perceived to increase soil erosion.

Broadcast burning increases the amount of mineral soil exposed by a varying amount, depending on the depth and consumption of the litter layer on the forest floor. Additional soil exposure, beyond that due to logging, can be as little as eight percent or over forty percent (Perry et. al., pg.111). Observations leave little doubt that accelerated erosion is a common result of fire on forested lands. In slash disposal fires, by regulating burning, it is possible to control the amount of litter consumed and, presumably, the resulting erosion. During a wildfire, litter and other fuel is so dry that almost all fine organic matter is consumed leaving virtually the entire soil surface exposed to erosion (Rice et al, 1972).

Piled slash burns hotter than broadcast slash, increasing consumption of organic matter and nutrient losses. High soil temperatures generated under burning piles (typically, about 5-10 % of the harvested area) severely and negatively affect soil properties by physically changing soil texture and structure and reducing nutrient content (Perry et al, p. 115).

Affected Environment

The Galls Foot planning area is within the Galls Creek and Foots Creek Drainages. Approximately 39 percent of the planning area is public land managed by the Bureau of Land Management and 61 percent is in private ownership. The Galls Foot planning area consists mainly of the Galls Creek, Foots Creek, Millers Gulch and frontal drainages to the Rogue River. Refer to the Water Resources section for a description of the analysis area. Soils series identified in the proposed units are Vannoy, Voorhies, Caris, Offenbacher, and McMullin. These soils are located on mountain sideslopes that range from 25 to 65 percent with the majority of the proposed harvest and road construction on slopes averaging 55 percent. The existing erosion rates of these soils are similar to those described by Amaranthus (1985) of approximately 0.7 yd^3/ac/yr. Soils in the planning area are generally moderately sensitive to disturbance activities like road construction, log yarding and prescribed fire.

About 71 percent of the proposed harvest units are on Caris and Offenbacher soils. The Caris and Offenbacher soils have high surface gravel content and on slopes over 60 percent have potential for instability. Most of the soil movement would occur in the form of surface raveling. The Vannoy, Voorhies and McMullin soils on mountain sidelsopes in this area are relative stable and evidence of recent large rotational landslide events were not observed in the proposed planning area.

A map showing the location of the soils in the project area is on file at the Medford District office. A description and characteristics of the soils identified in the project area can be found at the end of the SOILS section this document.

Roads

A review of all roads in the planning area reveled approximately 21 percent of the existing roads are on private land, 79 percent on BLM administered land and 1 percent on State of Oregon land. About 18 percent of these roads have been verified as being paved or adequately surfaced with rock. The remaining 82 percent of the roads are either verified natural surface or information on the surface type is unknown (un-inventoried roads on private land). Many of the designed surfaced roads on private land and BLM-administered land have been built over ten years ago and are in stable condition but surfacing is below optimum to minimize road related erosion particularly during winter use. Soil loss from a lightly graveled roadbed is 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). 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.

There are approximately 24 miles of road that are cut into hillsides with slopes greater than 60 percent and about 20 of these miles are associated with potentially unstable soils. Most existing roads on BLM managed lands are established roads (10+ years) that are in stable condition with small areas of cutbank sloughing associated with the road system. Although stable, many of these roads are in need of maintenance to up-grade drainage facilities and road surfacing.

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 soil porosity and site organic matter (OM). 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, 2004 p.194). Although other factors such as water regimes, soil biological types and populations, and erosion 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. It 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 a temperate climate, surface soils remained 3 to 4 degrees cooler throughout the growing season where litter was present and the period of plant-available soil moisture was extended for several weeks (Powers and Avers, 1995). Organic matter reduces evaporative losses, keep soil temperatures more favorable for microbial activity and release organically bound nutrients. However, there is one paradox associated with organic matter, virtually all findings from field experiments show that plantation survival and early growth are favored by removing surface materials during site preparation (Morris and Miller, 1994).

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 trees, shrubs, grasses, and moss. Soil organic matter appears typical for the region with a lot of the sites having less than ½ inch of litter (leaf and needles). Some sites with a mature forest canopy have a litter layer about 1 inch thick. Except for areas disturbed by roads and trails and sites with gravels and cobbles, the soil had at least a thin ground cover. 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 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). The soils in the proposed timber harvest area exhibit bulk density and porosity levels near normal. Most of the proposed area has not been impacted by heavy machinery in the past and the

majority of the soils, Caris, Offenbacher, and Voorhies, have high surface gravel content that keep the soil friable.

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. A summary of past harvest practices in the planning area is listed in Appendix B of this report. Since the 1970s BLM has harvested trees on about 4,150 acres in the planning area with the majority occurring in the Galls Creek drainage, Right Fork of Foots Creek drainage and the frontal Rogue River drainage between Sardine Creek and Millers Gulch. Over half of this harvesting occurred using helicopters during salvage of scattered dead trees in the 1990s.

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 some roads were historically poorly designed and located without regard to erosion and sedimentation impacts. Some of the roads have been poorly maintained and have been degraded as a result of use during the wet season. Clearcutting and broadcast burning in the 1980's created highly erosive conditions short-term, especially when ground-based yarding systems were used without much regard for the location and number of skid trails. These sites have been re-established with vegetation and, save for roads, erosion rates are near natural levels.

The most recent timber harvest by BLM involving the entire analysis area was in the late 1990s in the Millers Gulch area. Appendix B of this EA lists the approximate number of acres harvested since 1970 and the logging system used. All drainages have recovered from previous management activities with erosion rates being near natural levels except where roads exist.

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 Galls Foot project.

Discussions for Alternatives B reflect the direct and indirect impacts of the proposed action(s) of this alternative. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable.

The 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 (see Water Resource section for analysis areas). Short-term impacts (or affects) are those being ten years or less and long-term more than ten years.

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 planning area except for areas where roads and trails exists. The units that were harvested in 2002 and 2003 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 could be harvested in the near future. These actions would increase the amount of compacted acres in the drainages possibly affecting peak flows. A discussion of future harvest, compacted acres and road impacts is included in the Water Resources section.

The risk of catastrophic fire in the drainage is projected to increase (see Fire/Fuels Management section) if no action is taken to reduce the fuel loading. An active fuels management program over the past five years has offset some risk but almost a century of fire exclusion has occurred in this area and, consequently, "natural" conditions no longer exist. Fuel loading is greater and duff/litter layers are often greater than would naturally occur. Given the natural fire frequency in this area, many low-severity fire events have likely been suppressed over the past century. Fire exclusion in mixed conifer forests has increased the risk of fire due to decades of fuel accumulation (Taylor, 2003 p.704). Consequently, the inevitable but unpredictable, uncontrolled natural burn (wildfire) could be of such intensity as to severely increase erosion and sedimentation, and severely set back the community of microorganisms. When compared to the proposed action alternative(s), there would be no increase in erosion rates short-term but long-term erosion from roads would probably increase due to lack of road maintenance and the risk of a catastrophic wildfire would increase as a result of the no action alternative.

Alternative 2

Under this alternative, about 4.2 miles of permanent road would be constructed and about 6.1 miles of currently open road would be decommissioned. Approximately 6.1 miles of roads would be renovated. Approximately 46 acres would be tractor logged using designated skid trails, 855 acres would be skyline-cable logged using partial suspension, and 841 acres would have the logs removed with a helicopter. A skyline cable system would provide for maximum suspension decreasing the ground disturbance. Approximately 305 acres of skyline cable logging would occur on potentially unstable soils. About 247 acres of helicopter logging would occur on potentially unstable soils. Slash created by the logging would be treated by burning to reduce the total fuel loading on-site.

There is approximately 4.2 miles of new permanent road construction proposed in this alternative. Impacts associated with road construction would have the greatest impact on the soil resource as approximately 5.5 acres of land is 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. 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% of that from the bare soil roadbed of otherwise similar construction (Swift, 1988. p.321). The running surface of the majority of the new roads would be surfaced with 6- 8 inches of rock. Most of the proposed new road construction is on stable sideslopes on the landscape. Approximately one mile of the proposed 37-3-17.1 road dissects hill slopes over 60 percent on Caris/Offenbacher soils. Some surface raveling may occur the first wet season after construction on this portion of the road. Most of the raveling would be in the form of colluvial gravel. Except for these areas, soil erosion rates from the newly constructed areas are estimated to be about half as much as those reported by Amaranthus (1985. p. 232) of 7.28 $yd^3/ac/yr$ due to soil type, topography and project design features. The areas of road construction over 60 percent slope on Caris/Offenbacher soils may approach erosion rates about two-thirds of those levels described by Amaranthus the first few years after construction. It is not anticipated that large rotational landslides would occur as a result of the road construction as the road location is on stable landscape in the upper one-third of the hillslope and does not cross any major headwalls.

There would be about nine new helicopter landing areas built along new and existing roads near ridgetops. All landings that would be constructed are on stable soils on the landscape. Each helicopter landing would disturb about one acre. The helicopter landings would be surfaced with rock or seeded and mulched before the winter rains.

The mechanical decommissioning of the roads in this project would decrease erosion rates on those roads to near natural rates within a ten-year period. There would be a moderate (15-50%), short-term increase in erosion rates the first few rain events after road decommissioning work is completed. These effects would be minimized by deferring most road decommissioning until the end of the project (not in conjunction with road construction) and in the dry season, restoring natural drainages, and using straw bale check dams where culverts are displaced.

The road renovation that would occur consists of surfacing of increasing the surfacing and improving the drainage facilities on 6 miles of previously surfaced roads. This road work will help in reducing surface erosion from roads and decrease sediments reaching local waterways, which is a slight, positive direct, indirect and cumulative effect.

It is estimated the commercial timber harvest activities planned in this alternative would disturb, on average, about 6 percent of the ground in the proposed harvest units. As a result of implementing designated skid trails, the units tractor logged would result in approximately twelve percent or less of the area compacted (USDI, 1995. p.156). Designating skid trails would most likely minimize the area that would be deeply disturbed during tractor logging operations. In a study of thinnings and partial cutting by yarded systems, tractor logging caused soil disturbance on about 21 percent of the site resulting in 13 percent displacement and 8 percent compaction. Skyline cable yarding disturbed about 7 percent of the site, with 7 percent displacement and <1 percent compaction (Landsberg, 2003. p.29). Helicopter yarding in a clearcut showed 2 percent deep disturbance and no measurement for compaction (Clayton, 1981, p.6). Approximately 87 acres of ground would be disturbed as a result of timber harvest activities with about 26 acres of disturbance on potentially unstable soils. About 60 acres would be disturbed during skyline cable yarding with about 21 of these acres on potentially unstable soils. Approximately 17 acres would be disturbed during helicopter yarding with about 5 of these acres on potentially unstable soils. Approximately 10 acres during tractor yarding would occur on stable soils.

Short-term erosion rate potential would increase moderately 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 enter any waterways as a result of these units being on or near ridges and waterbarring/blocking of skid roads. Riparian buffers would also prevent any soil particle from entering nearby waterways. The decrease in soil pore space, as a result of the compacted skid roads, causes a slower infiltration rate and larger amounts of 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.

Erosion rates in the cable or helicopter units would exhibit only a slight increase over natural levels. In the cable units, disturbance other than compaction in the yarding trails would not be extensive. The yarding trails are usually narrow, shallow compacted troughs of surface soil partially covered by scattered litter and slash. On steeper slopes with higher erosion potential, waterbars would be constructed manually to direct water off the cable yarding trails. Although erosion rates would increase, most soil particles would remain on-site and return to near normal rates usually within 5 years as vegetative cover is reestablished.

Approximately 71 acres of soil would be compacted by the proposed timber harvest operations. The presence of compaction, an on-site effect, can contribute to the occurrence of offsite effects, the most obvious of which is erosion and sedimentation. Infiltration of precipitation into compacted soil is impeded, increasing the efficiency and concentration of runoff, which increases its depth, velocity, and erosivity. This suggests that semi-permanent or permanent compaction may contribute to chronic or cumulative surface erosion. Geppert (1984) concluded that cumulative surface erosion should result from the construction and existence of road networks, but that forest harvest and site preparation should not result in cumulative erosion, except when poorly applied on poor or harsh sites (Beschta, n.d.). There are no harsh or poor sites being treated in this proposed alternative.

Findings suggest that surface erosion resulting from the logging operation itself is not serious. In most operations, most of the area remains 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). For silvicultural regimes on most

sites, soil productivity decline should not be expected as a short-term effect, as a result of harvest per se. Short-term declines are likelier to result from associated effects such as compaction, loss of organic layers, or erosion. The probability of productivity decline resulting from forestry practices is least when regimes of low intensity are performed on sites with high productivity or favorable conditions (Beschta, n.d.).

Prescribed burning planned under this alternative would be in the form of handpile burning or broadcast burning. In most cases, the logging slash in the harvested units would be handpiled and burned. About five to ten years later, the units would then be broadcast burned. 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. 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).

The increase in erosion rates over present levels would be minimal 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 as underburning would be avoided 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. 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. Large proportions of the total Nitrogen budget can be lost through volatilization. Total foliar Nitrogen content also is reduced (14% in moderate burns, 33% in intense burns), and the effects last at least 4 years (Atzet, 1987 p.193). Overall, soil productivity would experience a slight, negative decrease short-term but potential long-term positive effects would be realized from the proposed actions as the risk of catastrophic fire is diminished.

In summary, there would be a slight(<15%), short-term increase in erosion rates as a result of timber harvesting activities which would return to near pre-harvest levels within 5 years. 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. The loss is accounted for in the (Medford District) non-declining timber harvest calculations (PRMP 1994. p.4-13). Soil productivity would experience a slight, negative decrease short-term but potential long-term positive effects would be realized by thinning and prescribed fire. No appreciable increase in OHV use from the roads being constructed is anticipated. There would be a moderate, short-term cumulative increase in erosion rates as a result of harvesting timber and fuel reduction activities (i.e., slashing, prescribed burning) which would last about three to five years. A slight long-term decrease in erosion rates would occur as the affected harvest units re-establish ground cover, land that was once occupied by roads are put back into producing vegetation (ground cover), roads with high erosion rates are renovated and the risk of catastrophic wildfire is reduced.

Although the road decommissioning will result in a long term net decrease in the amount of roads, there would be a slight net increase in the amount of roads in the analysis area over the short term which would result in a slight to moderate short-term increase in erosion rates and a slight long-term negative effect. The newly constructed roads would result in a slight to moderate increase in the local soil erosion rate potential, particularly the first few years after construction and use. A very slight increase in the cumulative erosion rate potential would occur the first five years after construction/decommissioning. Cumulatively, the roads that are to be decommissioned would not have an appreciable effect on the erosion rates as the amount of roads planned for

decommissioning is relatively small compared to the total number of roads that are existing and would remain after the project(s) are completed.

Most of the significant past actions occurred nearly twenty years ago. The effects of those actions, except for the roads, have long since diminished and soil erosion rates in all drainage are most likely near the 0.7 $yd^3/ac/yr$ reported by Amaranthus (1985). The possible future actions on private land are relatively small and dispersed across the landscape. These actions should have a minimal effect on soil erosion potential. The cumulative effects of these actions on soil compaction could increase the peak flow potential and this topic is addressed in the Water Resources section.

Cumulatively, there is currently little direct evidence to indicate that harvest removals in themselves lead to soil depletion over several succeeding rotations (Beschta, nd). 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. The less intense the cutting intensity results in lower effect on the soil. Another critical aspect of a silvicultural regime is the rotation or cycle length. Rotation length determines the intervals at which the site is entered and disturbed and nutrients are removed, redistributed or lost. Rotation length is especially significant 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 Galls Foot 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. Past timber harvesting that had a substantial affect on soil erosion rates was nearly twenty years ago (clear cutting in the 1980s) and the sites have recovered from those events. Therefore, cumulative effects to the soil resource would remain minimal if the soil resource is allowed enough time to recover from the disturbance of this project which should be the case based on the proposed silvicultural prescription.

Overall, the effects to the soil resource as a result of this proposed action could be described as slight, short-term negative effects from harvesting and road construction leading to slight, long-term negative effects. The long-term negative effects are the result of additional net increase of permanent roads in the planning area.

Table 3-4 Soils in the Galls Foot Planning Area

Soil Map Unit #	Soil Map Unit Name	Soil Category
25G	Caris-Offenbacher gravelly loams, 50 to 80 percent north slopes	1
26G	Caris-Offenbacher gravelly loams, 50 to 75 percent south slopes	1
113G	McMullin-Rock outcrop complex, 35 to 60 percent slopes	1
195E	Vannoy silt loam, 12 to 35 percent north slopes	2
195F	Vannoy silt loam, 35 to 55 percent north slopes	2
196E	Vannoy silt loam, 12 to 35 percent south slopes	2
197F	Vannoy-Voorhies complex, 35 to 55 percent south slopes	2

Soil Types found in the Galls Foot Planning Area

Caris-Offenbacher complex

The Caris and Offenbacher soils are intricately intermingled across the landscape in this map unit. These soils have surface textures of gravelly loam but in much of the proposed project area, rock fragments overlay the soil surface forming talus. Talus is angular rock fragments, mainly of gravel or cobble size, that was derived from and lying at the base of a cliff or on steep, rock slopes. Not all of the talus is easily identified, as it is covered with a layer of needles, leaves, and twigs.

The Caris soil is moderately deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles and twigs about 1 inch thick. The surface layer is very dark grayish brown gravelly loam about 7 inches thick. The upper 13 inches of the subsoil is dark yellowish brown very gravelly clay loam. The lower 11 inches is dark yellowish brown extremely gravelly loam. Bedrock is at a depth of about 31 inches. The depth to bedrock ranges from 20 to 40 inches. Permeability of the Caris soil is moderate. Runoff is rapid, and the water erosion potential is high. In some areas the surface layer is very gravelly loam or is stony.

The Offenbacher soil is moderately deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about 1 inch thick. The surface layer is dark grayish brown and dark brown gravelly loam about 9 inches thick. The subsoil is reddish brown and yellowish red loam about 25 inches thick. Bedrock is at a depth of about 34 inches. The depth to bedrock ranges from 20 to 40 inches. Permeability of this soil is moderate. Runoff is rapid, and the water erosion potential is high. In some areas the surface layer is very gravelly loam or is stony.

McMullin gravelly loam

The McMullin soil is shallow and well drained. It formed in colluvium derived dominantly from igneous and metamorphic rock. 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. 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 rapid, and the hazard of water erosion is high. This is a highly sensitive soil as related to soil productivity effects from disturbance (i.e., prescribed burning). This soil is often associated with rock outcroppings.

Vannoy silt loam

The Vannoy soil is moderately deep, well drained on hillslopes. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about ¾ inch thick. The surface layer is dark brown silt loam about 4 inches thick. The next layer is reddish brown silt loam about 7 inches thick. The subsoil is yellowish red clay loam about 27 inches thick. Weathered bedrock is at a depth of about 38 inches. Permeability of the Vannoy soil is moderately slow. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is gravelly or very gravelly loam. Runoff is medium and the potential for water erosion is moderate on slopes less than 35 percent. On slopes over 35 percent, runoff is rapid and the water erosion potential is high.

Voorhies very gravelly loam

The Voorhies soil is moderately deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles and twigs about 1 inch thick. The surface layer is very dark grayish brown and dark brown very gravelly loam about 8 inches thick. The upper 10 inches of the subsoil is brown very gravelly clay loam. The lower 18 inches is brown very cobbly clay loam. Weathered bedrock is at a depth of about 36 inches. Permeability of the Voorhies soil is moderate. The depth to bedrock ranges from 20 to 40 inches. As this soil is mainly found on slopes over 35 percent, runoff is rapid and the water erosion potential is high.

F. WATER RESOURCES

Issues/Concerns

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

- Vegetation canopy reduction associated with forest management (especially in the transient snow zone) may affect streamflows.
- Increases in soil compaction from proposed logging and road construction may affect stream flows.
- New road construction could alter the natural drainage patterns and indirectly affect stream flow.
- Changes in streamflow could lead to increased stream channel degradation.
- Timber harvesting and associated road construction, decommissioning, and renovation may impact water quality, by increasing sedimentation and stream temperature.

Discussion of Issues/Concerns (Potential Effects) and Related Research

This section provides a short literature review pertaining to the issues identified to be relevant to the implementation of the proposed action and its potential effects on water quantity and quality, and sets the stage for the description of the affected environment and subsequent analysis of effects.

Reduction in vegetation canopy (from timber harvest, roads, fuels reduction, prescribed fire and wildfire) has the potential to cause the following hydrologic process changes: reduced interception, evaporation, and transpiration (i.e. more precipitation reaches the soil surface and less water consumption by plants); increased snow accumulation in transient snow zone (see Affected Environment this section); increased snow melt rate; decreased snow melt time in transient snow zone; and increased soil water content (Moore et al. 2005). Possible effects on the streamflow regime from these hydrologic process changes include reduced time to hydrograph peak; increased frequency of peak flows; and increased magnitude of peak flows. To date there are no field studies explicitly linking peak flow increases with changes in channel morphology? Altered peak flows may affect stream channel condition by eroding streambanks, scouring streambeds, and transporting and depositing sediments if the magnitude of flow reaches the level required for sediment transport. These are normal occurrences in a dynamic, properly functioning stream system; however, increases in the magnitude and frequency of peak flows due to human-caused factors can intensify the effects.

Although there have been numerous studies in the Pacific Northwest that examine the effects of forest harvest on peak flows, the published results vary widely, depending on a number of factors including the type of event (rain; rain-on-snow; snow melt), the characteristics of the drainage basin, and the location in the basin of roads and clearcuts (Church et al. 2001). No paired watershed studies provide data on forest management practices commonly used today by federal land managers, including commercial thinning and extensive riparian buffers. Most of the paired watershed studies in the Pacific Northwest examine clearcut and shelterwood harvests, where clearcuts included riparian vegetation. A summary of paired catchment studies conducted in the Oregon Cascades shows peak flow increases from 13 to 42 percent (Moore et al. 2005). Peak flow changes for catchments that were 100 percent clearcut included a decrease of 36 percent, no significant change, and increases from 23 to 42 percent. Peak flow changes for catchments that were 25 or 30 percent patch cut included several with no significant change and increases of 13 and 17 percent. For the two shelterwood treatments, one had no significant change and the other had a 32 percent increase. Treatment types were a mix, with some catchments cable yarded, some tractor yarded, some had both cable and tractor yarding, some were roaded, and some were broadcast burned. Peak flow change does not appear to be related in any simple way to the percentage of basin area cut or basal area removed (Moore et al. 2005). The magnitude of peak flow increases declined with increasing event magnitude in most cases, with the greatest increases typically associated with autumn rain events on relatively dry catchments. These autumn events resulted in small peak flows with little hydraulic consequence (Moore et al. 2005). Peak flow increases for flow events with a return

interval of 5 years or greater were either small or there was no increase (Beschta et al. 2000). In the steep gradient cascade and step-pool type streams found in most of the Planning Area, such peak flow increases would have no affect on stream channels, as the flows critical for initiating morphological change are far beyond five-year events (Grant et al. 1990). Post-treatment recovery rates varied among studies. For the catchments in the Oregon Cascades, recovery times of at least 10 years in all cases where there was a significant treatment effect and at least 30 years in two cases were reported (Moore et al. 2005).

The transient snow zone is of interest to land managers since greater snow accumulation can occur in clearings, producing the potential for higher peak flows during rain-on-snow events. The *Oregon Watershed Assessment Manual* (OWAM) that was developed by Watershed Professionals Network (WPN 1999:IV-9-11) for the Governor's Watershed Enhancement Board (now known as the Oregon Watershed Enhancement Board) provides a method for assessing the potential risk for peak flow increases from runoff originating in the transient snow zone. This risk assessment method indicates that drainages with more than 25 percent of the area in the transient snow zone may be at risk for possible peak flow increases due to reductions in crown closure.

Removal of vegetative canopy can also increase water yield and discharge during the normal low-flow period, although absolute increases are small (Harr 1976b) and the effect is short term (Hicks et al. 1991:225). A summary of 12 studies in the Pacific Northwest suggests that annual water yield increases are not measurable when less than 25 percent of a catchment is harvested (Stednick 1996). When stands are only thinned, the residual stand may increase its use of water, so changes in streamflow following thinning are likely to be less than might be expected from counts of trees alone (Meehan 1991:186).
In one study, summer low flow increases were greatest in drainages where clearcut logging occurred. The first year after a small study watershed was clearcut in the Coyote Creek Experimental Watersheds located in the western Cascade Range of southwestern Oregon, summer low flow was increased by 196 percent (Harr et al. 1979). In the same study area, no significant change in summer flow was detected for two small drainages that were 30 percent harvested by the shelterwood and patch-cut methods (Harr 1976). In the H.J. Andrews Experimental Forest of the western Cascade Range of Oregon, summer low flow increased by 159 percent following clearcut logging in a small drainage (Hicks et al. 1991). This increase lasted for eight years following the start of logging. Another small drainage in the H.J. Andrews study area had low flow increases of 59 percent after 25 percent was patch-cut logged and burned. Low flows from this area continued to be greater than predicted for 16 years following the start of logging (Hicks et al. 1991). For the Alsea study area in the Oregon Coast Range, a significant reduction in number of low-flow days was observed for 5 years after a small drainage was 82 percent clearcut and burned (Harr 1976).

Partial cutting would be expected to have a much reduced influence on the streamflow regime compared to clearcutting. Rapid expansion of root systems and crowns of trees left after partial cutting or thinning would be expected to quickly reduce any changes in streamflow that did result from this type of logging (Rothacher 1971).

The perception that “logging dries up streams” may be explained by the initial increased local air temperatures, enhanced early snowmelt, and superficial drying of the surface soil and duff caused by clearcutting (Adams and Ringer 1994). Studies also have shown some instances where past logging and road construction practices have led to stream channel sedimentation, which can cause more water to flow below the surface of the stream bed. In each of these examples, downstream water flow probably would be maintained or even increase, but locally there is the appearance of drier conditions and related perceptions of flow changes (Adams and Ringer 1994). Several studies that show that summer low flows were reduced following harvest are generally not applicable to this project because the studies were either conducted in a significantly different hydrologic region or setting, involved clearcut harvesting on a large scale, studied effects in snowmelt-dominated precipitation regimes where “premature melting” of the snowpack is a concern, or otherwise analyzed treatments that are not similar to those in the current project. Applicable studies and literature reviews (e.g. Church and Eaton 2001; Keppeler 1998) indicate either increases in or no effect to summer low flows from vegetation removal and harvest activities. In the Pacific Northwest, the few studies showing low flow reduction as the result of vegetation removal were the result of either harvest of stream riparian areas or of harvest in areas subject to summer fog. In

one study, vigorous regrowth of water-reliant hardwoods along the stream following harvest of riparian areas significantly increased evapotranspiration rates during the growing season, causing a reduction in streamflow (Hicks et. al. 1991). This would not occur in the Galls Foot Area under the proposed action, because treatments are not proposed in riparian areas that would produce such a vegetation response. In another study, harvest in an area subject to summer fog that reduced "fog drip" precipitation during the otherwise dry summer months (Harr 1982) was hypothesized as the cause of slightly reduced summer low flows following harvest, although 5 years after harvest this same area showed increased summer flows (Ingwersen 1985). In another study with both clearcutting and partial cutting in an area where fog drip was a component of the dry season weather, summer low flows increased after harvest (Keppeler 1998). In the Planning Area, summer low flows would not be affected by changes in fog drip because, unlike portions of the Pacific Northwest that have substantial summer fog, the project is located in an area well inland from the coast where relative humidity is generally low and precipitation from fog drip is rare during the dry season.

All of these studies suggest that vegetation treatments that involved removal of vegetation would have the effect of increasing available water during the summer, although the increases may be small and could return to background levels within a matter of years. Any increased summer water availability would have little chance of affecting summer low flows, because due to seasonal drought conditions in the Planning Area, on-site vegetation would likely utilize any additional water before it could reach the stream network.

Soil compaction (due to ground-based logging and fuels treatment equipment, and the presence of forest roads and trails) may increase the frequency and magnitude of peak streamflows (Harr 1976). In undisturbed forest soils in western Oregon, infiltration capacities far exceed the maximum rates of rainfall so that all water enters the soil (Harr 1976b), thus minimizing overland flow. Compaction can reduce the infiltration properties of the soil, resulting in increased runoff. Soil compaction can also impede the subsurface movement of water as it moves downslope in shallow aquifers. Peak flows for small, headwater streams appear to be increased where at least 12% of a watershed was seriously compacted by road building, tractor skidding, or tractor windrowing of slash (Harr 1976). Factors that influence the contribution of a compacted area to increased runoff include: proximity of compacted area to streams, connectivity of compacted areas to streams, and watershed characteristics (Harr et al. 1979). Severe fire that exposes bare soil can also reduce the infiltration properties of the soil, resulting in increased runoff (Neary et al. 2005).

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

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

Well-designed roads with a properly functioning drainage system attempt to mimic the local natural drainage pattern by keeping the local downslope movement of water similar to the pre-road condition. However, during

extreme events (drought or peak flow) any hydrologic differences between the artificial drainage associated with the road system and the natural system become more critical and can cause noticeable effects to the local environment.

BLM's management as analyzed for in the Medford District RMP/EIS would cause no measurable changes in ground water. This was the case for even the most management-intensive alternatives that were considered in the RMP/EIS. Because one of the more environmentally conservative alternatives (relating to water resources) in the RMP/EIS was ultimately selected (USDI 1995:4) and is being implemented (USDI 1995:6), concerns over potential impacts to ground water from BLM activities are negligible (USDI 1994:4-18).

Riparian Reserve implementation would maintain or reduce water temperatures of perennial streams (USDI 1994, USDA and USDI 2005).

Timber harvesting operations have variable effects on sediment production (Everest et al. 1987). Excluding commercial harvest from Riparian Reserves prevents disturbance to stream channels during the felling and yarding operations. Yarding operations can cause extensive ground disturbance in harvested areas; however, cable systems that partly or fully suspend logs generally cause minimal disturbance to the soil surface (Everest et al. 1987). Increased surface erosion can result from ground disturbance and soil compaction caused by tractor logging (Sidle 1979). A buffer width of 100-200 feet is sufficient to prevent most sediment from reaching streams (A.C. Kindig and Cedarock 2003).

The amount of surface erosion generated by slash burning is generally proportional to the severity and extent of the burn (Sidle 1979). Severe broadcast burns on clearcut units in the Oregon Coast Range and western Cascade Range resulted in significant increases in suspended sediment loads for up to 5 years (Sidle 1979).

Most of the increase in sedimentation associated with forestry activities is attributed to forest roads (Sullivan 1985). There are two processes by which roads increase sediment loads in streams: 1) by increasing the incidence of mass failures; and 2) by erosion of the road surface, cut banks, and ditches and subsequent transport of this material to the stream (Duncan et al. 1987). In the Galls Foot planning area, surface erosion from road surfaces, cut banks, and ditches represents the dominant source of road-related sediment input to streams (see Soils section for discussion).

There is high variability in sediment production from road segment to road segment. Most segments produce little sediment, while only a few produce a great deal (Luce and Black 1999). Sections of road having a steep gradient, being heavily used, and draining directly into larger streams have the highest potential to produce and deliver material of a size most apt to deposit on or in the streambed (Bilby et al. 1989). Older roads in mid-slope positions dominate the production of sediment during extreme storms (Wemple et al. 2001). Ridgetop roads usually have the least effect on streams (Furniss et al. 1991).

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

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

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

Culvert removal during road decommissioning in Idaho has been shown to increase sediment concentrations; however, sediment yields decreased rapidly downstream (Foltz et al. 2005).

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

Affected Environment – Water Resources

The *South Rogue Gold Hill Watershed Analysis* (USDI 2001) provides general background information for the Planning Area. The watershed analysis reflects some of what was known about this watershed at the time the watershed analysis was completed; the water resources analysis for this environmental assessment relies on additional information, much of which is more recent than that contained in the watershed analysis.

Planning Area Description

The Planning Area is within the Rogue River-Gold Hill Watershed. The land within the Planning Area drains into the portion of the Rogue River from (and including) Galls Creek on the east down to (and including) Foots Creek on the west.

While general water resources information is contained below, the specific current condition data and analysis is contained in Appendix A, with the Appendix A information summarized in tables and discussion as part of the analysis of effects later in this chapter. The analysis of effects involves assessing various Risk Factors that identify conditions that affect water resources, such as sedimentation potential, compacted soils, stream channel conditions, etc. The method of analysis used is generally based on guidance provided in the RMP(USDI 1995:153-154), modified as necessary to address site-specific concerns in the Planning Area. The evaluation of risk factors was done to assess current conditions, including those resulting from past actions, and potential for effects of the alternatives related to hydrology and cumulative watershed effects. Discussion of why each risk factor is important, how it is being assessed and potential limitations in the available data or analysis methods is discussed in Appendix A.

Drainage areas are 7th Level Hydrologic Units in the watershed mapping hierarchy (explained in greater detail in Appendix A). The water resources discussion primarily uses the drainage areas identified in Table 3-H-1. These drainage areas generally fit the watershed delineation guidelines for analysis as listed in the Medford District Resource Management Plan (RMP) (USDI 1995:153). This size of analysis watershed 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 drainage, may have a potential adverse impact ("cumulative effect"). This size of analysis watershed is 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 (Lindell and Brazier 1986:2,11).

Table 3-H-1. Drainage Areas Associated with the Galls Foot Planning Area

Drainage	Location	BLM acres within Planning Area	Non-BLM acres within Planning Area	Total acres analyzed within Planning Area	Total Drainage Area (acres)	Total Drainage Area (square miles)
RH0415	Galls Creek	3717	4772	8488	8493	13.3
RH0521	Rogue River between Sardine Creek and Millers Gulch	901	834	1736	4603	7.2
RH0524	Millers Gulch	720	482	1202	1202	1.9
RH0603	Middle Fork Foots Creek	245	3144	3390	3390	5.3
RH0606	Left Fork Foots Creek	910	2012	2922	2922	4.6
RH0609	Foots Creek between Middle Fork / Left Fork confluence and Right Fork	1820	1127	2947	2947	4.6
RH0612	Right Fork Foots Creek	2464	3461	5925	5925	9.3
RH0615	Foots Creek between Right Fork Foots Creek and the Rogue River	293	1014	1307	1307	2
	Totals	**11071**	**16845**	**27916**	**30789**	**48.1**

Because of the volume of information in the 7th field drainage analyses, the data and analysis provided for each of these drainage areas is contained in Appendix A of this EA. Summaries of the information and effects analysis are provided here in enough detail to inform readers of important findings needed for comparing the effects among alternatives. Appendix A contains the detailed drainage-by-drainage background analysis and discussion that the tables, data and effects discussion here are drawn from.

Galls Creek and Millers Gulch 7th level drainage areas each drain their respective watershed into a single outlet point at their respective confluence points with the Rogue River. Right Fork Foots Creek, Left Fork Foots Creek, and Middle Fork Foots Creek each drain their respective watersheds to a single point in Foots Creek. The remaining drainage along the Rogue River (RH0521) is a frontal watershed that drains directly into both sides of the Rogue River along the entire river interface either by means of surface flow in small, individual channels or by subsurface flow. Note that this drainage area (RH0521) has a portion of the drainage on the opposite side of the river from the project that is not included in the Planning Area.

Obviously, this area will not be directly affected hydrologically by project activities that occur on the other side of the river. The two remaining drainages in Foots Creek (RH0609 and RH0615) are similarly frontal watersheds that drain directly into both sides of Foots Creek.

Most of the BLM land is located in the upper elevations of the respective drainage areas while the private lands dominate the lower valley areas near the Rogue River. Some of the private lands are owned by timber companies and their management is guided in part by the Oregon Forest Practices Act. Most of the private land use along the rivers is either residential or agricultural.

Precipitation Regime

Average annual precipitation in the Galls Foot Planning Area ranges from 24 to 36 inches per year (USDI 2001:15). Precipitation predominately falls in the late fall, winter, and early spring; summer months are typically very dry. The rain patterns in the winter months are wide-based with relatively low intensity and long duration in contrast to the localized, short duration, high intensity summer storms that occasionally occur.

Within the Planning Area, wet season precipitation generally falls as rain below 3,500 feet elevation and snow above 5,000 feet. Between 3,500 and 5,000 feet alternating warm and cold fronts drop a mix of snow and rain. Shallow snow packs often build in this elevation range, then are quickly melted by rain and warm winds (rain-

on-snow event). This area is typically referred to as the Transient Snow Zone (USDI 2001:15). The drainages of the Planning Area are within the rainfall-dominated zone, with small areas in the uppermost portions of Galls Creek and Foots Creek located in the Transient Snow Zone. None of the drainages analyzed contain any acreage in the snow-dominated zone.

Surface Water

Within the Galls Foot Planning Area, moderate to high streamflows usually occur between mid-November and April. The lowest streamflows generally occur from July through September or October (USDI 2001:31). Many of the tributary streams in the Planning Area become dry in late summer. Flows in the Rogue River are partially regulated by the William L. Jess Dam (formerly Lost Creek Dam) upstream of the Planning Area, maintaining higher-than-historic summer flows, and decreasing winter peak flows.

Table 3-H-2: Miles of Stream by Type, by Drainage in the Galls Foot Planning Area

Drainage	Perennial		Long Duration Intermittent		Short Duration Intermittent		Dry Draw		Total Stream Miles	
	BLM	All Lands	BLM	All Lands	BLM	All Lands	BLM	All Lands	BLM	All Lands
RH0415	1.8	13.4	5.3	17.3	7.8	33.5	33.7	57.6	48.6	121.7
RH0521	0.0	3.5	0.2	6.1	7.6	31.0	14.0	22.4	21.9	63.0
RH0524	0.2	2.2	0.3	2.2	2.0	5.1	7.0	8.7	9.5	18.0
RH0603	0.0	6.6	0.3	6.1	0.5	21.3	3.0	28.9	3.7	62.9
RH0606	0.3	6.1	1.7	5.2	1.1	14.4	8.7	22.6	11.8	48.4
RH0609	1.6	5.1	1.4	4.6	4.4	10.7	17.8	25.0	25.3	45.5
RH0612	3.2	7.8	2.0	11.5	5.9	26.4	31.3	55.9	42.4	101.6
RH0615	0.0	0.7	0.2	2.3	1.1	8.6	2.6	7.5	3.8	19.1
Totals	**7.0**	**45.5**	**11.2**	**55.3**	**30.5**	**151.0**	**118.1**	**228.6**	**166.8**	**480.4**

Surface water in the proposed Galls Foot Planning Area includes streams, springs, reservoirs, and ditches. *Perennial streams* are streams that in a year with average precipitation will have some water present throughout the year, although water in sections of some streams may be subsurface, especially late in the summer. Portions of perennial streams may also go dry due to irrigation and other water withdrawals that exceed natural summer streamflows (USDI 2001:63-64). *Long duration intermittent streams* are seasonal streams that typically have water present for at least 30 consecutive days each year, but generally go dry for at least part of the year. These types of streams often have water present for long enough periods each year that they exhibit streamside riparian vegetation significantly different from the vegetation in surrounding uplands. *Short duration intermittent streams* are ephemeral, meaning they flow only in response to large precipitation events. Short duration intermittent streams generally flow for less than 30 consecutive days. This type of stream still has a defined channel and evidence of annual scour and deposition, but is dry most of the year, and often has vegetation very similar to the surrounding uplands. *Dry draws*, another type of ephemeral stream, are usually small valley features and swales that do not exhibit both a defined channel and evidence of annual scour and deposition. They may go many years with no visible surface flow, only flowing in larger flood events. Because they do not annually scour material out of a channel, they often have deep accumulations of soil, rock, duff, and other debris that fill the bottom of the draw. During storm events, water slowly flows through or is stored in these accumulations of "colluvium", being gradually released to the downstream system or utilized by on-site vegetation. Dry draws are often the initiation points for naturally-induced debris torrents during large flood events. In dry draws, ground disturbance such as roads can also be a concern. Roads have the potential to route storm flow into the dry draw, and subsurface flow through the colluvium can also be intercepted by a road cut or compaction from a road that crosses the bottom of a dry draw, initiating surface flow with scour and deposition in the draw. This has the potential to change the downstream flow characteristics of the draw to a short-duration intermittent stream, affecting the size of downstream peakflows due to the more rapid delivery of storm flow to downstream reaches (water flows much faster through the defined surface channel of a short-duration intermittent stream than it does subsurface through the colluvium of a dry draw).

Appendix A provides information on bankfull and floodprone area widths for streams in each drainage, to provide some context to the reader of the size of streams being discussed in the analysis. Bankfull flow refers to the flow during large storms that occur on an average of every one-two years. These flows typically determine the size of the channel on a stream, referred to here as the bankfull channel. The size of the bankfull channel is measured in riffles at several locations along each stream reach. Another channel measurement that indicates entrenchment is the flood prone area width, the width inundated with water in a fairly common flood, for example a flood size that occurs on average every 20 years or so.

Streams categorized as perennial or intermittent on federal lands are required to have Riparian Reserves (USDI 1995:26-27, USDI 1995: Appendix A B-11 to B-15). Dry draws generally 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); however, some dry draws in the Planning Area have been included in Riparian Reserves due to signs of potential instability in the draw. Streams on private forest lands are managed according to the Oregon Forest Practices Act. Stream types on federal lands were identified through site visits; non-federal land stream types were estimated using aerial photo interpretation and extrapolation from information on adjacent federal lands.

The 1996 amendments to the Safe Drinking Water Act (SDWA) mandated that state agencies conduct source water assessments for every public water system. A federally-regulated public water system provides water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serves an average or at least 25 people for at least 60 days a year. The states must delineate the groundwater and surface water source areas which supply public water systems, inventory each of those areas to determine potential sources of contamination, and determine the most susceptible areas at risk for contamination.

The planning area falls within the source water areas for the cities of Rogue River and Grants Pass. The surface water source for these public water systems is the Rogue River downstream of the Planning Area.

Source water assessments have been completed by the DEQ and the Oregon Department of Human Services for the cities of Rogue River and Grants Pass. The completed assessments include an inventory of potential contaminant sources within the source water areas. Grazing animals were identified as a potential contaminant source for the Rogue River and Grants Pass drinking water protection areas. No other potential contaminant sources that could occur within the planning area were identified in the state source water assessments.

The Oregon Environmental Quality Commission has adopted numeric and narrative water quality standards to protect designated beneficial uses. In practice, water quality standards have been set at a level to protect the most sensitive uses. Salmon & Trout Rearing and Migration and Resident Fish & Aquatic Life are the sensitive beneficial uses in the Rogue River - Gold Hill Watershed (USDI 2005:6). The Oregon Department of Environmental Quality (DEQ) is required by the federal Clean Water Act (CWA) to maintain a list of stream segments that do not meet water quality standards for one or more beneficial uses. This list is called the 303(d) list because of the section of the CWA that makes the requirement. DEQ's 2004/2006 303(d) list is the most recent listing of these streams (ODEQ 2006a).

The BLM in cooperation with the Forest Service, DEQ, and the Environmental Protection Agency is implementing the *Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters* (USDA and USDI 1999). Under the Protocol, the BLM will protect and maintain water quality where standards are met or surpassed, and restore water quality limited waterbodies within their jurisdiction to conditions that meet or surpass standards for designated beneficial uses. The BLM will also adhere to the State Antidegradation Policy (OAR 2005; 340-041-0004) under any proposed actions. The DEQ has not determined the Total Maximum Daily Load (TMDL) for the Rogue River-Gold Hill Watershed. The BLM has completed a water quality restoration plan (WQRP) for BLM-administered lands in the Rogue River-Gold Hill Watershed South of the Rogue River (USDI 2005). 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. Necessary federal and state permits would be obtained for any proposed instream work.

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

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

Within the proposed Galls Foot planning area, the Rogue River and Galls Creek are included on DEQ's 2004/2006 303(d) list for exceeding temperature criterion, and the Rogue River exceeds the E. coli criterion. Stream temperature could possibly be affected by the proposed action and will be further discussed in this document. E. coli is a species of fecal coliform bacteria that is produced in the guts of warm-blooded vertebrate animals. The proposed action would not have any affect on the E. coli levels found in the Rogue River and therefore will not be addressed in detail in this environmental assessment. The 303(d) listed streams are discussed further in the Current Conditions section.

Ground Water

Although little information is available on groundwater availability in the Planning Area, groundwater supplies in the Rogue River-Gold Hill Watershed are probably limited, with the greatest volumes found in valley bottom alluvium of the Rogue River corridor. Ground water supplies in most areas of the Rogue basin are limited (USDI 1994:3-13). 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 Country (USDI 1994:3-13). The RMP/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). None of the Galls Foot Planning Area has been identified as a critical groundwater area by the Oregon Water Resources Department (OWRD 1989).

Limited amounts of shallow groundwater are stored in the accumulated colluvium in the smaller streams and draws of the Planning Area, and contribute the small amount of late summer flow present in some streams and the available groundwater at locations away from valley-bottom alluvium of the larger rivers. These natural "sponges" reach full capacity most winters, slowly releasing water to downstream areas throughout the summer or being fully utilized by vegetation growing on these deposits. While the vegetation utilizes much of the stored water within these stream bottom areas during the course of the summer, this vegetation is also critical to maintaining the stability of these deposits over the long term, and for helping increase the wintertime holding capacity of these areas.

Although data is not available on groundwater conditions in the Planning Area, conditions that would affect stream low flows would be a concern, since most of the low flows in the smaller streams of the Planning Area are maintained from the shallow groundwater stored in the accumulated colluvium of draw bottoms. Precipitation falling on an area where vegetation has been removed moves into the soil surface and may either drain into streams or become groundwater.

Springs, Wetlands, and Reservoirs

Springs, wetlands and reservoirs on BLM-administered lands within the Planning Area have been identified and mapped in GIS. Most of the features are less than one acre and are contained within Riparian Reserves. On BLM administered lands, locations of springs having some type of development for the purpose of diverting,

storing, and/or transporting water were identified during stream survey. The Oregon Water Resources Department website[1] was queried to find out if there are valid water rights for either diversion or storage at any locations on BLM land within these drainages. BLM records were also checked to determine any right-of-ways or other authorizations for diversion structures, water storage, or water transport facilities in this drainage. These are discussed on a drainage-by-drainage basis in Appendix A. Landowners who have obtained water rights from the State of Oregon for use of the water must also secure the required right-of-way from the BLM for installation and use of these facilities on public land. Landowners must initiate application for, and are usually granted, a right-of-way for water sources located on BLM lands if the landowner has a valid existing water right for the water source. Without a right-of-way for the transport facilities, the pipeline or ditch is in trespass, and the Bureau technically is not liable for damages that may occur to the facilities in the course of the Bureau's land management activities.[2] Water-related authorizations or developments have been identified on BLM land within the Galls Foot Planning Area boundary, providing information to assist in analyzing potential impacts and provide for the protection of authorizations and developments during the project.

Stream Morphology

The Medford BLM uses a stream classification system (Rosgen 1996) to categorize stream channels. These categories are based on stream gradients, stream sinuosity, valley form, entrenchment, and confinement. Most of the streams on BLM-administered lands in the Planning Area are located in the upper reaches of drainage areas and are classified as type Aa+, A or type B streams. Type Aa+ streams are uniquely associated with channels gradients greater than 10 percent. The A and B type channels are associated with gradients in the 4 to 10 percent range. The channels of these streams are typically confined to a narrow valley and are generally stable. However, debris and gravel materials do accumulate in the channel at lodge points that eventually fail and may cause a debris torrent. The recurrence cycle of these failures is dependent upon the size and availability of the wood material and the quantity of movement of the streambed material. Because AA+ and A type channels are typically located in steep, confined valleys, are deeply entrenched, often located on depositional slopes, landslide debris, and mixtures of noncohesive, colluvial and alluvial deposition, natural disturbance and active erosion of channels and banks is a common feature of these streams. Typical natural stream bank erosional processes are fluvial entrainment, bank collapse, dry ravel, freeze/thaw and lateral scour from debris flows. (Rosgen 1996:4-4 to 4-6, 5-44 to 5-83). Mainstem stream channels in parts of the area were extensively modified by mining activities beginning in the mid to late 1800's. Channels continue a gradual recovery from these impacts, with each successive flood promoting additional recovery toward a more pre-mining era condition.

Project Components not Assessed in Detail for Hydrology/Water Resources

Below are project components not assessed in detail for Water Resources, along with rationale explaining why they were not assessed and are not critical to an assessment of project implications for water resources.

Differences in Commercial Harvest Prescriptions

This analysis does not go into great detail regarding differences in the different harvest prescriptions. Although different in objectives, the different harvest prescriptions proposed for this project do not vary significantly in terms of their hydrologic impacts. Yarding systems employed by the different harvest prescriptions have similar impacts (similar between prescriptions, not similar between yarding systems) regardless of which one of the prescriptions is employed, as they disturb roughly the same amount of area given the type of yarding being done. All of the prescriptions proposed in the Galls Foot project with the exception of the Pine Site Prescription maintain average canopy closures greater than 30 percent (Gordon 2006), in line with the historical canopy closure listed for this ecoregion (WPN 1999:Appendix A). Canopy closure in proposed treatment units across the Planning Area would average 47 percent after treatment, and untreated forested areas across the planning area would average 85 percent canopy closure (Gordon 2006).

[1] http://egov.oregon.gov/OWRD/

[2] Joe Hoppe, BLM realty specialist, personal communication to BLM hydrologist David Squyres.

Drainage RH0527 – Rogue River below Miller's Gulch, above Foots Creek
This is a very small frontal drainage along approximately a ¾ mile section of the Rogue River. A small portion of this drainage is shown as included in the Planning area boundary, but no activities are proposed on the small acreage of BLM land within this drainage.

Environmental Consequences – Water Resources

This section discloses the impacts from various vegetation treatments and ground disturbing activities on water quantity and quality. Soil erosion is addressed in the Soils section and habitats and wildlife related to water are discussed in the Fisheries section.

The *Conditions and Effects Analysis on Water Resources* (Appendix A) is summarized on the following pages. Appendix A contains more detailed discussion of how the analysis was done, the (7th level) drainage-by-drainage discussion of basic drainage information, a quick overview of what is proposed under the alternatives, followed by analysis of each of the risk factors for that drainage. This analysis takes a hard look at the effects of the proposed alternatives on water resources issues by first quantifying the current conditions brought on by past actions, then combining the current conditions with each alternative to come up with the analysis of how conditions would change. This is then combined with other foreseeable future actions to complete the assessment of the cumulative effects of the alternatives. The analysis process serves the purpose both of meeting requirements under NEPA and with the objective to minimize detrimental impacts on water resources resulting from the cumulative impact of land management activities within the watersheds encompassing the Galls Foot Planning Area (USDI 1995:153). Appendix A contains the detailed information that provides the basis for the summary information provided here for current condition.

Data from the Appendix A analysis is presented in tables for *Past Action/Current Condition* (Table 3-H-4), *Direct and Indirect Effects* for each of the alternatives (tables 3-H-6 and 3-H-7), *Foreseeable Future Actions* (Table 3-H-8), and the *Cumulative* (or in the case of Alternative 1, *Combined Current and Ongoing*) *Impacts* for each alternative (tables 3-H-9 and 3-H-10). Table 3-H-3 provides a simple reference to each of the tables by alternative.

Table 3-H-3: Table Reference for Water Resources Effects Analysis

	Past Action / Current Condition	**Direct and Indirect Effects**	**Foreseeable Future Actions**	**Cumulative or Combined Current and Ongoing Impacts**
Alternative 1	Table 3-H-4	Table 3-H-6	Table 3-H-8	Table 3-H-9
Alternative 2	Table 3-H-4	Table 3-H-7	Table 3-H-8	Table 3-H-10

As shown in Table 3-H-3, the data for *Past Action/Current Condition* (Table 3-H-4) and *Foreseeable Future Actions* (Table 3-H-8) is common to all alternatives. Tables 3-H-6 and 3-H-7 list the data for the changes resulting from implementation of each alternative (*Direct and Indirect Effects*). The *Cumulative or Combined Current and Ongoing Impacts* tables (3-H-9 and 3-H-10) combine the information contained in the *Past Action/Current Condition*, *Direct and Indirect Effects*, and *Foreseeable Future Actions* tables for each alternative. The difference between the *Combined Current and Ongoing Impacts* for Alternative 1 ("No Action" Table 3-H-9) and the *Cumulative Impacts* for Alternative 2 (Table 3-H-10) represent the change in cumulative effects attributable to implementation of the given alternative.

Water Resources: Current Condition resulting from Past Actions

Table 3-H-4: Current Conditions resulting from Past Actions, by Drainage

Drainage (Chapter 3 Table 3-H-1)	**percent of Drainage with recent intensive timber harvest** (Table A2*)	**Acres of Disturbance on Highly Erodible or Potentially Unstable Soils** (Table A1*)	**percent Compacted Area** (Table A3*)	**percent Nonrecovered Transient Snow Zone Openings** (Table A4*)	**percent level of Concern for Nonrecovered Transient Snow Zone Openings** (Table A4*)	**Stream Channel Conditions on BLM** (Table A5*)	**Riparian Area Conditions on BLM** (Table A6*)	**Recent Catastrophic Events** (Table A7*)	**Road Density mile/mile^2** (Table A8*)	**Road Density BLM Riparian Reserves miles/mile^2** (Table A9*)	**Stream Sedimentation Conditions on BLM** (Table A10*)	**Stream Sedimentation Potential** (Table A10*)	**Water Quality Problems other then sedimentation** (Table A11*)
RH0415	25	10	5	NA	NA	Fair	Fair	0	7.7	4.3	Poor	High	Temperature
RH0521	20	2	4	NA	NA	Fair	Poor	0	11.1	5.1	Poor	High	Temperature and fecal coliform
RH0524	18	3	4	NA	NA	Fair	Good	0	6.7	4.4	Poor	High	none
RH0603	29	0	9	NA	NA	Fair	Fair	0	5.3	7.4	Poor	High	none
RH0606	11	0	5	NA	NA	Fair/Poor	Fair	0	4.9	5	Poor	High	none
RH0609	3	0	1	NA	NA	Poor	Fair	0	4.5	3.9	Poor	High	none
RH0612	20	14	2	NA	NA	Fair	Poor	0	5.4	5.7	Poor	High	none
RH0615	4	4	2	NA	NA	Fair	Fair	0	7.1	0	Poor	High	none

*The referenced tables and supporting analysis are contained in Appendix A.

Groundwater supplies in the Planning Area are unknown, but are most likely limited to valley bottom alluvium of the Rogue River corridor and major streams; ground water supplies in most areas of the Rogue basin are limited (USDI 1994:3-13). None of the proposed vegetation management activities in the alternatives analyzed here would be located in the valley bottom near the Rogue River. Limited amounts of shallow groundwater are also stored in the accumulated colluvium in the smaller streams and draws of the Planning Area, and contribute the small amount of late summer flow present in some streams and the available groundwater at locations away from valley-bottom alluvium of the larger rivers. These natural "sponges" reach full capacity most winters, slowly releasing water to downstream areas throughout the summer or being fully utilized by vegetation growing on these deposits. While the vegetation utilizes much of the stored water within these stream bottom areas during the course of the summer, this vegetation is also critical to maintaining the stability of these deposits over the long term, and for helping increase the wintertime holding capacity of these areas. Removal of this stabilizing stream bottom vegetation with the short-sighted purpose of increasing summer water yield could destabilize these colluvial deposits, allowing them to wash out to bedrock, effectively destroying the "sponge". Because these areas are protected as Riparian Reserves, and such colluvial deposits in the bottoms of streams are protected with no-treatment areas, actions proposed under the alternatives would have no negative effect on supplies of groundwater from this source. Combined with potentially less water use by thinned and periodically

underburned upland vegetation, water could possibly be available for input into these colluvial deposits later into the spring each year, seeping down slopes to the stream bottoms rather than being utilized on-site by dense vegetation. This could keep these stream bottom areas saturated later into the dry season, making somewhat increased supplies of this shallow groundwater available. Restoration of upland vegetation conditions and larger vegetation and woody debris in stream bottoms are both ultimately critical in maintaining and enhancing low flows and groundwater availability within the Planning Area.

Increases in the magnitude and frequency of peak flows can lead to subsequent adverse effects on stream channel condition (USDI 1994:4-18), by more rapid delivery of flow to the channel, increased delivery of sediment to the channel via road drainage and other ground disturbance, and from erosion of the stream channels themselves as the channel adjusts to accommodate the increased volume of flow. High road densities, proximity of roads to streams, large areas of compacted soil, and large percentages of area in nonrecovered openings within the Transient Snow Zone are all factors that can lead to increased peak flows.

Road densities (Table 3-H-4 column 10) are high within all drainages. One drainage, the Rogue River between Sardine Creek and Millers Gulch (RH0521) has extremely high road density, due primarily to development along the Rogue River and I-5 corridor through this drainage. On BLM lands, all but one of the drainages have high road densities within Riparian Reserves (Table 3-H-4 column 11)(indicating that many roads are in close proximity to streams), including a very high 7.4 miles per square mile of Riparian Reserve in the Middle Fork Foots Creek (RH0603) and 5.7 miles per square mile in Right Fork Foots Creek (RH0612). With high road densities and roads crossing streams at many locations (see the Appendix A *High Sedimentation Potential* risk factor discussion for each drainage), concentration of runoff by road drainage systems may be contributing to more rapid delivery of storm runoff directly to streams with possible increases in peak flows.

Compacted area due to harvest and roads (Table 3-H-4 column 4) is a concern in one drainage – the Middle Fork of Foots Creek (RH0603). Large areas of compacted soil, such as occur on roads, landings, and areas of tractor yarding, can be a concern from a hydrologic perspective because such areas can decrease the infiltration properties of the soil, resulting in increased surface runoff. This can also contribute to decreased soil moisture within and downslope of the compacted area. In riparian areas, large areas of compacted soil can indirectly affect stream conditions and water quality by contributing to reduced productivity of riparian vegetation. In the Middle Fork of Foots Creek drainage (RH0603), about 9% of the area is compacted (Table 3-H-4 column 4) due largely to roads and past tractor harvest on non-BLM lands. While still below the 12% level at which compacted area may potentially begin to affect peak flows, it is an indication that disturbance levels are high enough that further impacts could have a potential adverse effect on peak flows and need to be evaluated.

The Transient Snow Zone is of interest to land managers since greater snow accumulation can occur in clearings, producing the potential for higher peak flows during rain-on-snow events. The drainages of the Planning Area fall within the rainfall-dominated zone and do not have sufficient acreage located within the Transient Snow Zone to require analysis of the drainage for area in nonrecovered openings.

Conditions related to past catastrophic events are not an issue, as past large fires in the vicinity did not create ongoing impacts within the Planning Area (Table 3-H-4, column 9). There have been no other recent major catastrophic events in this drainage, so there is no effect relating to this risk factor

Stream channel conditions can also be an indicator of the adverse affects of peak flow increases, although degraded channel conditions can also arise from other impacts such as poor riparian vegetation condition and lack of sufficient instream structure such as woody debris. Streams need adequate stream channel structure (i.e. debris jams or other structures) to dissipate stream energy and prevent degradation of channel conditions (sinuosity, width/depth ratio, or gradient), and need things like rocks and woody debris sufficient to protect the channel from accelerated bank erosion and downcutting during flood events. All of the drainage areas have fair or fair-to-poor stream channel conditions on BLM lands (Table 3-H-4 column 7), with large fine sediment loads being the most obvious factor in the degraded condition ratings. Apart from the sediment load negatively

affecting channel conditions, channel stability itself was fair-to-good in all drainages. Sediment delivery from roads and OHV trails interacting with the hydrologic network was identified as the primary source of most of the poor channel conditions.

Table 3-H-5: Water Quality Limited Streams in the Galls Foot Planning Area

Name	location	Parameter(s)	Drainage
Rogue River	River reach throughout the drainage	Year-around Temperature, Fecal Coliform	RH0421
Galls Creek	Mouth to Headwaters	Summer Temperature	RH0415

Two of the eight drainages analyzed for the project contain streams that are on the State of Oregon 303(d) list of water quality limited streams (Table 3-H-5)(ODEQ 2006a). Listings are for high stream temperatures, with the exception of a Fecal Coliform listing for the Rogue River (RH0421). There is nothing to suggest that conditions on BLM lands in this drainage would have any affect on fecal coliform levels in the river. It is very likely that the high levels of fecal coliform present in the Rogue River are the culmulative result of the more than 2000 square miles of watershed area upstream of this drainage that contain extensive agricultural land, open range, and urban/suburban development, along with the associated impacts to streams which accompany such development. No streams within the analyzed drainages are on the 303(d) list for sediment issues (ODEQ 2006a).

Most drainages have numerous streams on BLM lands where past timber harvest was noted in the riparian area immediately adjacent to the creek (USDI 2006a). This timber harvest activity was from prior to implementation of the current Resource Management Plan (USDI 1995). All drainages had stream channel conditions that were in the fair-to-poor range (Table 3-H-4 column 7), and all but one drainage had riparian conditions in the fair-to-poor range (Table 3-H-4 column 8). Removal of streamside vegetation, roads constructed with drainage systems that route flow directly to streams, ground-disturbing harvest operations without streamside buffers, and lack of project design features/best management practices appear to be the primary factors that have lead to the conditions that could adversely affect stream temperature.

Although none of the streams in the Planning Area are on the 303(d) list for sediment (ODEQ 2006a), sedimentation conditions were identified based on on-the-ground data as poor in all of the drainages assessed (USDI 2006a)(Table 3-H-4 column 12). Analysis points to overall road densities, road and OHV trail interactions with streams as the culprits in the amount of adverse sediment conditions (see the Appendix A *High Sedimentation Potential* risk factor discussion for each drainage). The previous peak flow discussion applies here as well. There is very little existing disturbance on highly erodible soils (Table 3-H-4, column 3), another potential source of turbidity and sediment in streams. Highly erodible soils can more easily be impacted from ground disturbance or channelization of water, increasing the chances that associated fine sediment could enter the downslope aquatic system. Unstable areas are prone to mass wasting that could dramatically increase sediment yields and possibly affect stream function. Potentially unstable areas were identified near a number of dry draws in several of the drainages. See the *Soils* discussion for more information on highly erodible soils and potentially unstable areas.

Hydrology/Water Resources: Alternative 1 Direct and Indirect Effects

Table 3-H-6: Alternative 1 Changes in Risk Factors by Drainage resulting from "No Action"

Drainage (Chapter 3 Table 3-H-1)	**percent of drainage proposed for intensive timber harvest** (Table A2*)	**Acres proposed new disturbance on highly erodible/unstable soils** (Table A1*)	**percent proposed new compacted area** (Table A3*)	**percent proposed new transient snow zone openings** (Table A4*)	**Potential changes in stream channel conditions** (Table A5*)	**Potential changes in riparian area conditions** (Table A6*)	**Potential effects related to impacts from past catastrophic events** (Table A7*)	**Proposed change in road density miles/mile^2** (Table A8*)	**Proposed change in road density BLM Riparian Reserves miles/mile^2** (Table A9*)	**Potential change in management-related stream sedimentation** (Table A10*)	**Potential effect on water quality problems other than sedimentation** (Table A11*)
RH0415	0	0	0	NA	no change	no change	0	0	0	0	0
RH0521	0	0	0	NA	no change	no change	0	0	0	0	0
RH0524	0	0	0	NA	no change	no change	0	0	0	0	0
RH0603	0	0	0	NA	no change	no change	0	0	0	0	0
RH0606	0	0	0	NA	no change	no change	0	0	0	0	0
RH0609	0	0	0	NA	no change	no change	0	0	0	0	0
RH0612	0	0	0	NA	no change	no change	0	0	0	0	0
RH0615	0	0	0	NA	no change	no change	0	0	0	0	0

* The referenced tables and supporting analysis are contained in Appendix A.

There would be no changes in road densities (Table 3-H-6 column 9), proximity of roads to streams (Table 3-H-6 column 10), or areas of compacted soil (Table 3-H-6 column 4) with implementation of Alternative 1. Transient snow zone is not an issue in any of the drainages. There would therefore be no changes to the magnitude and frequency of peak flows.

With continued high road densities (Table 3-H-4 column 10) and roads crossing streams at many locations (see the Appendix A *High Sedimentation Potential* risk factor discussion for each drainage), concentration of runoff by road drainage systems would continue contributing to more rapid delivery of storm runoff directly to streams, resulting in continued increased peak flows. Roads alter the hydrologic network and may increase the magnitude of peak flows and affect the time it takes runoff to reach the stream. Road cuts intercept subsurface water and road ditches convey it to streams. Road surfaces are in a permanently compacted state, promoting the collection and runoff of water during storm events; this water can be transported to streams (Wemple 1994). This effect is more pronounced in areas with high road densities and where roads are in close proximity to streams (USDI 2001:61). Roads are the primary source of sediment for streams in the analysis area (USDI 2001:70). Roads can also be a concern if they change the local drainage pattern and force the natural drainage system, which has developed over millennia, to adjust to a new regime, causing adverse effects on the aquatic system. A fill or cut slope failure produces soil material that could potentially increase the sediment input to a stream. Culvert failures can cause the water to be diverted from one drainage to another thereby affecting the channel stability of both systems. The channel in the drainage receiving the additional flow must start an adjustment process to accommodate this flow increase while the original channel responds to a reduction in

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

Stream channel conditions would remain at an increased level of risk for adverse affects of increased peak flow (Table 3-H-6 column 6). Streams need adequate stream channel structure (i.e. debris jams or other structures) to dissipate stream energy and prevent degradation of channel conditions (sinuosity, width/depth ratio, or gradient), and need things like rocks and woody debris sufficient to protect the channel from accelerated bank erosion and downcutting during flood events. Increased peak flows could destabilize the stream channel, increasing bank erosion, reducing channel structure, and increasing sedimentation within the channel.

Under Alternative 1 (no action), riparian areas would continue to be protected per direction in the Aquatic Conservation Strategy (ACS) (USDI 1995:22-23). Riparian areas where previous harvest activities occurred would continue to gradually recover from past harvest impacts. There would be no road-related work in Riparian Reserves under this alternative, so watershed restoration direction regarding roads under the Aquatic Conservation Strategy might not be met. RMP direction that silvicultural practices are to be applied to Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain ACS and Riparian Reserve objectives (USDI 1995:27) would not be implemented under this alternative, so there would be no improvement in riparian vegetation condition (Table 3-H-6 column 7), particularly where needed in young riparian stands that were created from intensive timber harvest in streams done prior to implementation of Riparian Reserves as a management tool in the 1990s. Riparian areas need to be in a condition where adequate vegetation, landform, or woody debris is present to: dissipate stream energy during high flow events to reduce erosion and improve water quality; filter sediment, capture bedload, and aid in floodplain development; improve floodwater retention and groundwater recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and to support greater biodiversity (USDI/USDA 1998). When adequate vegetation, landform, or woody debris is not present along a stream, proper functioning of the physical processes listed above is compromised.

Streams would neither be added nor removed from the 303(d) list as result of choosing the No Action Alternative (Table 3-H-6 column 12). Implementation of Alternative 1 would not change current stream temperature conditions. Some streams would continue to have some degree of warming due to a combination of natural influences, areas of past intensive harvest in riparian areas, and degraded riparian and channel conditions at some locations. There would be no action to correct problems associated with roads constructed with drainage systems that route flow directly to streams, so any temperature effects from channel conditions aggravated by roads would be expected to continue.

Choosing the No Action Alternative would not take any action to correct problems related to stream sedimentation. Sedimentation would be expected to remain a problem, and trends in sediment inputs to streams would be expected to continue (Table 3-H-6 column 11). There would be no action to decrease overall road densities (Table 3-H-6 column 9) or decrease road interactions with streams (Table 3-H-6 column 10; Appendix A *High Sedimentation Potential* discussion for Alternative 1 in each drainage). There would be no new disturbance on highly erodible soils (Table 3-H-6, column 3) or unstable areas, and area of compacted ground would not change (Table 3-H-6 column 4). Disturbance on highly erodible soils is a potential source of turbidity and sediment in streams (see Appendix A Table A1 and the Appendix A discussion for the *Highly Erodible Soils* risk factor for each drainage). Highly erodible soils can more easily be impacted from ground disturbance or channelization of water, increasing the chances that associated fine sediment could enter the downslope aquatic system. Unstable areas are prone to mass wasting that could dramatically increase sediment yields and possibly affect stream function. The previous discussion regarding peak flow, above, applies to this sedimentation discussion as well.

Hydrology/Water Resources: Alternative 2 Direct and Indirect Effects

Table 3-H-7: Alternative 2 Proposed Changes in Risk Factors by Drainage

Drainage (Chapter 3 Table 3-H-1)	**percent of drainage proposed for intensive timber harvest** (Table A2*)	**Acres proposed new disturbance on highly erodible/unstable soils** (Table A1*)	**percent proposed new compacted area** (Table A3*)	**percent proposed new transient snow zone openings** (Table A4*)	**Potential changes in stream channel conditions** (Table A5*)	**Potential changes in riparian area conditions** (Table A6*)	**Potential effects related to impacts from past catastrophic events** (Table A7*)	**Proposed change in road density miles/mile^2** (Table A8*)	**Proposed change in road density BLM Riparian Reserves miles/mile^2** (Table A9*)	**Potential change in management-related stream sedimentation** (Table A10*)	**Potential effect on water quality problems other than sedimentation** (Table A11*)
RH0415	<1	12	<1	NA	positive	positive	0	-0.1	-0.9	positive	0
RH0521	0	3	<1	NA	no change	positive	0	0	0	0	0
RH0524	0	2	<1	NA	no change	positive	0	-0.2	-0.9	positive	0
RH0603	<1	<1	<1	NA	no change	positive	0	0	0	0	0
RH0606	<1	4	<1	NA	positive	positive	0	+0.3	-3.6	positive	0
RH0609	<1	2	<1	NA	no change	positive	0	-0.1	0	positive	0
RH0612	<1	3	<1	NA	positive	positive	0	-0.1	-0.3	positive	0
RH0615	0	0	<1	NA	no change	no change	0	0	0	0	0

* The referenced tables and supporting analysis are contained in Appendix A.

Overall road density would decrease slightly with implementation of Alternative 2 (Table 3-H-7 column 9). However, road density would increase in one drainage, decline in four drainages, and remain unchanged in three drainage (Table 3-H-7 column 9). Overall, roadwork under this alternative would better disconnect roads from the stream system by decommissioning roads and locating portions of the transportation system higher on ridges, away from streams. The road decommissioning would have some positive benefit from a hydrologic/sediment delivery standpoint, helping to control and prevent road-related runoff and sediment production. This is one of the most important components of a watershed restoration program under the Aquatic Conservation Strategy (USDI 1995:23). BLM's management direction under the watershed restoration portion of the Aquatic Conservation Strategy is to focus on removing and upgrading roads (USDI 1995:23). Although road density would increase in one drainage, a better picture of the effects to the stream system is gained by looking at the changes to road density within the Riparian Reserves of each drainage (Table 3-H-7 column 10). Roads in the Riparian Reserves are located very close to the streams themselves, often crossing the stream, so changes in the amount and condition of roads within Reserves can make a major difference in the potential impacts. Under Alternative 2, road density in Riparian Reserves would be reduced in four drainages (Table 3-H-7 column 10). The reductions would be dramatic in the Left Fork Foots Creek drainage (RH0606) with a reduction of 3.6 miles per square mile of Riparian Reserve road density, the same drainage where the overall road density is increasing. Galls Creek (RH0415), Millers Gulch (RH0524), and Right Fork Foots Creek (RH0612) would all have lesser reductions in Riparian Reserve road density. Riparian Reserve road density in the remaining drainages would not change, and there would be no drainages where Riparian Reserve density

would increase. No new road construction is proposed within any Riparian Reserve in this Project, and all drainages where any new road construction is proposed would also have some road decommissioned with Riparian Reserves.

In Left Fork Foots Creek (RH0606), where overall road construction would be greater than the corresponding decommissioning of streamside roads, the reduced interaction of roads with the stream system would immediately reduce sediment delivery to streams. The decommission work would remove a significant source of sediment and peakflow delivery along several intermittent streams, while the new construction would be located outside of any Riparian Reserves and would be designed to prevent any channelization of flow into dry draws during flood events. Even though the location of the new road would increase the risk of a road related slope failure during a flood event, if such a failure did occur at some point in the future, most of the material would be deposited even before entering the Riparian Reserve. The remaining amount of sediment actually entering a stream channel far downslope from the road would still be a much lesser amount that what is currently transported directly into the stream each year by the roads that are proposed to be decommissioned. The current eroding roads proposed for decommissioning continuously bleed sediment into the downstream aquatic system creating a chronic impact, even during relatively small flow events; this can be contrasted to what would occur should a road slope failure occur, such failures typically occur during flood events, and on a maintained system road would not be chronic in nature. Aside from the risk of a road failure during a flood event, the new road construction would have no effect on instream sedimentation. The implementation of the combination of roadwork proposed under this alternative would immediately decrease sediment delivery to the downstream aquatic system.

With reduction of Riparian Reserve road density in many drainages (Table 3-H-7 column 10), removal of stream crossings and more disconnection of roads from the stream network (Appendix A discussion for the *High Sedimentation Potential* risk factor for each drainage), there would be less rapid delivery of storm runoff directly to streams from roads. Peak flows from roads would be reduced. These improvements to roads are important because roads alter the hydrologic network and may increase the magnitude of peak flows and affect the time it takes runoff to reach the stream. Road cuts intercept subsurface water and road ditches convey it to streams. Roads can change the local drainage pattern and force the natural drainage system, which has developed over millennia, to adjust to a new regime, causing adverse effects on the aquatic system. A fill or cut slope failure produces soil material that could potentially increase the sediment input to a stream. Culvert failures can cause the water to be diverted from one catchment to another thereby affecting the channel stability of both systems. The channel in the catchment receiving the additional flow must start an adjustment process to accommodate this flow increase while the original channel responds to a reduction in water. Well-designed roads with a properly functioning drainage system would attempt to mimic the local natural drainage pattern by keeping the local downslope movement of water similar to the pre-road condition. However, during extreme events (drought or peak flow) any hydrologic differences between the artificial drainage associated with the road system and the natural system become more critical and can cause noticeable effects to the local environment. Road surfaces are in a permanently compacted state, promoting the collection and runoff of water during storm events; this water can be transported to streams (Wemple 1994). This effect is more pronounced in areas with high road densities and where roads are in close proximity to streams (USDI 2001:61). Roads are the primary source of sediment for streams in the analysis area (USDI 2001:70). Instream sedimentation conditions related to roads and harvest would improve or remain unchanged in all drainages (Table 3-H-7 column 11).

Large areas of compacted soil, such as occur on roads, landings and tractor yarded harvest units can be a concern from a hydrologic perspective because such areas can decrease the infiltration properties of the soil, resulting in increased surface runoff. This can also contribute to decreased soil moisture within and downslope of the compacted area. In riparian areas, large areas of compacted soil can indirectly affect stream conditions and water quality by contributing to reduced productivity of riparian vegetation. Increases in compacted area would be slight as a result of the proposed action (see Soils section and the Appendix A *Compacted Area* discussion for each drainage.) The one drainage where compaction was identified as a potential issue, the Middle Fork of Foots Creek drainage (RH0603), the project would potentially compact far less than 1 percent new ground; total existing compaction in that drainage following the project would be relatively unchanged at

about 9 percent, still below the 12 percent level at which compacted area may potentially begin to affect peak flows. Change in disturbance levels would not have an adverse effect on peak flows as a result of implementing the Galls Foot project.

There would be little new disturbance on highly erodible soils (Table 3-H-7, column 3) in any of the drainages under this alternative, and this disturbance would not impact streams (see Appendix A Table A1 and the Appendix A discussion for the *Highly Erodible Soils* risk factor for each drainage). Disturbance on highly erodible soils is another potential source of turbidity and sediment in streams. Highly erodible soils can more easily be impacted from ground disturbance or channelization of water, increasing the chances that associated fine sediment could enter the downslope aquatic system. Potentially unstable areas were identified in a number of dry draws in several of the drainages; these potentially unstable areas have been designated as Riparian Reserves, per the direction in the RMP (USDI 1995:27). Unstable areas are prone to mass wasting that could dramatically increase sediment yields and possibly affect stream function. See the *Soils* discussion for more information regarding highly erodible soils and unstable areas.

Implementation of Alternative 2 would have a positive effect on stream channel conditions in three drainages; in the remaining drainages there would be no change in stream channel conditions (Table 3-H-7 column 6). Stream channels would be protected within Riparian Reserves (Chapter 2 Project Design Features). At various locations, decommissioning of stream crossings and streamside roads would decrease the likelihood of incurring negative effects to stream channels from increased peak flows or sediment delivery (see Appendix A risk factor discussions for *High Sedimentation Potential*, *High Road Density*, and *Stream Channel Condition* for each drainage). Streams need adequate stream channel structure (i.e. debris jams or other structures) to dissipate stream energy and prevent degradation of channel conditions (sinuosity, width/depth ratio, or gradient), and need things like rocks and woody debris sufficient to protect the channel from accelerated bank erosion and downcutting during flood events. This is important because increases in peak flows or sediment delivery could destabilize the stream channel, increasing bank erosion, reducing channel structure, and increasing sedimentation within the channel.

Under Alternative 2, riparian areas would continue to be protected and managed per direction in the Aquatic Conservation Strategy (ACS) (USDI 1995:22-23). As previously discussed, road decommissioning in some Riparian Reserves would likely decrease some road-related impacts. To meet the RMP direction that silvicultural practices are to be applied to Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain ACS and Riparian Reserve objectives (USDI 1995:27), Alternative 2 would implement vegetation treatments in some Riparian Reserves, allowing trees to gain late successional characteristics more quickly as well as increasing the chances that the riparian stands would be better adapted to occurrences of low intensity fire and other natural or prescribed disturbance. These treatments would generally be done within the Reserves that represent the least desirable current conditions (typically overstocked or very young stands). The treatments proposed under Alternative 2 are important because they would help promote desired conditions in the Reserves of all but one of the drainages (Table 3-H-7 column 7; Appendix A *Riparian Areas* Alternative 2 discussion for each of the drainages); only Foots Creek below Right Fork Foots Creek would not have riparian work done. Riparian areas need to be in a condition where adequate vegetation, landform, or woody debris is present to: dissipate stream energy during high flow events to reduce erosion and improve water quality; filter sediment, capture bedload, and aid in floodplain development; improve floodwater retention and groundwater recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and to support greater biodiversity (USDI/USDA 1998). When adequate vegetation, landform, or woody debris is not present along a stream, proper functioning of the physical processes listed above is compromised.

There is no activity proposed under this alternative that would result in anthropogenic-caused heating of streams (USDI 2005:24) or cause other adverse effects to water quality (Table 3-H-7 column 12; Appendix A *Clean Water Act* risk factor discussion for each drainage). Implementation of Best Management Practices (USDI 1995:Appendix D), other Project Design Features (Chapter 2), and protection of Riparian Reserves would

enable the Project to avoid violation of the Clean Water Act. Under Alternative 2, riparian areas would continue to be protected and managed per direction in the Aquatic Conservation Strategy (ACS) (USDI 1995:22-23). This alternative draws upon the passive and active restoration management actions recommended for achieving federal recovery goals as identified in the *Water Quality Restoration Plan for the Rogue River-Gold Hill Watershed South of the Rogue River (USDI 2006c:25-26)*. Natural influences on water quality would continue. There would be no removal of streamside vegetation, roads would not be constructed with drainage systems that route flow directly to streams, and project design features/best management practices (including Riparian Reserves) would be implemented to minimize any adverse effects on water quality (USDI 1994:4-23).

Hydrology/Water Resources: Foreseeable Future Actions

Table 3-H-8: Changes in Risk Factors by Drainage due to Foreseeable Future Actions

Drainage (Chapter 3 Table 3-H-1)	**percent of Drainage potentially converted to new young stands by foreseeable harvest** (Table A2*)	**Acres of Foreseeable New Disturbance on Highly Erodible or Unstable Soils** (Table A1*)	**percent Foreseeable New Compacted Area** (Table A3*)	**percent Foreseeable New Transient Snow Zone Openings** (Table A4*)	**Effect on Stream Channel Conditions of foreseeable actions** (Table A5*)	**Effect on Riparian Area Conditions of foreseeable actions** (Table A6*)	**Effect of Foreseeable Future Actions related to past catastrophic events** (Table A7*)	**Foreseeable change in Road Density miles/mile^2** (Table A8*)	**Foreseeable change in Road Density BLM Riparian Reserves miles/mile^2** (Table A9*)	**Foreseeable Change in Management-related Stream Sedimentation Potential** (Table A10*)	**Foreseeable Effect on Water Quality Problems other than sedimentation** (Table A11*)
RH0415	17	50	4.1	NA	negative	negative	0	0	0	negative	Improving
RH0521	4	13	1.1	NA	no change	positive	0	0	0	0	Improving
RH0524	9	0	2.5	NA	no change	positive	0	0	0	0	Improving
RH0603	21	33	5.2	NA	negative	negative	0	0	0	negative	Improving
RH0606	6	2	1.4	NA	negative	negative	0	0	0	negative	Improving
RH0609	5	9	1.4	NA	negative	negative	0	0	0	negative	Improving
RH0612	16	31	3.9	NA	negative	negative	0	0	0	negative	Improving
RH0615	2	2	0.6	NA	no change	positive	0	0	0	0	Improving

* The referenced tables and supporting analysis are contained in Appendix A.

There is no foreseeable road construction in the Planning Area other than that proposed in this project; most areas that could be harvested on private lands are accessible by existing roads.

Future intensive timber harvests on non-BLM lands are possible in most drainages; available timber within each drainage ranges from a few acres up to many hundreds of acres (see the Appendix A *Large Percentage of Forest Vegetation Harvested* risk factor *Foreseeable Future Actions* discussion for each drainage). Potential large changes could occur in Middle Fork Foots Creek (RH0603) where an additional 21 percent of the drainage is potentially available for logging in the immediate future; potential intensive harvest could also occur on 17

percent of lands in Galls creek (RH0415), 16 percent of lands in Right Fork Foots Creek (RH0612), and 9 percent of lands in Millers Gulch (RH0524)(Table 3-H-8 column 2). Compacted area could increase as a result of these activities, including as much as 5.2 percent of the drainage in RH0603, 4.1 percent in RH0415, 3.9 percent in RH0612, and 2.5 percent in RH0524 (Table 3-H-8 column 4). Timber harvest activities that expose soil to surface erosion can result in accelerated rates of sediment production. Skid trails and yarding corridors can expose soil and also cause compaction. In general, tree crowns intercept precipitation and can reduce the effect of extreme storm events while the tree roots provide stability to the soil. Consequently, large open areas without vegetative surface cover may have a greater risk of increased sediment production. Potential future harvests on non-BLM lands could periodically increase levels of fine sediments reaching streams, followed by gradual stabilization as areas recovered from harvest-related disturbance (Appendix A *High Sedimentation Potential* risk factor discussion for each drainage).

Thinning, fuel reduction, and future periodic maintenance underburning already completed or underway in some of the drainages under other federal projects could benefit adjacent riparian areas by helping restore a more natural vegetation structure/fire regime, potentially decreasing the magnitude of wildfires moving into riparian areas out of the uplands (see Appendix A *Riparian Areas* and *High Impacts from a Catastrophic Event* risk factor discussions for each drainage).

Stream channel and riparian conditions would likely decline in five drainages due to foreseeable future actions: Galls Creek (RH0415), Middle Fork Foots Creek (RH0603), Left Fork Foots Creek (RH0606), Foots Creek between Middle Fork and Right Fork Foots Creek (RH0609), and Right Fork Foots Creek (RH0612)(Table 3-H-8 columns 6 and 7). Streams need adequate stream channel structure (i.e. debris jams or other structures) to dissipate stream energy and prevent degradation of channel conditions (sinuosity, width/depth ratio, or gradient), and need things like rocks and woody debris sufficient to protect the channel from accelerated bank erosion and downcutting during flood events. This is important because increases in peak flows or sediment delivery could destabilize the stream channel, increasing bank erosion, reducing channel structure, and increasing sedimentation within the channel. Stream channels on private lands would continue to be protected by county ordinance and Oregon Forest Practices Rules; however, the combination of a large amount of non BLM timber harvest in these drainages (Appendix A *Large Percentage of Forest Vegetation Harvested* risk factor discussion for drainages RH0415, RH0603, RH0606, RH0609, RH0612) and increasing levels of OHV use could further impact stream channels, because of the high overall levels of recent harvest activity on private land in some drainages (Table 3-H-4 column 2), area of compacted soils (Table 3-H-4 column 4), and the associated concerns for increases in peak flows and sedimentation. High intensity harvest could impact stream channels if skid trails, roads, or OHV trails were created that could route additional flow and sediment to streams. Increasing OHV use in the Planning Area could over time deliver increasing levels of peakflow and sediment directly to stream channels (see *Road Density* and *High Sedimentation Potential* discussions for each drainage in Appendix A). Implementation of any of the action alternatives in the upcoming Johns Peak EIS would likely reduce OHV interaction with stream channels on BLM lands.

Intensive harvest activities on non-federal lands also have the potential to negatively impact riparian conditions on smaller intermittent/ephemeral streams by disturbing soils and vegetation because there are generally few restrictions on private yarding operations on these types of streams under the Oregon Forest Practices Act; The Oregon Forest Practices Act would regulate activities on larger intermittent, perennial and fisheries streams on non-federal land, but those protections are substantially less than what is necessary to meet regulatory, Endangered Species Act, and Clean Water Act requirements addressed by Resource Management Plan implementation for similar streams on BLM-administered land. Sedimentation inputs to streams from non-BLM roads and harvest activities would likely increase over time in five of the drainages (Table 3-H-8 column 11; Appendix A *High Sedimentation Potential* risk factor discussion for each drainage) due to continuing disturbance and increasing OHV interactions with the hydrologic network; channel and riparian conditions would continue on a downward trend in those same drainages (Table 3-H-8 columns 6 and 7) due to the accumulating impact resulting from this maintenance of the status quo.

Hydrology/Water Resources: Alternative 1 Combined Current and Ongoing Effects

Table 3-H-9: Alternative 1 (No Action) Combined Current and Ongoing Effects: Conditions and Trends in Risk Factors by Drainage (combining the Past Actions/Current Conditions [Table 3-H-4] and Foreseeable Future Actions [Table 3-H-8] with effects from implementation of the "No Action" Alternative [Table 3-H-6]). These are the current and ongoing conditions that will occur with selection of the "no action" alternative, and are the baseline conditions by which the cumulative impacts of the action alternative (table 3-H-10) can be compared to evaluate cumulative effects.

Drainage (Chapter 3 Table 3-H-1)	**Cumulative percent of Drainage converted to young stands by harvest** (Table A2*)	**Cumulative Acres of Disturbance on Highly Erodible or Unstable Soils** (Table A1*)	**Cumulative percent Compacted Area** (Table A3*)	**Cumulative percent Nonrecovered Transient Snow Zone Openings** (Table A4*)	**percent level of Concern for Nonrecovered Transient Snow Zone Openings** (Table A4*)	**Cumulative Trend in Stream Channel Conditions** (Table A5*)	**Cumulative Trend in Riparian Area Conditions** (Table A6*)	**Potential cumulative trend related to impacts from past catastrophic events** (Table A7*)	**Cumulative Road Density miles/mile^2** (Table A8*)	**Cumulative Road Density BLM Riparian Reserves miles/mile^2** (Table A9*)	**Cumulative change in management-related stream sedimentation** (Table A10*)	**Cumulative Trend on Water Quality Problems other than sedimentation** (Table A11*)
RH0415	43	60	9	NA	NA	Declining	Declining	0	7.7	4.3	Declining	Improving
RH0521	24	15	5	NA	NA	no change	Improving	0	11.1	5.1	no change	Improving
RH0524	27	3	6	NA	NA	no change	Improving	0	6.7	4.4	no change	Improving
RH0603	50	33	14	NA	NA	Declining	Declining	0	5.3	7.4	Declining	Improving
RH0606	16	2	7	NA	NA	Declining	Declining	0	4.9	5	Declining	Improving
RH0609	8	9	3	NA	NA	Declining	Declining	0	4.5	3.9	Declining	Improving
RH0612	36	45	6	NA	NA	Declining	Declining	0	5.4	5.7	Declining	Improving
RH0615	6	6	2	NA	NA	no change	Improving	0	7.1	0	no change	Improving

* The referenced tables and supporting analysis are contained in Appendix A.

Compared to existing condition (Table 3-H-4), with implementation of the "No Action" alternative (Table 3-H-6) and effects of foreseeable future actions (Table 3-H-8), there would no changes in road densities in the drainages (compare Table 3-H-9 column 10 to Table 3-H-4 column 10); however, in Galls Creek (RH0415), Middle Fork Foots Creek (RH0603), Left Fork Foots Creek (RH0606), Foots Creek between Middle Fork and Right Fork Foots Creek (RH0609), and Right Fork Foots Creek (RH0612) trends and conditions related to road density and associated disturbance would likely continue a gradual increase due to ongoing and increasing OHV activity in the drainage, with gradual increases in road-related impacts to water resources (see the *High Sedimentation Potential* risk factor discussion for each of those drainages in Appendix A). However, because all action alternatives under the Johns Peak EIS would establish a managed trail system and limit OHV use on BLM lands within the Johns Peak OHV area to that managed system, implementation of any of the Johns Peak action alternatives would lead to reduced mileage of OHV trails and roads on BLM lands within the drainage, with a corresponding reduction in road/trail-related impacts over time.

Areas of compacted soil would increase somewhat in many drainages (compare Table 3-H-9 column 4 to Table 3-H-4, column 4) due to foreseeable intensive timber harvest activities (Table 3-H-8 column 2) on private lands, and the continuing trend of increasing impacts from OHV use in many drainages.
With continued high road densities (Table 3-H-9 column 10) and roads crossing streams at many locations (see the Appendix A *High Sedimentation Potential* discussion for each drainage), concentration of runoff by road drainage systems would continue contributing to more rapid delivery of storm runoff directly to streams, resulting in continued increased peak flows. There would be no road-related work under this alternative, so watershed restoration direction regarding roads under the Aquatic Conservation Strategy might not be met. No restorative actions such as road decommissioning, removal of stream crossings, upgrading of culverts, or vegetation treatments to improve riparian condition would be implemented under Alternative 1, so maintenance or restoration of some riparian processes at some locations could be compromised that otherwise might have benefited from these actions (Appendix A *Riparian Area, High Sedimentation Potential*, and *High Road Density* risk factor discussions for each drainage). This is important because roads alter the hydrologic network and may increase the magnitude of peak flows and affect the time it takes runoff to reach the stream. Road cuts intercept subsurface water and road ditches convey it to streams. Road surfaces are in a permanently compacted state, promoting the collection and runoff of water during storm events; this water can be transported to streams (Wemple 1994). This effect is more pronounced in areas with high road densities and where roads are in close proximity to streams (USDI 2001:61). Roads are the primary source of sediment for streams in the analysis area (USDI 2001:70). Roads can also be a concern if they change the local drainage pattern and force the natural drainage system, which has developed over millennia, to adjust to a new regime, causing adverse effects on the aquatic system. A fill or cut slope failure produces soil material that could potentially increase the sediment input to a stream. Culvert failures can cause the water to be diverted from one catchment to another thereby affecting the channel stability of both systems. The channel in the catchment receiving the additional flow must start an adjustment process to accommodate this flow increase while the original channel responds to a reduction in water. Well-designed roads with a properly functioning drainage system would attempt to mimic the local natural drainage pattern by keeping the local downslope movement of water similar to the pre-road condition. However, during extreme events (drought or peak flow) any hydrologic differences between the artificial drainage associated with the road system and the natural system become more critical and can cause noticeable effects to the local environment.

Because there would be no new disturbance on highly erodible soils (Table 3-H-9, column 3) in any of the drainages under this alternative, implementation of this alternative would not cause any increase in cumulative impacts related to disturbance on highly erodible soils. Foreseeable future actions (Table 3-H-8, column 3) could cause slight increases in disturbance on highly erodible soils (see comparisons in Appendix A Table A1 and the Appendix A discussion for the *Highly Erodible Soils* risk factor for each drainage. Also compare Table 3-H-4 , column 3 [Current Condition] to Table 3-H-9, column 3 [Alternative 1 Combined current and ongoing effects]). This increase in disturbance would only be a few acres, and would not result in changes in impacts to streams over current conditions. This is important because disturbance on highly erodible soils is a potential source of turbidity and sediment in streams. Highly erodible soils can more easily be impacted from ground disturbance or channelization of water, increasing the chances that associated fine sediment could enter the downslope aquatic system. Because no activity is proposed in potentially unstable areas under this alternative, implementation of this alternative would not cause any increase in cumulative effects related to these areas. This is important because unstable areas are prone to mass wasting that could dramatically increase sediment yields and possibly affect stream function. See the *Soils* discussion for more information regarding highly erodible soils and unstable areas.

Streams need adequate stream channel structure (i.e. debris jams or other structures) to dissipate stream energy and prevent degradation of channel conditions (sinuosity, width/depth ratio, or gradient), and need things like rocks and woody debris sufficient to protect the channel from accelerated bank erosion and downcutting during flood events. This is important because increases in peak flows or sediment delivery could destabilize the stream channel, increasing bank erosion, reducing channel structure, and increasing sedimentation within the channel. Stream channel conditions would continue to be at an increased level of risk from adverse affects of

increased peak flow in virtually all drainages. With no changes in management, channel conditions would remain static or trend downward over time (Table 3-H-9 column 7), with drainages having the highest road densities (Table 3-H-9 columns 10 and 11) and other disturbances seeing the most rapid declines in condition. Currently elevated levels of stream sedimentation (Table 3-H-4, column 12) would be expected to continue relatively unchanged in three drainages (Table 3-H-9 column 12), but would gradually get worse in Galls Creek (RH0415), Middle Fork Foots Creek (RH0603), Left Fork Foots Creek (RH0606), Foots Creek between Middle Fork and Right Fork Foots Creek (RH0609), and Right Fork Foots Creek (RH0612) as trends of increasing OHV impact to the hydrologic network continued. Apart from OHV use, it is anticipated that management activities would continue on private lands in much the same way and at similar rates as they have in the past. Sedimentation impacts from these lands would be expected to continue with little change, fluctuating in response to the level of harvest activity. Sedimentation from natural sources (for example erosional processes, bedload transport in streams) would continue, fluctuating in response to things such as variations in annual weather, climate cycles, and wildfire return intervals. See the Appendix A *High Sedimentation Potential* risk factor discussion for each drainage for further discussion.

No vegetation treatments to improve riparian condition would be implemented under Alternative 1, so maintenance or restoration of some riparian processes at some locations could be compromised that otherwise might have benefited from these actions. Other future prescribed treatments (for example, low-intensity fire) that could be needed to meet ACS and Riparian Reserve objectives might not be possible to implement in some locations due to heavy fuel loading associated with overstocked young stands. In other areas, vegetation treatments already authorized under other projects could allow riparian conditions to improve over time. Ongoing protection of Riparian Reserves would allow those natural recovery processes that are functioning properly to result in a continued gradual improvement of riparian condition on BLM lands, with most areas eventually reaching Properly Functioning Condition barring a severe wildfire, new instream mining projects, or continued OHV-related impacts in the Reserves. However, choosing the No Action Alternative 1 would not follow the RMP direction to apply silvicultural practices to Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain ACS and Riparian Reserve objectives (USDI 1995:27). Some riparian stands would continue to grow slowly or be in poor health due to overstocked conditions, especially those areas that had been previously harvested or that have had fire excluded for long periods of time. Due to such conditions, some Reserves may be at greater risk of high intensity fire than under natural conditions or under the conditions that would result from implementation of the management direction provided in the RMP. Riparian protection on non-federal lands would continue to be governed by county ordinance and the Oregon Forest Practices Act. Riparian areas on lands under these jurisdictions would continue to have minimal riparian protection, especially on intermittent streams. Foreseeable future harvests on private lands could cause riparian degradation on those lands, but the impact would be somewhat limited by implementation of the Oregon Forest Practices Act. Appendix A *Riparian Areas* risk factor discussions for each drainage provide information further the current riparian condition trends shown in Table 3-H-9 column 8.

Selection of the No Action Alternative would not change current stream temperature conditions, with long term conditions trending toward improvement (Table 3-H-9 column 13). Streams would continue to have some degree of warming due to a combination of natural influences, areas of past intensive harvest in riparian areas, and degraded riparian and channel conditions at some locations. There would be no action to correct problems associated with roads constructed with drainage systems that route flow directly to streams, so any temperature effects from channel conditions aggravated by roads would be expected to continue. Riparian areas on BLM lands would continue to be protected and managed per direction in the Aquatic Conservation Strategy (ACS) (USDI 1995:22-23), except for the lack of implementation of the RMP direction to utilize silvicultural practices to attain objectives. Riparian areas where previous harvest activities occurred would continue to gradually recover from past harvest impacts. There would be nothing under this alternative that would result in anthropogenic-caused heating of streams in this drainage (USDI 2005:24). Activities on non-BLM lands are required to meet Clean Water Act requirements. No other impacts to water quality are anticipated.

Hydrology/Water Resources: Alternative 2 Cumulative Effects

Table 3-H-10: **Alternative 2 Cumulative Trends in Risk Factors by Drainage** (combining the Past Actions/Current Conditions [Table 3-H-4], the Alternative 2 action proposed [Table 3-H-7], and Foreseeable Future Actions [Table 3-H-8]).

Drainage (Chapter 3 Table 3-H-1)	**Cumulative percent of Drainage converted to young stands by harvest** (Table A2*)	**Cumulative Acres of Disturbance on Highly Erodible or Unstable Soils** (Table A1*)	**Cumulative percent Compacted Area** (Table A3*)	**Cumulative percent Nonrecovered Transient Snow Zone Openings** (Table A4*)	**percent level of Concern for Nonrecovered Transient Snow Zone Openings** (Table A4*)	**Cumulative Trend in Stream Channel Conditions** (Table A5*)	**Cumulative Trend in Riparian Area Conditions** (Table A6*)	**Potential cumulative effects related to impacts from past catastrophic events** (Table A7*)	**Cumulative Road Density mi/mi^2** (Table A8*)	**Cumulative Road Density BLM Riparian Reserves miles/mile^2** (Table A9*)	**Cumulative change in management-related stream sedimentation** (Table A10*)	**Cumulative Trend on Water Quality Problems other than sedimentation** (Table A11*)
RH0415	43	72	9	NA	NA	Declining	Declining	0	7.6	3.4	Declining	Improving
RH0521	24	18	5	NA	NA	No change	Improving	0	11.1	5.1	no change	Improving
RH0524	27	5	7	NA	NA	No change	Improving	0	6.5	3.5	no change	Improving
RH0603	50	34	14	NA	NA	Declining	Declining	0	5.3	7.4	Declining	Improving
RH0606	17	6	7	NA	NA	Declining	Declining	0	5.2	1.4	Declining	Improving
RH0609	8	11	3	NA	NA	Declining	Declining	0	4.4	3.9	Declining	Improving
RH0612	36	48	6	NA	NA	Declining	Declining	0	5.3	5.4	Declining	Improving
RH0615	6	6	2	NA	NA	No change	Improving	0	7.1	0	no change	Improving

* The referenced tables and supporting analysis are contained in Appendix A.

Compared to combined current and ongoing road density effects under the "No Action" alternative (Alternative 1)(Table 3-H-9 column 10), overall road density would decrease slightly under Alternative 2 (Table 3-H-10 column 10). Road density would increase in one drainage and decrease in four others (Table 3-H-7 column 9)(see the direct and indirect effects discussion for Alternative 2). The transportation system/drainage improvements proposed under Alternative 2 could result in an immediate improvement in sedimentation impacts during and after major storm events in some drainages. Road relocation and stream crossing removals within Riparian Reserves would have the greatest positive impact of the work proposed under this alternative, reducing sedimentation and peak flow delivery conditions in a number of streams, with a subsequent positive effect on channel conditions at downstream locations (see Appendix A *High Sedimentation Potential*, *High Road Density*, and *Stream Channel Conditions* risk factor discussions for each drainage). Although improved conditions could be apparent at times at the mouth of individual 7th field drainages downstream of some of the improvements, the improvements would not make enough of a difference against background conditions to be discernable within lower portions of mainstem Foots Creek or the Rogue River. Over the long term, improving vegetation conditions on BLM lands in this drainage and throughout the watershed could reduce the frequency of stand-replacement wildfire and allow more low severity fires to burn, restoring a sediment regime that more closely mimics natural conditions. Gradual recovery of riparian areas (previously clearcut or subjected to other high

intensity management that did not mimic more natural disturbance, but now managed as Riparian Reserves) could allow gradual improvement of riparian processes and corresponding improvements in sediment conditions from past harvest impacts over time, but sedimentation and riparian area conditions could gradually get worse in Galls Creek (RH0415), Middle Fork Foots Creek (RH0603), Left Fork Foots Creek (RH0606), Foots Creek between Middle Fork and Right Fork Foots Creek (RH0609), and Right Fork Foots Creek (RH0612) as trends of increasing OHV impact to the hydrologic network continued (Table 3-H-10 columns 8 and 12). In spite of the improvements under this alternative, roads would still remain the largest unnatural contributor to negative sedimentation impacts in the drainage. With an overall reduction in road density (compare Table 3-H-10 column 10 to Table 3-H-9 column 10), reduction of Riparian Reserve road density in four drainages (compare Table 3-H-10 column 11 to Table 3-H-9 column 11), removal of several stream crossings on active streams (Appendix A *High Sedimentation Potential* risk factor discussion for each drainage) helping disconnect roads from the stream network (Appendix A *High Sedimentation Potential* and *High Road Density* risk factor discussions for each drainage), there would be less rapid delivery of storm runoff directly to streams from roads (see the Appendix A *High Sedimentation Potential*, *High Road Density*, *Riparian Area Conditions*, and *Stream Channel Conditions* risk factor discussions for each drainage). Peak flows from roads would be reduced; however, this reduction would not be discernable over background levels at or beyond the mouth of individual 7th field drainages, and trends in OHV use could ultimately have the opposite effect.

Most of the new road construction would be completed at the beginning of the project, while road decommissioning would be done later in the project. However, the road decommissioning in Left Fork Foots Creek (RH0606) would be completed at the beginning of the project (see Project Design Features in Chapter 2) so that this source of sediment and peakflow delivery would be reduced immediately. Implementation of the Chapter 2 Project Design Features would help minimize potential risks, so the potential for road-related problems to be transmitted to streams would be reduced. Apart from the Left Fork Foots Creek road decommissioning work, the net effect would be that, even though Project Design Features would minimize routing of flow and sediment directly to streams at the beginning of the project, there would be slightly increased road densities during the actual project work, so risk levels related to roads during the project would be comparable to what existed prior to the start of the project. The improved conditions resulting from the remaining decommissioning (with the associated overall reduction in road density) would not begin to take effect until near the end of the project. Roads alter the hydrologic network and may increase the magnitude of peak flows and affect the time it takes runoff to reach the stream. Road cuts intercept subsurface water and road ditches convey it to streams. Road surfaces are in a permanently compacted state, promoting the collection and runoff of water during storm events; this water can be transported to streams (Wemple 1994). This effect is more pronounced in areas with high road densities and where roads are in close proximity to streams (USDI 2001:61). Large areas of compacted soil such as occur on roads or tractor yarding can be a concern from a hydrologic perspective because such areas can decrease the infiltration properties of the soil, resulting in increased surface runoff. This can also contribute to decreased soil moisture within and downslope of the compacted area. In riparian areas, large areas of compacted soil can indirectly affect stream conditions and water quality by contributing to reduced productivity of riparian vegetation. Roads are the primary source of sediment for streams in the analysis area (USDI 2001:70). Roads can also be a concern if they change the local drainage pattern and force the natural drainage system, which has developed over millennia, to adjust to a new regime, causing adverse effects on the aquatic system. A fill or cut slope failure produces soil material that could potentially increase the sediment input to a stream. Culvert failures can cause the water to be diverted from one drainage to another thereby affecting the channel stability of both systems. The channel in the drainage receiving the additional flow must start an adjustment process to accommodate this flow increase while the original channel responds to a reduction in water. Well-designed roads with a properly functioning drainage system would attempt to mimic the local natural drainage pattern by keeping the local downslope movement of water similar to the pre-road condition. However, during extreme events (drought or peak flow) any hydrologic differences between the artificial drainage associated with the road system and the natural system become more critical and can cause noticeable effects to the local environment. Once harvest activities were completed, all roads would receive a final round of maintenance to fix “wear-and-tear” to surfacing and erosion control

measures incurred during the project[3]. Effects to hydrology, while potentially observable within a short distance of the work, would not be discernable over background levels at or beyond the mouth of individual 7th field drainages.

Because the slight increase in disturbance on highly erodible soils under Alternative 2 (Table 3-H-7, column 3) would have no impact to streams (see *Alternative 2 Direct and Indirect Effects* discussion), implementation of this alternative would not cause any increase in cumulative effects related to disturbance on highly erodible soils. Foreseeable future actions (Table 3-H-8, column 3) could cause slight increases in disturbance on highly erodible soils (see comparisons in Appendix A Table A1 and the Appendix A discussion for the *Highly Erodible Soils* risk factor for each drainage. Also compare Table 3-H-4 , column 3 [Current Condition] to Table 3-H-10, column 3 [Alternative 2 Cumulative Effects]). This increase would be only a few acres, and would not result in changes in impacts to streams over current conditions. This is important because disturbance on highly erodible soils is a potential source of turbidity and sediment in streams. Highly erodible soils can more easily be impacted from ground disturbance or channelization of water, increasing the chances that associated fine sediment could enter the downslope aquatic system. Because no activity is proposed in potentially unstable areas under this alternative, implementation of this alternative would not cause any increase in cumulative effects related to these areas. This is important because unstable areas are prone to mass wasting that could dramatically increase sediment yields and possibly affect stream function. See the *Soils* discussion for more information regarding highly erodible soils and unstable areas.

Under Alternative 2, stream channels would continue to have protection as Riparian Reserves, and treatments in Riparian Reserves would continue to utilize Project Design Features (Chapter 2) that would prevent impact to the channels. Stream channels of larger streams on private lands would continue to be protected by county ordinance and Oregon Forest Practices Rules. Streams need adequate stream channel structure (i.e. debris jams or other structures) to dissipate stream energy and prevent degradation of channel conditions (sinuosity, width/depth ratio, or gradient), and need things like rocks and woody debris sufficient to protect the channel from accelerated bank erosion and downcutting during flood events. This is important because increases in peak flows or sediment delivery could destabilize the stream channel, increasing bank erosion, reducing channel structure, and increasing sedimentation within the channel. Forest management that does a better job at mimicking a low-severity natural fire regime could, over time, provide greater inputs of large, stable wood to channels and more stable peakflows and baseflows, resulting in improvements in channel stability and condition over the long term. Implementation of similar management across all ownerships could further improve the situation; without similar management on other ownerships, conditions of stream channels on private lands could remain static or even decline over time. With no changes in management, channel conditions would remain static or trend downward over time (Table 3-H-10 column 7), with drainages having the highest road densities (Table 3-H-9 columns 10 and 11) and other disturbances seeing the most rapid declines in condition. Currently elevated levels of stream sedimentation (Table 3-H-4, column 12) would be expected to continue relatively unchanged in three drainages (Table 3-H-10 column 12), but would gradually get worse in Galls Creek (RH0415), Middle Fork Foots Creek (RH0603), Left Fork Foots Creek (RH0606), Foots Creek between Middle Fork and Right Fork Foots Creek (RH0609), and Right Fork Foots Creek (RH0612) as trends of increasing OHV impact to the hydrologic network continued. Apart from OHV use, it is anticipated that management activities would continue on private lands in much the same way and at similar rates as they have in the past. Sedimentation impacts from these lands would be expected to continue with little change, fluctuating in response to the level of harvest activity. Sedimentation from natural sources (for example erosional processes, bedload transport in streams) would continue, fluctuating in response to things such as variations in annual weather, climate cycles, and wildfire return intervals. See the Appendix A *High Sedimentation Potential* risk factor discussion for each drainage for further discussion.

Riparian areas on BLM lands would continue to be protected and managed per direction in the Aquatic Conservation Strategy (ACS) (USDI 1995:22-23). Riparian areas where previous harvest activities occurred would continue to gradually recover from past harvest impacts. Management of Riparian Reserves would

[3] John Samuelson, BLM engineer, personal communication to BLM hydrologist David Squyres.

follow the RMP general management guidelines for Riparian Reserves (USDI 1995:26-27). Riparian conditions on non-federal lands would continue to be influenced by county ordinance and the Oregon Forest Practices Act. Riparian areas on lands under these jurisdictions would continue to have minimal riparian protection, especially on intermittent streams. Increasing OHV use in some drainages could degrade riparian areas, contributing to additional impacts over time (Table 3-H-10, column 8). Implementation of any of the action alternatives in the upcoming Johns Peak EIS would likely reduce OHV-related impacts in Riparian Reserves.

No activity is proposed under this alternative that would result in anthropogenic-caused heating of streams in this drainage (USDI 2005:24), and implementation of Best Management Practices, other Project Design Features (EA Chapter 2), and protection of Riparian Reserves would enable the Project to avoid violation of the Clean Water Act. This Project, other recent riparian vegetation treatments in the Planning Area, and foreseeable future management in the watersheds of the Planning Area, would allow gradual improvement in water quality over time (Table 3-H-10 column 13).

Assuming that future management of BLM lands in the Planning Area would generally continue to focus on implementing the Southern General Forest Management Area type of harvest prescriptions to meet Resource Condition Objectives and other management direction (USDI 1995:192-194), including the maintenance of a minimum of 40 percent canopy cover at the stand level in regeneration units other than pine series or where needed due to stand conditions or site characteristics (USDI 1995:192), new young stands might only be created as a result of future stand-replacement wildfire or stand-scale mortality caused by forest pathogens. Because both stand replacement fire and stand-scale mortality could be reduced over the long-term compared to current conditions, along with the gradual recovery of riparian areas affected by past clear-cutting, this would benefit riparian restoration and maintenance of late successional characteristics along streams on BLM lands.

Summary of Key Findings on Issues of Concern – Water Resources

Some of the key findings from the Water Resources discussion above and in Appendix A are reprised below, to make it easier to highlight some of the differences between the Alternatives. See Appendix A for more detailed information.

ISSUE: Vegetation canopy reduction associated with forest management (especially in the transient snow zone) may affect streamflows.

KEY FINDINGS:
Current Condition

- Transient Snow Zone and the associated concern over risk for peak flow enhancement from creating openings in the Transient Snow Zone is not an issue in this rainfall-dominated area.
- In southwest Oregon, water can soak into the ground (infiltration) much faster than rainfall occurs, so overland flow cannot deliver flow directly to streams unless the ground becomes compacted and disturbances such as roads are able to concentrate surface flow. Soil compaction and impacts from the road network are the primary concerns for peak flow enhancement in rain-dominated areas.
- Restoration of upland vegetation conditions and larger vegetation and woody debris in stream bottoms are both critical in maintaining and enhancing low flows and groundwater availability within the Planning Area, since groundwater storage within the Planning Area is generally limited to valley bottom alluvium along the major rivers and streams and in the accumulated colluvium in the valley bottoms of smaller streams and draws.

Foreseeable Future Actions

- Future intensive timber harvests on non-BLM lands are possible in most drainages; large changes could occur in Middle Fork Foots Creek (RH0303), Galls Creek (RH0415), Right Fork Foots Creek (RH0612), and Millers Gulch (RH0524). At some locations, these future intensive harvests and associated disturbance could increase compacted ground, increase sediment production and sediment delivery to streams, and cause declines in stream channel and riparian conditions.

- Future periodic maintenance underburning already authorized in some of the drainages and proposed under other federal projects in other drainages could benefit adjacent riparian areas, potentially decreasing the magnitude of wildfires moving into riparian areas out of the uplands, and promoting conditions favoring larger trees and woody debris in riparian areas.

Alternative 1 (Current and Ongoing effects)

- Riparian areas where previous intensive harvest activities occurred would continue to gradually recover from past harvest impacts.
- The effect to riparian vegetation of taking "no action" on BLM land would be negative in many drainages, because RMP direction that silvicultural practices are to be applied to Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain ACS and Riparian Reserve objectives (USDI 1995:27) would not be implemented.

Alternative 2 (Proposed Action)

- The density of forest canopy cover remaining across the project level after implementation of Alternative 2 would still far exceed typical natural condition, and would probably remain on the high end of natural variability. Although the effect to streamflows cannot be quantified, additional soil moisture available due to vegetation reduction would probably be used on-site by the remaining vegetation rather than contributing to increased summer low flows. The mechanisms that would have potential to affect peakflow enhancement under the proposed action are primarily soil compaction and road interactions with streams.
- Implementation of the Chapter 2 Project Design Features (which incorporate Best Management Practices (BMPs)(USDI 1995:Appendix D) along with the allocation of Riparian Reserves would greatly mitigate potential adverse effects of management activities on water resources; however, adverse effects would not be totally eliminated. The water resources effects identified here in Chapter 3 and discussed in greater detail in the drainage-specific analyses in Appendix A are either the same as or less than those identified in the Medford District PRMP/EIS (USDI 1994:4-12 to 4-24).

ISSUE: Increases in soil compaction from proposed logging and road construction may affect stream flows.

KEY FINDINGS:

Current Condition

- Road density is high, with many roads in close proximity to streams. Road surfaces are usually 100% compacted.
- Concentration of runoff by road drainage systems is likely contributing to more rapid delivery of storm runoff directly to streams at some location and may be contributing to increased peak flows. However, with the exception of Middle Fork Foots creek, the magnitude of this effect is likely not great in the Planning Area, as area in roads and compacted area is below levels that research suggests would trigger elevated peak flows.
- Compacted area due to past harvest and roads is a slight concern in the Middle Fork Foots Creek drainage (RH0603); Middle Fork of Foots Creek has slight potential for elevated peak flows due to the amount of compacted ground and area in roads.

Foreseeable Future Actions

- No increases in road density are anticipated from other projects in the planning area, but a trend in increasing OHV use is increasing road-related compaction impacts in Galls Creek and most of the drainages in Foots Creek. If implementation of any of the action alternatives in the upcoming Johns Peak OHV EIS occurs, OHV impacts on BLM lands would gradually be reduced, but trends on non BLM lands are expected to continue. If a "no action" alternative in the Johns Peak EIS is selected, conditions related to roads, riparian, stream channels, and stream sedimentation would all continue to decline.
- Future intensive timber harvests on non-BLM lands are possible in most drainages; large changes could occur in Middle Fork Foots Creek (RH0303), Galls Creek (RH0415), Right Fork Foots Creek

(RH0612), and Millers Gulch (RH0524). At some locations, these future intensive harvests and associated disturbance could increase compacted ground.

Alternative 1 (Current and Ongoing effects)

- The compaction associated with continued high road densities and roads crossing streams at many locations would result in continued potential for increased peak flow delivery to streams.
- Riparian areas on BLM lands would continue to be protected per direction in the Aquatic Conservation Strategy (ACS)(USDI 1995:22-23); however, with no road-related decommissioning work in Riparian Reserves, watershed restoration direction regarding roads under the ACS might not be met.

Alternative 2 (Proposed Action)

- Overall active road density would decrease slightly, with more substantial decreases in road density within Riparian Reserves.
- Roadwork would better disconnect roads from the stream system through decommissioning of some roads and stream crossings and accessing the planning area with a transportation system generally located further from streams; this would help to control and prevent road-related runoff and sediment production, one of the most important components of a watershed restoration program under the ACS (USDI 1995:23). The beneficial effect of the proposed roadwork in improving drainage and relocating roads further from streams would offset some localized increases in road density necessary to make those road system improvements.
- The reduction in Riparian Reserves road density in some drainages, removal of stream crossings, and more disconnection of the transportation system from the stream network would reduce some potential peak flow impacts and therefore reduce any associated sediment delivery to streams and the downstream aquatic system. This in turn would improve or maintain stream channel conditions.
- Any changes in the magnitude or frequency of peak flows would be insignificant, because changes in road density, proximity of roads to streams, or areas of compacted soil would not be sufficient to produce incremental changes in the flow regime.
- Implementation of the Chapter 2 Project Design Features (which incorporate Best Management Practices (BMPs)(USDI 1995:Appendix D) along with the allocation of Riparian Reserves would greatly mitigate potential adverse effects of management activities on water resources; however, adverse effects would not be totally eliminated. The water resources effects identified here in Chapter 3 and discussed in greater detail in the drainage-specific analyses in Appendix A are either the same as or less than those identified in the Medford District PRMP/EIS (USDI 1994:4-12 to 4-24).

ISSUE: Road construction could alter the natural drainage patterns and indirectly affect stream flow.

KEY FINDINGS:

Current Condition

- Road density is high, with many roads in close proximity to streams.
- Concentration of runoff by road drainage systems is likely contributing to more rapid delivery of storm runoff directly to streams at some location and may be contributing to increased peak flows. However, with the exception of Middle Fork Foots creek, the magnitude of this effect is likely not great in the Planning Area, as area in roads and compacted area is below levels that research suggests would trigger elevated peak flows.
- Compacted area due to past harvest and roads is a slight concern in the Middle Fork Foots Creek drainage (RH0603); Middle Fork of Foots Creek has slight potential for elevated peak flows due to the amount of compacted ground and area in roads.
- Naturally unstable areas were identified in some dry draws.

Foreseeable Future Actions

- No increases in road density are anticipated from other projects in the planning area, but a trend in increasing OHV use is increasing road-related impacts in Galls Creek and most of the drainages in Foots Creek. If implementation of any of the action alternatives in the upcoming Johns Peak OHV EIS occurs, OHV impacts on BLM lands would gradually be reduced, but trends on non BLM lands are

expected to continue. If a "no action" alternative in the Johns Peak EIS is selected, conditions related to roads, riparian, stream channels, and stream sedimentation would all continue to decline.

Alternative 1 (Current and Ongoing effects)

- Continued high road densities and roads crossing streams at many locations would result in continued potential for increased peak flows.
- Riparian areas on BLM lands would continue to be protected per direction in the Aquatic Conservation Strategy (ACS)(USDI 1995:22-23); however, with no road-related work in Riparian Reserves, watershed restoration direction regarding roads under the ACS might not be met.

Alternative 2 (Proposed Action)

- Overall active road density would decrease slightly, with more substantial decreases in road density within Riparian Reserves.
- Roadwork would better disconnect roads from the stream system through decommissioning of some roads and stream crossings and accessing the planning area with a transportation system generally located further from streams; this would help to control and prevent road-related runoff and sediment production, one of the most important components of a watershed restoration program under the ACS (USDI 1995:23). The beneficial effect of the proposed roadwork in improving drainage and relocating roads further from streams would offset some localized increases in road density necessary to make those road system improvements.
- Proposed roadwork would alter current drainage conditions, but in a positive way. The reduction in Riparian Reserves road density in some drainages, removal of stream crossings, and more disconnection of the transportation system from the stream network would reduce some potential peak flow impacts and therefore reduce any associated sediment delivery to streams and the downstream aquatic system. This in turn would improve or maintain stream channel conditions.
- Naturally unstable areas identified in dry draws would be protected as Riparian Reserves and protected from ground disturbance, preventing any alteration of drainage patterns that could influence flows. No road construction would occur in these areas.
- Any changes in the magnitude or frequency of peak flows would be insignificant, because changes in road density, proximity of roads to streams, or areas of compacted soil would not be sufficient to produce incremental changes in the flow regime.
- Implementation of the Chapter 2 Project Design Features (which incorporate Best Management Practices (BMPs)(USDI 1995:Appendix D) along with the allocation of Riparian Reserves would greatly mitigate potential adverse effects of management activities on water resources; however, adverse effects would not be totally eliminated. The water resources effects identified here in Chapter 3 and discussed in greater detail in the drainage-specific analyses in Appendix A are either the same as or less than those identified in the Medford District PRMP/EIS (USDI 1994:4-12 to 4-24).

ISSUE: Changes in streamflow could lead to increased stream channel degradation.

KEY FINDINGS:

Current Condition

- Stream channel conditions are fair-to-poor in all drainages in the Planning Area.
- Road density is high, with many roads in close proximity to streams.
- Concentration of runoff by road drainage systems is likely contributing to more rapid delivery of storm runoff directly to streams at some location and may be contributing to increased peak flows. However, with the exception of Middle Fork Foots creek, the magnitude of this effect is likely not great in the Planning Area, as area in roads and compacted area is below levels that research suggests would trigger elevated peak flows.
- Compacted area due to past harvest and roads is a slight concern in the Middle Fork Foots Creek drainage (RH0603); Middle Fork of Foots Creek has slight potential for elevated peak flows due to the amount of compacted ground and area in roads.

Foreseeable Future Actions

- No increases in road density are anticipated from other projects in the planning area, but a trend in increasing OHV use is increasing road-related impacts in Galls Creek and most of the drainages in Foots Creek. If implementation of any of the action alternatives in the upcoming Johns Peak OHV EIS occurs, OHV impacts on BLM lands would gradually be reduced, but trends on non BLM lands are expected to continue. If a "no action" alternative in the Johns Peak EIS is selected, conditions related to roads, riparian, stream channels, and stream sedimentation would all continue to decline.

Alternative 1 (Current and Ongoing effects)

- Continued high road densities and roads crossing streams at many locations would result in continued potential for increased peak flows.
- Stream channels would continue to be at an increased level of risk for adverse effects of increased peak flows. With no changes in management, stream channel conditions could trend downward over time, with drainages having the highest road densities and other disturbances seeing the most rapid declines in condition.

Alternative 2 (Proposed Action)

- Overall active road density would decrease slightly, with more substantial decreases in road density within Riparian Reserves.
- Roadwork would better disconnect roads from the stream system through decommissioning of some roads and stream crossings and accessing the planning area with a transportation system generally located further from streams; this would help to control and prevent road-related runoff and sediment production, one of the most important components of a watershed restoration program under the ACS (USDI 1995:23). The beneficial effect of the proposed roadwork in improving drainage and relocating roads further from streams would offset some localized increases in road density necessary to make those road system improvements.
- The reduction in Riparian Reserves road density in some drainages, removal of stream crossings, and more disconnection of the transportation system from the stream network would reduce some potential peak flow impacts and therefore reduce any associated sediment delivery to streams and the downstream aquatic system. This in turn would improve or maintain stream channel conditions.
- Any changes in the magnitude or frequency of peak flows would be insignificant, because changes in road density, proximity of roads to streams, or areas of compacted soil would not be sufficient to produce incremental changes in the flow regime.
- While the project would slightly decrease effects on streams, watershed restoration is not part of the Purpose and Need for this project, so actions are not focusing on such restoration. Continued high road densities and roads crossing streams at many locations would continue potential for increased peak flows. Stream channels would continue to be at an increased level of risk for adverse effects of increased peak flows. The relatively minor benefits to water resources that would be achieved by this project would not have a major impact on overall conditions in the Planning Area; stream channel conditions could trend downward over time, with drainages having the highest road densities and other disturbances seeing the most rapid declines in condition.
- Implementation of the Chapter 2 Project Design Features (which incorporate Best Management Practices (BMPs)(USDI 1995:Appendix D) along with the allocation of Riparian Reserves would greatly mitigate potential adverse effects of management activities on water resources; however, adverse effects would not be totally eliminated. The water resources effects identified here in Chapter 3 and discussed in greater detail in the drainage-specific analyses in Appendix A are either the same as or less than those identified in the Medford District PRMP/EIS (USDI 1994:4-12 to 4-24).

ISSUE: Timber harvesting and associated road construction, decommissioning, and renovation may impact water quality, by increasing sedimentation and stream temperature.

KEY FINDINGS:

Current Condition

- Road density is high, with many roads in close proximity to streams.

- Stream sedimentation conditions are poor in all drainages within the Planning Area, due to overall road densities and road interactions with streams.
- Several streams within the Planning Area have stream temperatures that exceed State water quality standards. This is a combination of natural influence, past intensive harvest in riparian areas along with degraded riparian and channel conditions at some locations. On BLM lands, the primary factors that adversely affect stream temperatures include removal of streamside vegetation, roads constructed with drainage systems that route flow directly to streams, ground-disturbing operations without streamside buffers, and lack of project design features/best management practices being applied to management activities.

Foreseeable Future Actions

- No increases in road density are anticipated from other projects in the planning area, but a trend in increasing OHV use is increasing road-related impacts in Galls Creek and most of the drainages in Foots Creek. If implementation of any of the action alternatives in the upcoming Johns Peak OHV EIS occurs, OHV impacts on BLM lands would gradually be reduced, but trends on non BLM lands are expected to continue. If a "no action" alternative in the Johns Peak EIS is selected, conditions related to roads, riparian, stream channels, and stream sedimentation would all continue to decline.
- Future intensive timber harvests on non-BLM lands are possible in most drainages; large changes could occur in Middle Fork Foots Creek (RH0303), Galls Creek (RH0415), Right Fork Foots Creek (RH0612), and Millers Gulch (RH0524). At some locations, these future intensive harvests and associated disturbance could increase compacted ground, increase sediment production and sediment delivery to streams, and cause declines in stream channel and riparian conditions.

Alternative 1 (Current and Ongoing effects)

- Continued high road densities and roads crossing streams at many locations would result in continued potential for increased peak flows.
- Riparian areas on BLM lands would continue to be protected per direction in the Aquatic Conservation Strategy (ACS)(USDI 1995:22-23); however, with no road-related work in Riparian Reserves, watershed restoration direction regarding roads under the ACS might not be met.
- The effect to riparian vegetation of taking "no action" on BLM land would be negative in many drainages, because RMP direction that silvicultural practices are to be applied to Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain ACS and Riparian Reserve objectives (USDI 1995:27) would not be implemented.
- Water quality conditions would not change in the Planning Area, but there would also be no action to correct problems associated with roads, so any temperature effects from channel conditions aggravated by roads would be expected to continue. Streams would continue to have some degree of warming due to a combination of natural influences, areas of past intensive harvest in riparian areas, and degraded riparian and channel conditions at some locations. Stream sedimentation would also remain a problem with sediment input to streams expected to remain relatively constant, except for impacts related to ongoing and increasing OHV use in many of the drainages.

Alternative 2 (Proposed Action)

- Overall active road density would decrease slightly, with more substantial decreases in road density within Riparian Reserves.
- Roadwork would better disconnect roads from the stream system through decommissioning of some roads and stream crossings and accessing the planning area with a transportation system generally located further from streams; this would help to control and prevent road-related runoff and sediment production, one of the most important components of a watershed restoration program under the ACS (USDI 1995:23). The beneficial effect of the proposed roadwork in improving drainage and relocating roads further from streams would offset some localized increases in road density necessary to make those road system improvements. No roads or associated stream crossings would be built within Riparian Reserves.
- The reduction in Riparian Reserves road density in some drainages, removal of some stream crossings, and more overall disconnection of the transportation system from the stream network would reduce

some potential peak flow impacts and therefore reduce any associated sediment delivery to streams and the downstream aquatic system. This in turn would improve or maintain stream channel conditions.

- There would be minimal impacts to streams from disturbance on highly erodible soils or potentially unstable areas.
- Stream temperatures would not be affected.
- Naturally unstable areas identified in dry draws would be protected as Riparian Reserves and protected from ground disturbance.
- Although some effects (both good and bad) to water quality and quantity could possibly be apparent at times immediately downstream of some project activities, any changes would be very small and would not be discernable at the mouth of the individual 7th field drainages in which they occur. With no effects at the 7th field drainage level, there would be no potential for incremental changes in hydrology/water resource conditions within the Rogue River-Gold Hill 5th field watershed. Downstream watersheds in the Rogue River would therefore also not be affected. The Medford PRMP/EIS disclosed that the allocation of Riparian Reserves and implementation of Best Management Practices (Chapter 2 Project Design Features) would greatly reduce potential adverse effects, but that these adverse effects would not be entirely eliminated (USDI 1994:4-23).
- Implementation of the Chapter 2 Project Design Features (which incorporate Best Management Practices (BMPs)(USDI 1995:Appendix D) along with the allocation of Riparian Reserves would greatly mitigate potential adverse effects of management activities on water resources; however, adverse effects would not be totally eliminated. The water resources effects identified here in Chapter 3 and discussed in greater detail in the drainage-specific analyses in Appendix A are either the same as or less than those identified in the Medford District PRMP/EIS (USDI 1994:4-12 to 4-24).

G. FISH HABITAT

Fisheries Introduction

The proposed Galls/Foot project is located in the south eastern half of the Rogue River-Gold Hill (RRGH) fifth field Watershed, in the Middle Rogue Basin. Included in the Galls/Foot planning area are the Galls Creek, Foots Creek, Millers Gulch, and Colvig Gulch drainages, as well as several other small, unnamed frontal basins that flow directly into the Rogue River. Other large fish-bearing streams in the RRGH Watershed but not within the planning area include Birdseye Creek on the southwest side of the Watershed, Kane Creek to the southeast, Sams, Sardine, Wards, and Whetstone Creeks on the north side (opposite the Rogue River), and the mainstem of the Rogue River, an important migratory and spawning corridor for recreationally and commercially important salmonids. These other drainages will not specifically be discussed in this analysis as they would not be affected by the Galls/Foot project. The RRGH Watershed as a whole will be discussed in this analysis, as the Northwest Forest Plan states that Aquatic Conservation Strategy objectives (see appendix D) will be analyzed at the fifth field watershed scale. However, this analysis will focus primarily on the Galls, Miller (seventh field watersheds), and Foots (sixth field watershed) drainages, as it is in these particular streams that affects to fisheries resources from this project would be discernable.

Key Fisheries Resources Issues in the Watershed

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

- 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) mining, extensive road/trail construction that has created high road densities and increased sediment inputs to aquatic habitat, and past timber harvest that has reduced riparian canopy cover and the potential for large wood inputs.

- Fish populations appear to be on a declining trend in several of the streams in the RRGH watershed for which data is available. Declines are likely in part attributable to declining aquatic habitat.

- Sediment levels in some streams in the watershed are currently high enough to be compromising the function and health of both the stream system and populations of aquatic organisms.

- Sedimentation from road construction/decommission, and other ground disturbing activities could increase sediment levels in stream channels, which could further degrade habitat, including designated Coho Critical and Essential Fish habitat, as a result of implementing the action alternative.

- Off Highway Vehicle (OHV) use in the southern half of the watershed is high, with many miles of trails bisecting the watershed. Some OHV trails have been as identified as directly contributing to instream habitat degradation. 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

In 1997 the Southern Oregon/Northern California (SONC) 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). Within the planning area, only Foots and Galls Creeks have been observed to support populations of coho salmon. Millers Gulch is not a known coho stream, but this document will assume that coho could have historically utilized it.

Coho Critical and Essential Fish Habitat

On May 5, 1999, NMFS designated Coho Critical Habitat (CCH) for SONC 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). Occupied CCH in the RRGH Watershed includes the Rogue River, Foots, Galls, Birdseye, Sams, and Sardine Creeks. Unoccupied CCH includes the other major fish bearing streams, including Kane Creek and Millers Gulch.

Essential Fish Habitat (EFH) has been defined by NOAA fisheries 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 case, coho salmon). EFH within the Galls/Foot planning area includes Galls and Foots Creeks and Millers Gulch, and overlaps with 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 300' or twice the length of a site potential tree (whichever is greater) for fish bearing streams, 150' or the length of one site potential tree for non fish bearing perennial streams, and 100' or the length of one site potential tree for intermittent streams. Widths are measured as slope distance from the edge of the stream, and are applied to both sides of the channel. Site potential tree heights average 160' on BLM lands in the RRGH Watershed. Within the project area, RR widths of 640' (320' slope distance either side of the channel) to 720' (360' slope distance either side of channel) surround all fish streams. 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, 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 HUC 5 (large watershed) scale. The 9 objectives and effects from implementation of the preferred alternative are presented in Appendix D of this document.

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 Galls/Foot project, within the planning area. Anticipated direct and indirect affects to fisheries resources will be described from each action. Cumulative impacts will be analyzed later in this document (see Aquatic Habitat section).

Johns Peak/Timber Mt. OHV plan: The Ashland Resource area of the Medford District BLM is currently drafting an Environmental Impact Statement (EIS) to address the ongoing impacts to resources occurring from extensive off road vehicle (OHV) use. Impacts to fisheries resources in the Galls/Foot planning area and in the RRGH watershed have been observed as a result of trails and OHV use, notably excessive sedimentation in aquatic habitats. Kane Creek has been particularly affected by trail related erosion. The EIS and management plan, through selection of an action alternative, will seek to address this issue and reduce impacts to natural resources. At this time, all of the action alternatives being developed under the EIS would significantly reduce the number of OHV trails open to use, including those existing in Riparian Reserves and crossing stream channels. It is anticipated that upon implementation of one of the action alternatives that trail derived erosion will decrease, reducing sediment deposition to stream channels. This decrease may be preceded by short term increases as problematic trail systems are decommissioned or obliterated; over time (3-5 years) sediment input and deposition levels are anticipated to fall below current levels as decommissioned/abandoned trail segments stabilize and vegetative recovery occurs. The EIS will seek to eliminate many chronic sources of sediment to aquatic habitats, while still providing recreation opportunities for OHV users.

Riparian Fuels Reduction Study: The Ashland Resource area has received grant money to conduct a fuels study in selected riparian areas to quantify effects of riparian treatments on hydrological, botanical, and biological parameters. One of the selected riparian areas is in the Foots Creek basin: 0.45 miles of perennial stream channel and 1.9 miles of intermittent stream channels within this small basin will receive fuels treatments as needed (determined by fuels specialists). The treatments would thin small diameter trees and brushy vegetation only, and would leave all overstory, shade producing trees intact. Underburning would be preformed in the spring as conditions allow. Direct and indirect affects to aquatic habitat from this study are not entirely known at this time, hence the need for the study. However, anticipated affects of this study, based on similar studies carried out in other areas, include both potentially positive and negative affects to aquatic habitat such as: increased base summer stream flows for several years following treatments (unlikely as remaining vegetation would likely utilized any extra ground water stored), increased riparian tree vigor (Dwire 2003), reduced threat of a severe large fire, and a small risk of ash input into stream channels in areas where fire has cleared vegetation adjacent to channels (McMahon and deCalesta 1990). This risk is small, as burning would be done in the spring, generally at the beginning of the dry season. These areas would have all summer to resprout and recover before rains of sufficient magnitude to wash ash downslope and into the channels would be likely to occur (generally in the mid to late fall). Only in the event of an intense summer thunderstorm would exposed ash likely migrate into the stream channels, in which case a brief turbidity pulse would migrate downstream,

affecting water quality for a short period. The nearest fish populations would be located ~3/4 of a mile downstream from this project.

Private Timber Harvest: Future timber harvest on private lands would likely occur within the watershed. The water resources analysis of this EA addresses future timber harvest on private lands, and assumes that is 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. At this time, it is not specifically known when or where private timber harvest will occur in the watershed.

Future Fuels Treatments: Approximately 3,700 acres of future fuel treatments are planned within the planning area. Fuels treatments would leave riparian buffers, require minimal ground disturbance, and would not treat large trees. All check lines would be waterbarred and rehabilitated after ignition operations were completed. Canopy levels would not be reduced by treatments, nor would ground compaction increase; hence peak flows would not be affected. The only effect fuels treatments may have to fisheries 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 fisheries resources, and they will not be considered further in this analysis.

Current Watershed Conditions/Environmental Effects

This section will present baseline conditions in the RRGH Watershed and within the planning area 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 Galls/Foot project, coupled with foreseeable effects from future projects, are the cumulative effects of this project to fisheries resources in the watershed and specific drainage basins.

Fish and Designated Habitat

Rogue River Gold Hill Watershed
SONC coho salmon, spring and fall chinook salmon (*O. tshawytscha)*, summer and winter steelhead (*O. mykiss*), cutthroat trout (*O. clarkii*), Pacific lamprey (*Lampetra tridentata)* sculpin (*Cottus spp.*), Klamath small-scale sucker (*Catostomus rimiculus*), and rainbow trout (*O. mykiss*) are native fish species present in the RRGH Watershed. Distribution of these species includes the mainstem of the Rogue River in its entirety through the watershed. Many of these species are also present in the larger tributary streams that drain the watershed. In addition, a host of introduced fish species are present in the Rogue River mainstem, including redside shiners (*Richardsonius balteus*), large and smallmouth bass (*Micropterus dolomieui* and *M. salmoides*), bluegill (*Lepomis macrochirus*), common carp (*Cyprinus carpio)* as well as other introduced warm water fish.

The RRGH watershed is somewhat unique to the Rogue River Basin, as it has been identified by the Oregon Department of Fish and Wildlife (ODFW) as containing some of the most productive spawning and rearing habitats for summer steelhead in the entire Rogue River Basin, with several of the tributaries identified as being "class I" summer steelhead streams, supporting historical spawning runs of over 1,000 fish each (Everest, 1973). In the planning area, Foots and Galls Creeks have been identified as historically being "class I" summer steelhead streams.

Spring and fall chinook, coho, and summer and winter steelhead are the species of greatest economic importance in the watershed, providing for commercial (in the Pacific Ocean) and recreational (in the Rogue River) fishing opportunities. The mainstem of the Rogue River is considered occupied CCH and EFH from its mouth at the Pacific Ocean upstream to William J. Less (formerly Lost Creek) Dam. The mainstem of the Rogue River is open to recreational angling year round, and attracts anglers both locally and from abroad.

The Rogue River 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. Spring and fall chinook salmon are mainstem spawners and utilize suitable spawning locations in the Rogue River. A percentage of winter steelhead and coho salmon also spawn in the mainstem, especially during periods of low flow when access into spawning tributaries is difficult (personal observation). The mainstem provides some juvenile salmonid rearing habitat, although young fish rearing in the Rogue River are likely more susceptible to avian and piscivorous predation than they would be in the tributaries.

ODFW spawning surveys have documented a trend of declining adult steelhead redd observations in several of the streams in the watershed (see chart one below) with notable reductions of observed redds noted in Kane, Foots, and Galls Creeks. In addition, recent presence absence surveys conducted by the BLM have documented a reduction in observed fish distribution in Kane Creek (USDI 2001, USDI 2003). The reasons behind these declines are likely attributable to many factors, including past and ongoing habitat degradation (see aquatic habitat section below).

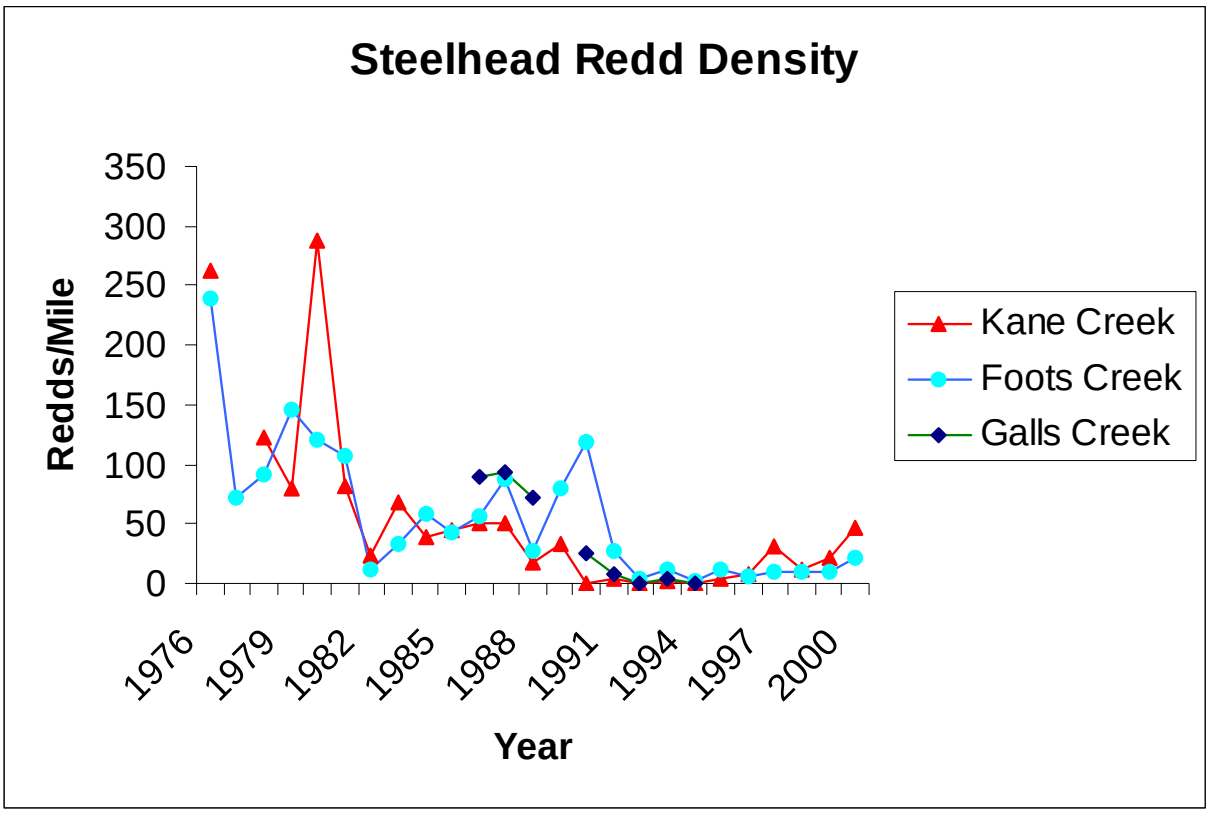


Chart one: Decline of steelhead redd densities in select RRGH watershed streams in the past quarter century. Data from ODFW annual steelhead redd counts and is available on-line at: http://rainbow.dfw.state.or.us/nrimp/information/index.htm

Within the RRGH Watershed Foots, Birdseye, Kane, Galls, Sams, Sardine, Wards, and Whetstone Creeks, and Millers Gulch are known to support populations of fish. Of these streams, Galls and Foots Creeks and Millers Gulch are included in the planning area, and are discussed below.

Galls Creek

Galls Creek was historically a major summer steelhead spawning stream in the Rogue Basin, supporting spawning runs of 1,000 adult fish (Everest 1973). Recently, steelhead surveys conducted by ODFW between 1986 and 1994 found an eight year average of 36.4 redds per mile of stream. Numbers of redds varied each year, from a high of 186 in 1987 to 4 in 1994, with a generally declining trend apparent. Steelhead distribution

extends up to river mile 6.1 on the West Branch of Galls Creek, as does that of rainbow trout. Cutthroat trout distribution has been reported to extend an additional 1.1 miles up the east fork of the West Branch of Galls Creek. Nearly the entire fish bearing section of Galls Creek is located on private lands.

ODFW considers Galls Creek to be suitable spawning and rearing habitat for coho salmon to approximately river mile 2.7 (see the following web site: ftp://rainbow.dfw.state.or.us/pub/gis/pdf/distrib/coho/coho17100308_11x8.pdf). Occupied CCH and EFH will be considered to extend upstream to this point. In addition, given the absence of natural migration barriers to anadromous fish, this document will assume that historic use of Galls Creek by coho salmon extended farther upstream, and unoccupied CCH and EFH will be considered to extend up to river mile 6.1 (the upper extent of historically observed anadromous fish use).

Foots Creek

Foots Creek is also a very important summer steelhead spawning and rearing stream, possessing some of the highest observed densities of returning adult fish found in the entire Rogue River basin (Everest 1973). While the long term trend in observed redds has been declining, an ODFW steelhead surveys conducted in the spring of 2002 found an average of 69.4 steelhead redds per mile on Foots Creek, up from the average for all years of 57 per mile. Steelhead have been documented up to river mile 5.6 (includes mainstem below confluence of forks) on the Left Fork, up to river mile 4.1 on the Right Fork, and up to river mile 2.5 on the Middle Fork (USDI, 2001).

Coho salmon spawn and rear in Foots Creek as well. ODFW records indicate that coho use the mainstem and Left Fork of Foots Creek, to river mile 3.6 (measured from the mouth of Foots Creek). Occupied CCH/EFH extends to this point, and includes the mainstem of Foots Creek below the forks. Coho have not been documented in the Right or Middle Forks of Foots Creek, and the ODFW does not consider these forks to be suitable spawning and rearing habitat. However, this document will assume that coho could have historically utilized habitat accessible to anadromous fish in the forks, and unoccupied CCH and EFH will include the 6.6 miles of stream accessible to steelhead in both the Middle and Right Forks of Foots Creek, and to river mile 5.6 on the Left Fork (including the mainstem).

Millers Gulch

The South Rogue Gold Hill Watershed Analysis, completed by the BLM in 2001, lists Millers Gulch as a fish bearing stream, containing summer steelhead (USDI, 2001). Current BLM GIS layers show distribution extending to river mile 0.9, although fish have not been documented this far upstream. ODFW records indicate that steelhead redds were observed in the 1970's in 0.3 miles of Millers Gulch, presumably the lower reach from the mouth upstream (Vandyke, 2006). This document will assume that steelhead have access to river mile 0.9.

Coho salmon have not been documented in Millers Gulch, and ODFW records do not indicate that Millers Gulch is considered suitable habitat for migration, spawning or rearing for coho. Given the small size of Millers Gulch, it is very unlikely that it historically provided much spawning or rearing habitat to coho, other than opportunistic use (such as flood refugia near its mouth). However, this document will assume since steelhead have access, that coho could potentially as well.

Table 3-4 (below) and map one display fish and fish habitat distribution (observed and assumed) within the Galls/Foot planning area.

Frontals

None of the frontal basins (including Colvig Gulch and other non-named stream basins) that flow directly into the Rogue River within the planning area, are known to currently support, or to have historically supported populations of fish. All of these streams are intermittent, and do not retain surface flow during much of the year. They appear to be intercepted by an irrigation ditch before they reach the Rogue River (observation from aerial photos due to limited access to private lands). These streams do not provide fish habitat, and will not be

addressed further in this section. For more information regarding these streams, please see the water resources section of this document.

Table 3-4: Known historic salmonid and assumed habitat distribution in the Galls/Foot Planning area.

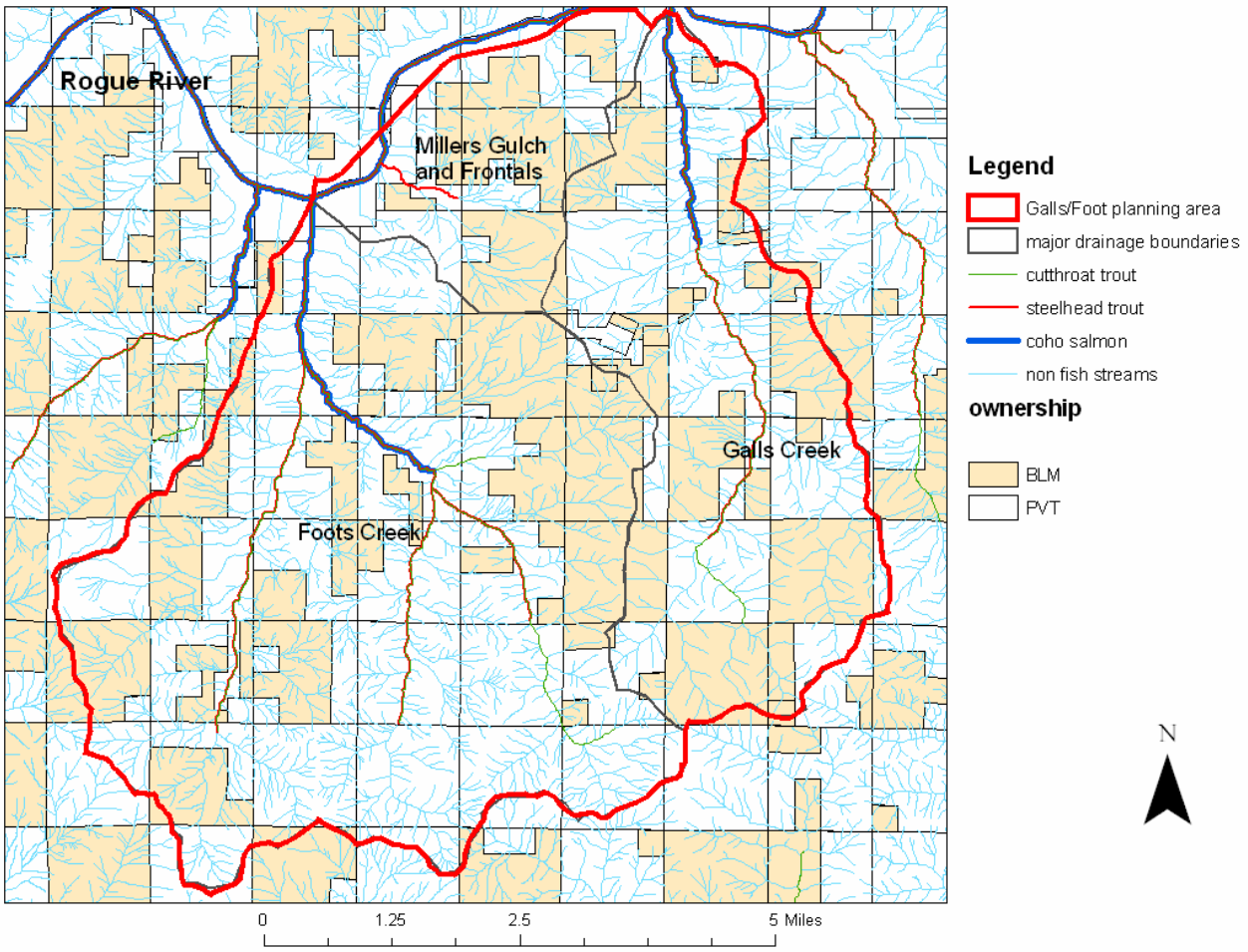
Stream	Coho river miles	CCH/EFH river miles	Steelhead river miles	Cutthroat River miles
Galls Creek	2.7[3]	6.1[1]	6.1	7.2
Foots Creek	3.6[3]	12.2[1]	12.2	14.5
Millers Gulch	0.0[2]	0.9[1,2]	0.9[1]	0.9[1]
Total Fish/habitat Miles	**6.3**	**19.2**	**19.2**	**22.6**

1- Assumed historic distribution based on best available information.

2- Species has not been documented in this drainage.

3- from ODFW records.

Map1: Fish distribution in the Galls Foot planning area. Occupied CCH/EFH is the fat blue line (coho salmon in the legend), and unoccupied CCH/EFH is the slimmer red line (steelhead trout).



Effects to Fish and Designated Habitat

No Action Alternative

The No Action Alternative will have "*No Effect*" to fish populations or distribution, SONC coho salmon, CCH, or EFH, as no ground disturbing activities will 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.

Alternative 2

Alternative 2 has been determined to be "*May Effect, Not Likely to Adversely Affect* (*NLAA*)" SONC coho salmon, CCH, and EFH. This determination was made based on analysis to fish and aquatic habitat in this EA and the Biological Assessment (BA) prepared for the NMFS for this timber sale. Should the BLM to choose to implement this alternative, it would initiate consultation following the guidelines in Federal Register Section 402.16 (50 CFR Part 402).

Aquatic Habitat Current Conditions

Rogue River Gold Hill Watershed

Instream habitats in the RRGH Watershed as a whole can be described as degraded as compared to pre-European settlement. A host of past and ongoing activities have contributed to this degradation, beginning with the discovery of gold in the area in the middle 1800's. Historic gold mining activities included dredging and placer mining; operations that have left a legacy of disturbed aquatic habitats still apparent in many areas today. Many tons of substrate were turned over and removed from streams, and old tailings piles are now common adjacent to many of the stream channels in the watershed (USDI, 2001). Some streams were diverted through sluice boxes or by other means to facilitate hydraulic mining. The diversions were not screened, and probably resulted in the mortality of many aquatic organisms. These operations also encouraged channel erosion and scour, and some streams (including Foots, Birdseye, Kane, and Galls Creeks) now flow though areas of deeply incised channels, in spots no longer connected to their historic flood plains. As the channels incised, they also straightened, leading to a corresponding increase in stream velocities, further exacerbating channel scour (USDI, 2001). In addition, historic mining practices required the removal of large wood from stream channels to facilitate mining operations. Large wood is a key component to healthy stream ecosystems that encourages formation of pools (rearing habitat), helps promote accumulation and storage of gravel (spawning habitat), helps slow stream velocities (reducing bank erosion), and helps capture and store mobilized sediment (a harmful component to aquatic organisms in excessive amounts). The result of these operations to aquatic organisms is negatively modified habitats such as less pool and off channel habitats (a critical rearing habitat element) and an increase in riffle and other fast water habitats, an increase in sedimentation levels beyond historic levels, and stream reaches prone to subsurface flow due to aggradations of worked tailings.

Timber harvest in the watershed began during this same time frame, as mining operations cleared areas for roads to access mine sites, and to establish structures on. The majority of this early harvest would have been concentrated in the riparian areas, as they were easily accessible, and were the areas of interest to early miners and settlers. As settlement of the area continued, mining operations declined and agriculture became the dominant land use of the area, with intense livestock grazing occurring in riparian areas (USDI, 2001). Forested areas were cleared for livestock, resulting in further reductions of riparian vegetation. Withdrawals of water for irrigation as well as for mining operations became common practice, and many in-stream water rights were claimed. The amount of water allocated for diversion now exceeds the minimum stream flows in many of the area streams, including Kane, Birdseye, Foots, and Galls Creeks (USDI, 2001). Irrigation ditches to transport diverted water were constructed, many of which intercepted stream flows and diverted the water into the ditches, cutting off many small streams from directly entering the Rogue River. Presently, the largest of these ditches parallels the Rogue River on its south bank for many miles. Infrastructure has been constructed that allows the major streams on this side to be bypassed by the ditch; hence, Birdseye, Foots, Galls, and Kane Creeks, and Millers Gulch still flow directly to the Rogue River.

As the population in the Rogue Valley increased, the stream corridors in the RRGH Watershed have largely been settled. Private residences, agricultural lands, and roads now follow all of the major, fish bearing streams well up into their valleys. This has resulted in further confinement of stream channels, increasing degradation of instream habitats. The Rogue River is now bordered on both of its banks by houses, highways, and Interstate-5. Urbanization and development in the watershed is still continuing at present day.

Lands in the watershed not settled (primarily the uplands and headwater reaches of the drainage basins) have been utilized for timber harvest by private timber companies and the BLM. Many miles of road have been constructed in the watershed to access harvest units. Prior to the Northwest Forest Plan, clear-cutting and harvest of trees in riparian areas on federal lands was common practice; hence many riparian areas were degraded (see Riparian Reserve section, this document), and potential large wood inputs to aquatic habits greatly reduced from anticipated historic levels. Roads have contributed to sedimentation of instream habitat (see water resources and soils sections). The effects of 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. Increased turbidity from high sediment amounts can disrupt feeding and territorial behavior of juvenile salmonids, which 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).

OHV use has been documented as contributing to sediment deposition in the watershed as well, particularly in the southern half of the watershed, as many streams in the vicinity of the proposed Johns Peak/Timber Mt OHV area are being negatively impacted by trail related erosion (USDI 2001, USDI 2005). Trail density and related erosion is particularly high in the Kane Creek drainage, and has been identified to be negatively impacting aquatic habitat (USDI, 2005).

While other activities have occurred in the watershed that have directly or indirectly altered aquatic habitats, the above discussed activities have and continue to have the greatest impacts to fish and fish habitat. All of these activities have had negative impacts to the major drainages within the Galls/Foot planning area, and have contributed to the degradation of aquatic habitats and reduction of biological health of the stream system.

Galls Creek

The 8,496 acre Galls Creek drainage basin lies west of the Kane Creek drainage. BLM managed lands account for 44% of the drainage, but the entire mainstem channel is within private lands. BLM managed lands do include 0.13 miles of the channel of the West Branch of Galls Creek, the only fish bearing reach in the drainage basin not on private lands.

Galls Creek is a perennial stream that has been observed to often have interrupted surface flow during the late summer. In September of 2005, the West Branch of Galls Creek on BLM lands was observed to be completely dry. It is unknown to what degree this phenomenon is natural or has been influenced by past activities within the watershed. In spite of this, Galls Creek does provide spawning and early season rearing habitat for summer steelhead and coho salmon.

The lower 2.5 miles of the mainstem of Galls Creek was surveyed by the ODFW, and was characterized as having a relatively low gradient channel (1-3% throughout) located in an open V-shaped valley and constrained 100% by terraces (ODFW, 1991). Pools accounted for only 15% of all habitat units, while cobbles (54%) and gravels (31%) dominated the substrate composition. Rural residential/agriculture are the primary land uses in this lower segment. The mainstem channel continues upstream through private residential and agriculture lands for ~ an additional two miles, to the confluence of the East and West Branches of Galls Creeks. No instream habitat data is available for this reach. The West Branch of Galls Creek is the larger of the forks, and fish use

continues 1.4 miles up this fork, and an additional 0.9 miles up a major tributary to the West Branch. Lands upstream of the East and West Branch confluence are forested and managed primarily for timber by the BLM and private land holders.

OHV use is occurring in Galls Creek, and trail related erosion contributes to instream habitat degradation on several tributary reaches surveyed by the BLM. Pool habitats have not been observed to be impacted by excessive sedimentation in the surveyed fish bearing reaches of Galls Creek. Fine particulate substrates (including silt and sand) were reported to account for less than 10% of all substrates in the lower 2.5 miles of stream channel surveyed by ODFW (ODFW 1991), and 15% through the 0.13 mile BLM reach of the West Branch of Galls Creek (USDI 2001). The ODFW considers >20% fines in substrate "undesirable".

Irrigation withdrawals exceed baseline summer flows most years, exacerbating low or no flow conditions in lower stream reaches in the summer months, a situation that can also lead to increasing water temperatures, and decreasing dissolved oxygen content (USDI 2001). Galls Creek has been placed on the state 303(d) list for not meeting temperature criteria (see the 2002 303(d) list, available on-line at: http://www.deq.state.or.us/wq/wqfact/ final2003_303(d)list.pdf). Low/no surface flow conditions are also common in channels in the upper watershed; the BLM managed fish-bearing reach of the West Branch has been observed to be dry or puddled numerous years during the summer (personnel observations).

Foots Creek

The Foots Creek drainage basin is 25.8 square miles in size, and lies adjacent (west) to the Galls Creek basin. The creek flows north from its headwaters west of Timber Mt. for approximately 7 miles before entering the Rogue River near the small community of Foots Creek.

The vast majority of the main-stem riparian areas and fish bearing channels on Foots Creek and its main forks are on private, residential lands. Riparian and in-stream habitat conditions throughout these lower reaches have been described as degraded (USDI 2001), as the lower sub-watershed has been severely impacted by past mining activity, resulting in a dredged, down-cut channel that lacks complexity, pools and sinuosity. Piles of tailings can still be observed near the creek banks to this day.

Habitat surveys conducted by the ODFW in 1991 documented that the substrate composition in the lower 1.7 miles of the mainstem of Foots Creek was dominated by gravel and cobble (43% each), and that fines accounted for 10 or less of all substrates present (ODFW, 1991). The high percentage of gravels and low percentage of fines indicates that suitable spawning habitat is abundant through this section of the stream. Riffles were the most common habitat type, indicating a limited availability of quality rearing habitat. Roads parallel both the left and right forks up into the steep, granitic headwaters of this drainage.

Clearing of vegetation and construction of roads and residences have further constrained and channelized the creek, and have contributed to bank de-stabilization, erosion, lack of shade, and lack of large wood in and near the stream. The creek channel has down-cut as much as 10 feet near its mouth, below the HWY 99 bridge-crossing.

Stream flows in lower portions of Foots Creek may be sub-surface (possibly due to irrigation withdrawals or aggraded mine tailings) in the dry summer months, resulting in dewatered channels in the lower drainage basin (personal observation). Water rights for irrigation withdrawals do exceed base-line summer flows most years, exacerbating low or no flow conditions in the summer months (USDI, 2001). ODFW has identified Foots Creek as a priority for summer stream flow restoration.

Stream channels and riparian areas in the upper Left Fork of Foots Creek (upstream of the Middle Fork confluence) are in better condition. A well vegetated riparian corridor exists, providing shade and a source of large wood to the creek (USDI, 2001). Pools are more frequent in this upper section than in lower portions of Foots Creek, adding to habitat complexity and providing important rearing habitat for juvenile salmonids and other aquatic organisms.

There is some limited OHV use occurring in the upper basin. However, OHV use has not been identified as a contributing factor to fish and aquatic habitat degradation in this basin.

Millers Gulch
The Millers Gulch drainage is 1202 acres in size and lies to the west of the Galls Creek drainage. BLM managed lands include 720 acres (60%) of the basin, but only 225 feet of the mainstem channel, which is within an isolated parcel surrounded by private lands.

The mainstem of Millers Gulch is a perennial stream, and like other perennial streams in the analysis area, it has been observed to lack surface flow during some dry summers. The lower mainstem reach was observed to be completely dry in September of 2005 (USDI 2005).

Land use in lower Millers Gulch is rural residential, and the upper basin is utilized for natural resources, notably a large silica mine, timber lands (private and BLM), and several rock quarries. Several stream channels historically drained through the highly disturbed area in the vicinity of the silica mine.

Millers Gulch has not been surveyed by the ODFW Aquatic Inventories program, and very little information exists regarding instream habitat conditions throughout the bulk of the presumed fish bearing reach. BLM surveyed the 225 feet of mainstem channel (stream reach I.D. # 3657) that flows through BLM lands in the fall of 2001. At that time it was documented that the stream substrate was dominated by silt (40%) and gravels (35%). An upstream tributary reach (I.D. #3708) was found to contain substrates dominated (65%) by silt, followed by sand (10%). This is a high percentage of fines, and is almost certainly impacting the health of any aquatic organisms present in the stream (none were documented by the BLM surveyors in 2001 or by ODFW surveyors in an upstream area in 2002). These two stream reaches represent the only lengths of perennial stream located on BLM managed lands within the Millers Gulch Basin, and though only a small sample of all perennial reaches (.21 miles out of an estimated 2.2 miles from GIS), they suggest that aquatic habitats in Millers Gulch are being compromised by excessive sedimentation.

The source(s) of this sediment have not been identified, but likely result from poorly designed and located roads and the extensive ground disturbance associated with the silica quarry. Road densities are very high in the Millers Gulch drainage basin (estimated at 6.6 miles of road/mile^2 from GIS).

Effects to aquatic habitat

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 watershed would continue to exist in their current degraded state. As no new road construction or decommissioning of old roads would occur, road densities would remain at the current level within the planning area. Fish habitat would continue to be impacted as a result of past and ongoing activities. No change in trends of declining habitat or biological productivity are anticipated, with one exception; the Johns Peak management plan could, if implemented, reduce some chronic sources of sediment to the watershed streams, and reduce future risks of sediment input to the other drainages by managing if and where new trails/use could occur.

Urban and agricultural lands would likely remain in their current state, impacting fish habitat in the RRGH watershed as described. 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.

Future fuels reduction projects in the area are not anticipated to have any adverse impacts to aquatic habitats. Fuels treatments projects proposed in the area would remove only small diameter vegetation, would require minimal ground disturbance (no slashbuster units are proposed), and would leave no-treatment buffers around

stream channels, with the one exception of the small study basin. All check lines would be rehabbed after ignition operations, minimizing the risk of erosion and transport of sediment down the lines towards aquatic habitats. Anticipated affects to water quality as a result of the riparian fuels study have been discussed under the Foreseeable Future Actions section above.

Alternative 2:
This alternative proposes 1,743 acres of various prescription commercial timber harvest, 2,870 acres of pre-commercial thinning, 4.2 miles of permanent new road construction, 0.24 miles of temporary spur road construction, 4.2 miles of mechanical road decommissioning, 1.8 miles of "natural" decommissionin), 6.1 miles of road renovations, and construction of new helicopter landings. All commercial harvest and silviculture activities may potentially be followed up by fuels treatments. The majority of the commercial harvest units are located in the Galls, Foots, and Millers basins, although there is a large block of regeneration units located in the Colvig Gulch basin. No new road construction (including the temporary spurs) would cross or parallel any defined (annual scour and deposition) stream channels or Riparian Reserves. Some dry draws would be crossed by the proposed roads. A significant portion of the proposed road renovation and decommissioning would take place on roads that cross or parallel defined stream channels and reserves.

Ground disturbing activities in or near stream channels and roads have the greatest potential to impact fish habitat; it is these activities that could cause erosion and sediment transport to, and storage in, stream channels. The soils and water resources sections of this document describe where and by what means erosion will likely occur, and the mechanisms for displaced sediments to enter the stream network. The new road construction, road decommissioning, potential use of one existing landing in a riparian reserve, and log haul proposed under this alternative have been identified as having the greatest potential to contribute sediment to streams. In addition, harvest activities, especially regeneration harvest that may create significant canopy openings, are of concern to fisheries resources, as the potential to alter hydrological and erosional processes (see water resources and soils) exists from these activities.

Roads

New Roads
Six new permanent road segments are proposed, totaling ~ 4.2 miles in length. The segments are: a 0.2 mile segment located on the drainage divide between the Galls Creek and Horn Gulch (a Foots Creek tributary) basins, hereafter referred to as road "A"; a 0.5 mile segment located near the drainage divide between the Horn Gulch and the Lonesome Gulch drainages in the Foots Creek basin (road "B"); 0.15 mile segment located on a ridge between the Left and Middle Forks of Foots Creek (road "C"); a 1.3 mile segment located on/near the drainage divide between the Galls Creek and Foots Creek basins (road "D"); 2.0 miles of midslope road in the Left Fork of Foots Creek drainage basin (road "E"), and a 0.3 mile spur off of this midslope road "E" located on a knoll (road "F").

The water resources and soils analysis have identified that the greatest potential impact to aquatic resources from the proposed new roads is the risk of the roads capturing precipitation, routing it down the road, and enabling erosion and transport of sediment to the stream network, particularly during a large flood event. Roads that are hydrologically connected to stream channels (roads that cross channels and can input water and particulates directly to the channels) have the greatest potential to directly impact aquatic habitats. Utilizing appropriate Project Design Features (PDFs) as outlined previously in this document, such as outsloping of the road prism and installing cross drains or rolling water dips where appropriate, would minimize (but not eliminate) the potential for displaced sediment to be routed directly to the draws. Utilizing these features enables the road to route the majority of captured water (and any sediment transported by this water) off of the road prism, downslope and into vegetation where it would be stored. However, at any point where a road crosses a stream channel, water and transported particulates from the nearest drainage structures (cross drains or rolling water dips) on either side of the channel crossing is available to be transported directly into the channel.

Roads “A”, “B”, “C” and “F” would not cross any stream or dry draw channels, and would be located either on or just below ridge tops. These roads would have no direct connectivity to aquatic habitats (see water resources). As no connectivity would exist, there is no chance that displaced sediment routed down and off of these roads could directly enter any channels. Any sediment transported off of these roads during rain events would be deposited in vegetation downslope of the road, where it would be captured.

Road “D”, which throughout its length would be located either on top or just below the ridgeline separating the Galls and Foots drainage basins, would not cross any channels in the Foots Creek basin, but it would be very near the tops of three dry draw channels in the West Branch of the Galls Creek basin. There is a very small potential for this road segment to be hydrologically connected to the stream network in this basin. The nearest population of fish in proximity to this road is located one mile downstream.

Road “E” would have the greatest potential to impact aquatic habitats; this road would contour mid slope and cross 12 dry draw channels throughout its length. At any place where the road crossed the draws there would be potential for intercepted water and routed sediment to be transported into the channels. Proper spacing of cross drains would enable the road to divert the majority of captured water and routed sediment off of the road into downslope vegetation, but between the last cross drain on either side of the draw crossing, water and transported sediments intercepted by the road prism would be available for direct input into the draws. These potential input points would all be located from one half to one mile (measured from the channel/proposed road crossings, down the channel and into the mainstem of the Left Fork of Foots Creek) from the nearest fish populations and CCH.

In addition to the permanent roads, two short temporary spur roads are proposed for construction. Both of these spurs are located on/near the ridge between the East and West Branches of Galls Creek, and total only 0.2 miles in length. Neither one of the spurs would cross any channels; they would not be hydrologically connected to the stream network. After harvest operations were completed, the spurs would be obliterated, mulched, reseeded, and allowed to revegetate.

It is unlikely that any sediment routed into the draws as a direct result of building/maintaining these roads (and the spurs) would migrate downstream to fish habitat. The water resources analysis determined that any sediment routed off the roads and to the draws would likely be stored in the draws rather than be transported downstream to fish bearing habitat, so the potential for roads “D” and “E” to directly impact fish habitat is slight (see water resources analysis, this document). Indirectly, however, these two road segments, and particularly road “E”, would increase the long term risk of sediment transport to the tributary channels of the Left Fork of Foots Creek and the West Branch of Galls Creek, in the event that the roads failed during a large flood event. It is not possible to quantify the amount of sediment, or the distance it would likely migrate during such an event, but the water resources analysis identified that the majority of sediment generated during such an event would not even migrate as far downstream as the reserves (see water resources), and that the amount would be less than would be input directly into the stream system from the riparian roads proposed for decommissioning.

Road Decommission

Decommissioning of old roads would be accomplished through two methods: mechanical and natural decommissioning. Natural decommissioning involves ensuring that the road is blocked to vehicular access, and little else. The only ground disturbing activity required is the digging of a trench to block access, if needed. Over time, vegetation colonizes the road bed (already occurring on some of the road segments). This form of decommissioning is referred to as “abandonment” in the Biological Assessment (BA) prepared for this timber sale. Natural decommissioning would not add a detrimental effect to aquatic systems, as very little ground disturbance would occur. However, natural decommissioning would not allow for the opportunity to ensure that the road would be hydrologically removed from the stream system (see water resources). The road bed would still exist to capture and route water downslope, until the road bed has fully recovered. Roads that contribute sediment to streams would still do so after natural decommissioning (none of the road segments proposed for natural decommissioning are known to be contributing to the degradation of aquatic habitats), and could

potentially still be used by OHVs. This analysis will not consider natural decommissioning as a decrease in road densities.

Mechanical decommissioning involves the use of heavy equipment to pull culverts and cross drains out of the ground, and to then rip up the road prism. Water dips are created adjacent to any channel crossings and fill material in the channel is pulled back past the bankfull channel width to ensure that the old road can not intercept stream flow and divert it out of the natural channel. Additional dips may be added where needed to divert captured ground water or precipitation off of the ripped road bed. After ripping, the disturbed ground is seeded and mulched. Where appropriate, roads will be either barricaded or covered with scattered brush, logs, etc. to discourage continued use by Off Highway Vehicles. This form of decommissioning involves much more disturbance than natural decommissioning. At any point where culverts/cross drains must be removed, it is inevitable that some sediment will settle in the channels. Utilizing proper PDFs such as dry season work only, placement of sediment booms downstream of the disturbance, and diverting stream flow around major instream projects would help to minimize the amount of sediment mobilized directly into the stream channel.

6 miles of old road are proposed for decommissioning. 1.9 miles of this would be abandoned, and 4.2 miles mechanically decommissioned. 1.6 miles would occur in Riparian Reserves, of which 1.4 miles would be mechanical decommissioning.

The roads proposed for decommissioning are composed of 16 separate road segments. Two segments, totaling 0.3 miles are located in the Millers Gulch basin. Both segments are actually on the same road, but only the lengths of road on BLM lands are proposed to be decommissioned. Both segments are within the Riparian Reserve of Millers Gulch, and one dry draw is crossed by one of the segments. These segments would be decommissioned "naturally", or abandoned, and would require no ground disturbance, and hence would have no impacts to aquatic resources, and they will not be elaborated upon further.

Eight segments are located throughout the Galls Creek drainage basin. Of these, four segments, totaling 1.0 miles in length, are located either on top of or just below a ridge top, and would be mechanically decommissioned. One segment (.45 miles in length) is located near a ridge top and would be abandoned, and has by and large recovered hydrologically (30' tall ponderosa pine trees currently growing on the old road prism). None of these segments cross any stream channels, and decommissioning them would not affect fisheries or aquatic resources as there is no connectivity between these roads and the stream network, and they will not be elaborated upon further.

The other segments within the Galls Creek drainage basin are either located in a Riparian Reserve, or cross at least one stream channel. One is a 0.4 mile segment located in the East Branch of Galls Creek basin ("East Branch" segment), and crosses one dry draw and one intermittent stream channel. This road also crosses the Riparian Reserve of the intermittent channel. The other is a 1.0 mile long road segment ("West Branch" segment) that crosses two intermittent channels and five dry draws in the West Branch of Galls Creek drainage. This road is located in Riparian Reserves for the majority of its length, as the road parallels and crosses both of the intermittent channels. This road exits BLM lands at the confluence of these two channels, which form a perennial stream channel. The point at which the stream becomes perennial represents the upper most distribution of cutthroat trout in this drainage.

There are six segments totaling 2.9 miles located throughout the Foots Creek drainages. Four of these would be abandoned and not require any ground disturbing activities, would not have any effects to fisheries resources, and will not be discussed further. The other segments would be mechanically decommissioned. One, a 0.3 mile segment located in Riparian Reserves in the upper Right Fork of Foots Creek (the "Foots Creek" segment), crosses an intermittent tributary to the Right Fork ~ ¼ of a mile upstream of the uppermost point of CCH in the Right Fork. The other, a 1.5 mile system composed of two segments, is located in Riparian Reserve (0.7 miles total in Riparian Reserve) in Max Gulch ("Max Gulch" segment), a tributary to the Left Fork of Foots Creek, and crosses 7 dry draws and one perennial channel. The "Max Gulch" road intercepts and diverts flow from an intermittent channel, where it contributes to erosion and eventual sediment transport back into Max Gulch.

The potential for sediment to enter aquatic habitats, including CCH, exists from the mechanical decommissioning of the "West Branch", "East Branch", "Foots Creek", and "Max Gulch" road segments. An estimated total of three cubic yards (Hass, personnel communication) may enter the West Branch and CCH in the mainstem of Galls Creek as periodic pulses over a period of years. An estimated cubic yard or less of fine sediment could be deposited into CCH in the Right Fork of Foots Creek, and an additional cubic yard or less into CCH in the Left Fork of Foots Creek. Inputs would occur during high flow events, following instream work. Vegetation and structure in the channels downstream of the road crossings would be sufficient to capture most mobilized sediment, storing and over time slowly releasing it as undetectable pulses during subsequent high flow events to fish habitat. The exception would be a large flood event that could conceivably mobilize the deposited sediment, in which case it would remain entrained throughout the stream system and enter fish habitat/CCH as a single pulse of increased turbidity that would not be detectable beyond turbidity levels anticipated during such an event. In any case, the amount of sediment contributed to aquatic habitats would be less than that contributed episodically during flood events as a result of not decommissioning these poorly designed/located roads.

In sum, sediment would be released to the aquatic systems as short duration pulses (short term negative impact) resulting primarily from pulling the culverts and cross drains. Once all ground disturbing activities are completed and the roads are disconnected from the stream system, sediment inputs would be reduced below current levels, and as the old road prism recovered, would be eliminated (long term benefit). This activity would, over time, yield a positive benefit to aquatic habitats as chronic sediment sources to streams would be eliminated.

Road Renovation/Haul Routes

Proposed renovation of 6.1 miles of existing road is not expected to have negative effects to aquatic habitat. Road renovation would consist primarily of adding rock to road surfaces. No cross drains or culverts are proposed for replacement or addition in this timber sale, which while minimizing the necessary disturbance, does not allow for the opportunity to improve road drainage (see water resources). All roads proposed for renovation under this timber sale are located in the Galls and Foots Creek drainages, and would also be used as haul routes.

Approximately 61 miles of road may potentially be used as haul routes. Roads used as haul routes have the potential to directly transport airborne particulates to stream channels as repeated use of the roads creates dust (sediment) that may settle into the channels. Any non-paved roads located adjacent to or crossing stream channels may contribute small amounts of dust to the stream. The magnitude of this effect would be greatly diminished by following standard PDFs that call for dust abatement of haul routes, but it is possible that a small amount of dust generated from the haul could enter aquatic habitats. The majority of this effect would be well upstream of fish habitat, as there would only be five non-paved crossings over fish streams. The main haul roads for this project include the Foots and Galls Creek main roads, which provide access to Highway 99 and Interstate 5. Approximately 2.3 miles of unpaved, rocked road parallel Galls Creek. However, the majority of this length (1.7 miles) is well removed from the channel, separated by an estimated average distance of 400'. It is highly unlikely that airborne particulates generated from log haul would migrate this distance, through vegetation, and into the channel. There are ~ 3 miles of potential unpaved haul routes that parallel fish bearing channels in the Foots Creek drainage. In short segments the potential haul roads are adjacent to the stream channels, but the majority of the roads are removed at least 100' from the edge of the channels.

Although hauling on these roads may potentially contribute dust directly to fish habitat, the magnitude of this affect is anticipated to be very small, due to dust abatement measures (see Chap 2, PDFs) that would be employed, and because at least some vegetation exists between the roads and the channels (except at the crossings), and it is not expected that the amount of dust that does settle into fish habitat will be of sufficient quantity to adversely modify habitat.

Repeated use of the unpaved haul roads may indirectly contribute sediment to streams as rocked surfaces become pulverized rock (dust) surfaces after repeated heavy truck traffic. The pulverized rock that remains on the road prism would be available to be transported off of the road during the first significant rain event following a summer season of haul. Properly engineered roads have the capability of diverting 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 could potentially directly contribute captured water and mobilized sediment into the stream channel. Therefore, use of the roads for haul would indirectly increase the risk of road derived sediment transport to stream channels.

There are an estimated 65 gravel surface stream crossings on the haul roads within the planning area; 31 within the Foots Creek drainage, 27 in the Galls Creek drainage, and 7 crossings at the top of the Millers drainage. Of the total gravel surface crossings, only 5 would directly cross fish habitat. There would be numerous crossings on tributary streams adjacent to fish habitat, and on tributary streams well upstream of habitat. Inputs would be dispersed both spatially and temporally, spanning seven 7th field drainages in the planning area over the duration of the project (estimated three years). Inputs would occur during the first major rain event following a season of haul. It is not possible to determine the amount of sediment that may be generated and contributed to aquatic habitats from haul, but given dry condition hauling and with most roads being rocked or paved, the majority of the haul routes well removed from fish habitat, and application of dust abatement measures, surface erosion and dust would be minimal from log hauling. Any sediment to move off roads would be a small amount that would be assimilated into background conditions. The dispersal of the effects over time and space would dilute the effects to aquatic habitat of any potential sediment that reached streams, so that inputs to any one piece of fish habitat would be undetectable. (Hydrology report, 2006).

Commercial timber harvest

The soils and water resources analysis of this project documented that timber harvest would not contribute to instream habitat degradation. In the Planning Area, the Ecoregion Description (see water resources, Appendix A) lists historic canopy closure within the Planning Area as greater than 30 percent, with the exception of the oak woodland/ lowest elevations which historically had less than 30 percent canopy closure. Commercial harvest would leave average canopy closures of between 30 and 60%, and PCT would not treat overstory canopy trees. After harvest operations, an estimated average remaining canopy closure of 47% would remain in treatment units, while all other forested areas across the landscape are currently estimated to have an average 85% canopy cover (water resources, appendix A). Because even following harvest and PCT, canopy closure in units in each of the drainages would still be at or above historic percentages, and the average canopy closure across the landscape would be much greater than those described in the Ecoregion Description, harvest and PCT would not affect peak flows.

Harvest and yarding operations would not take place in Riparian Reserves. The Riparian Reserve buffers would capture and store any mobilized sediment coming from harvest/yarding operations. No casual mechanism exists for commercial timber harvest to input sediment into stream channels.

Because harvest would not increase peak flows or input sediment into aquatic habitats, it would have no direct or indirect effects to fisheries resources, and would not add a cumulative effect.

Pre-commercial thinning/follow up fuels treatments

Pre-Commercial Thinning (PCT) proposed under this alternative is not anticipated to impact fisheries resources. The PCT treatments would leave no-treatment buffers, as outlined in the project design features, around all stream channels except for the short duration intermittent channels (defined as having surface flow for < than 30 days annually). The vegetative buffers remaining adjacent to the perennial and long-duration intermittent channels would trap any off-site sediment or ash movement (very unlikely) mobilized as a result of PCT activities. There is no probability that these channels would be directly affected, as no avenue exists for sediment or ash to enter the channels from PCT treatments. Hence this analysis will focus on PCT treatment

units that include short duration intermittent channels. Within the planning area, there would be 6.5 miles of short duration intermittent channel segments within proposed PCT units that could potentially receive some channel-adjacent treatments.

The 6.5 miles of channel segments are dispersed amongst six 7-th field drainages, and most are located more than ½ mile from fish bearing channels. Only three are located less than ½ mile from fish habitat; one in the Right Fork of Foots Creek (300' of channel, 1200' mainstem Right Fork of Foots Creek) and two near the mainstem of Galls Creek (total ~ 1800' of channel, 500' to 700' distance to Galls Creek).

PCT activities would involve only hand crews with saws, thinning small diameter vegetation. Very little ground disturbance would occur. Any check lines would be rehabbed following ignition operations, reducing the risk of the fire-lines contributing sediment downslope. No ignition would occur inside the Riparian Reserves. Ground cover, such as forbs and grasses, trees greater than 8" diameter and all riparian plant species (generally not present adjacent to short duration intermittent channels) would remain after PCT activities. In addition, PCT activities adjacent to the short duration intermittent stream channels would only treat vegetation as necessary to accomplish fuels and/or silviculture objectives. If vegetation adjacent to a short duration channel is treated, it is likely because it is densely overstocked from past management activities (i.e. fire exclusion, past harvest and poorly planned plantations) and in need of thinning to release trees so that they may obtain desired mature characteristics. Hence, many channel adjacent areas would not be treated at all. In any case, the manual treatments (cutting and scattering or piling) are not anticipated to produce enough ground disturbance to cause exposure of bare soil. Vegetation removed in old plantations would be scattered; not hand piled and burned. Vegetation cut in other areas would be hand piled and burned (the majority of the PCT units that include short duration channels are not in old plantations). Piles (not allowed in channels) that are burned would produce ash rings that could potentially lead to deposition of ash in channels. However, as overland flow on the forest floor is very rare in Southwest Oregon, it is very unlikely that ash would migrate off site. Surface runoff over undisturbed ground generally permeates the soil and moves to stream channels via subsurface flow (Chamberlain, et al. 1991). Only in the event of a large precipitation event that produced rain fall intensities above soil infiltration rates would the possibility of overland flow exist. These types of storms typically occur in southern Oregon as short duration, high intensity summer thunderstorms, and are rare and very localized, further reducing the likelihood that ash generated from PCT would migrate off site. In the unlikely event that ash did migrate off-site, remaining vegetation would still exist adjacent to the channels even after PCT activities to capture the ash, keeping it from reaching the short duration channels. Given the light nature of the disturbance, the unlikelihood of overland flow to occur in the planning area, and that vegetation would still remain adjacent to channels even after treatment, there is very little chance that PCT would input sediment into aquatic habitats. As most of the units that include short duration intermittent streams are located over ½ mile from fish bearing streams, there is even less chance that PCT would affect fish habitat.

Short duration intermittent stream channels are typically surrounded by vegetation that is very similar, if not the same, as that of the surrounding uplands. As such, and given that they are dry for much of the year, they do not exhibit typical riparian characteristics. Hence, they were likely subject to similar fire return intervals as adjacent upland areas. Therefore, in the unlikely event of movement of ash into these channels as a result of PCT, the amount of sediment/ash deposited into these channels would be within the range of natural variability.

PCT may potentially increase ground water availability. The water resources analysis identified that any increases were likely to be of insufficient magnitude to affect (positively or negatively) stream flows, as any extra available ground water would likely be utilized by vegetation remaining on site before it reached stream channels.

Landings

Construction of new helispots and landings would not affect fisheries resources. All proposed sites are located on ridges or are existing landings. No new sites would be built in RRs. Any captured precipitation that may become concentrated flow and mobilize sediments from the surface of the landing would be diverted off the landing, downslope and into vegetation where the runoff and sediment would be captured, or diverted down a

road. Any flow/sediment diverted down a road would be diverted off of the road prism/ditch at the location of the first downslope drainage structure, and into downslope vegetation. The water resources analysis identified that one potential existing landing (may or may not be used) in the Galls Creek basin may potentially route sediment off the landing, down an OHV trail, and into the stream system as this landing is located in a RR, less than 150' from the top of an intermittent channel. Any dirt created from use of the landing would likely wash off the landing, and some would probably be routed down the OHV trail and towards the intermittent channel.

The amount of sediment released into the intermittent channel is expected to be a cubic yard or less (D Squyers, personnel communication). This sediment would wash into the channel during a rain event following the season of use of the landing. It would then migrate down the channel towards fish habitat, where it would over time be released during high flow events as undetectable pulses beyond inputs occurring during such an event from other sources.

Aquatic Habitat Effects Summary

There would be no effect on water temperature, because shade would be maintained or improved along all stream channels. Short term (one to three years) there would likely be some amount of fine sediment (total estimated at 6 cubic yards, spread amongst three 7th field watersheds) entering stream channels in the vicinity of the four riparian roads proposed for decommissioning, downstream of one existing helicopter landing, and adjacent to certain roads used as haul. 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. In the long term, the riparian road decommissioning would reduce fine sediment inputs to channels to below what is currently occurring. Any sediment increases resulting from the proposed road work and use of one landing would be minor relative to existing sediment levels and would be offset by the substantial sediment decreased resulting from road decommissioning. This would ultimately benefit aquatic systems at site scales. The beneficial effects of these actions would be unnoticeable at the large spatial scale of the RRGH Watershed, due to continuing water quality problems from historical and present-day activities.

There is little chance that construction of the new roads would directly affect fisheries and aquatic resources, but it would increase the risk of indirect affects. Specifically, construction of road segment "D" would increase the risk of sediment transport to tributary channels to the West Branch of Galls Creek during a major flood event and associated road failure, although the risk would be very slight as the road would be on or near a ridge top, and located a long distance from fish habitat. Construction of road segment "E" would increase the risk of sediment transport to tributary channels to the Left Fork of Foots Creek during a major flood event and associated road failure. This road, if it failed, could potentially impact fish habitat, including unoccupied CCH. However, coupled with the road decommissioning proposed, the net effect of all activities would be a long term reduction in sediment inputs to aquatic habitats in the Foots and Galls basins, and a decreased risk of sediment transport to the Left Fork of Foots Creek in the event of a large flood and associated road failure, as the road proposed for decommissioning is at much greater risk for failure and contribution of sediment based on its location on the landscape.

Cumulatively, the Johns Peak OHV EIS (assuming implementation of an action alternative) could lead to short term increases in sediment inputs to channels in both the Foots and Galls Creek basins as problematic trails are identified, and fixed or decommissioned as needed. As the trails recovered, chronic sources of sediment to channels would be eliminated, yielding long term beneficial results to aquatic habitats. The riparian fuels reduction study would add a slight risk of increased sediment input to a stream channel in the Foots Basin in the event of a strong summer storm following underburning. This would be coupled with the short term increases and long term decreases expected following the riparian road decommissioning. Apart from OHV use, the effects of which may be reduced upon implementation of an action alternative, it is anticipated that management activities would continue on private lands in much the same way and at similar rates as they have in the past. Sedimentation impacts from these lands would be expected to continue with little change, fluctuating in

response to the level of harvest activity. Sedimentation from natural sources would continue, fluctuating in response to things such as variations in annual weather, climate cycles, and wildfire return intervals.

Future private timber harvest is assumed to continue at present levels, and cumulative effects to water resources have been assessed (see water resources and appendix A, this document). Future private harvest, coupled with increased OHV use (assuming selection of the no action alternative or until such time as an action alternative is selected) is expected to continue the declining trends in streambank stability, sedimentation potential, and health of riparian areas currently present in the planning area. The Galls Foot timber sale would, in the short term add a small amount of sediment to channels in the Foots and Galls Creek drainage basins, but would in the long term reduce sediment inputs into these same channels as described above. The reduction in sediment levels would not offset the amount being input from all other sources, so no change in the declining aquatic habitat conditions is anticipated following implementation of the action alternative.

In addition, assuming worst case scenario, future private timber harvest may increase the amount of non hydrologically recovered (stands younger than 30 years of age, < 30% canopy closure) openings in the Middle Fork of Foots and the Galls Creek drainages to levels above the 25% threshold assumed to increase the risk of peak flows (see water resources, appendix A). No harvest activities proposed under this timber sale would reduce canopy cover below 30%. However, openings created by new roads and landings would contribute < 1% of permanent non-recovered openings in these drainages. These areas would be at risk for increased peak flows, although this problem is likely overstated, as many of the past harvested areas are close to full hydrological recovery (see water resources, appendix A).

Riparian Reserves Current Conditions

Rogue River Gold Hill Watershed

Riparian corridors along fish bearing stream reaches in the RRGH Watershed (including the mainstem Rogue) 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 absent or very narrow around the mainstem Rogue, and homes and pastures 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 wide) forested streams.

Within the planning area, Gall Creek has been placed on the Oregon Dept. of Environmental Quality's (ODEQ) 2002 303(d) list of impaired water bodies for exceeding summer maximum temperature parameters (see water resources), set at 64.4^0 F. This summer maximum temperature standard was generated for fish, specifically salmonids which have a narrow thermal temperature tolerance. Elevated water temperatures can affect feeding, growth, and survival of salmonids (Meehan 1991). For example, the reported preferred temperature range for coho salmon is between 53.6 and 57.2 degrees F (Meehan 1991). Temperatures outside of the preferred range affect the metabolic performance of fish, altering the balance between energy inputs and outputs (growth). This does not mean that a fish can not grow at higher or lower temperatures, but that growth is not as efficient outside of the optimum temperature range. As temperature increases so do the metabolic needs of the fish, with decreases in growth, and increases in stress becoming more apparent as temperatures continue to rise, until a point termed the upper lethal limit, where death of the individual is imminent. The upper lethal limit of coho has been reported to be 78.9^0 F (Meehan 1991) and is described as the temperature that kills 50% of all fish exposed within 1,000 minutes. Galls Creek has been found to exceed the state temperature limit from its mouth upstream to river mile 4.5, with temperatures as high as 75.6^0 F recorded. This is well above the preferred, and

approaching the lethal temperature tolerance of coho salmon. Note, however, that the upper lethal limit was determined in a lab where temperature was held constant at 78.9^0 for ~ 17 hours. In small forested streams such as Galls Creek, it is common that there exists a large diurnal fluctuation in temperature. The maximum temperature recorded in Galls Creek persisted for only a few hours (USDI, 2006). However, it is still indicative of temperatures high enough to present stress to growth of juvenile coho. Elsewhere within the planning area, no other streams have been found to exceed this temperature criterion, and there are no other reported water quality violations listed by the ODEQ.

Headwater reaches of the drainages are generally less impacted, as these areas are still forested. However, past timber harvest (including pre Northwest Forest Plan and private timber harvest that has occurred within riparian areas) and roads to access timber units have reduced many riparian areas from historic conditions. This has decreased the amount of shade afforded to stream channels.

Of additional concern are the decrease of, and the potential for, large wood inputs to stream channels in the watershed resulting from past removal of stream side trees. Large wood is an important component of the aquatic system (particularly in small tributary streams such as those in the planning area) that affects the physical processes and biological health of the streams. Large wood that falls into a stream channel can help create debris jams that promote accumulation of spawning gravels and encourage formation of pools, increase sediment storage, help to slow and divert high stream energies that would otherwise scour out substrates, and encourage channel meander (which generally increases habitat diversity and complexity). ODFW considers greater than three "key" pieces (pieces 24" or greater in diameter) of LARGE WOOD per 100 meters of stream "desirable", and one key piece or less per 100 meters "undesirable" habitat for aquatic organisms residing in streams within forested ecosystems.

Within the project boundary, there are an estimated 1,955 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 RR's. 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 RR's on BLM managed lands within the Galls/Foot planning area is presented by major drainage basins in table two below.

Table 3-5: Seral state of Riparian Reserves in the Galls/Foot Planning area

Drainage Basin	**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
Galls	16	145	61	159	181	141	703
Foots	3	351	51	142	291	191	1029
Millers	0	54	0	7	55	15	131
Frontals	9	22	2	13	13	33	92
Project total	**28**	**572**	**114**	**321**	**540**	**380**	**1955**

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" in diameter at breast height (DBH)) or older will function to provide sufficient shade to stream channels, and that pole size trees (< 11" 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" 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 three below displays the percent of all reserves (note that the water resources analysis includes only conifer forested reserves, while this analysis includes all reserves, hence some percentages will be different between the two analysis'), 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 3-6 Percent of all reserves in mid seral or greater, and mature seral stages in the planning area

Drainage Basins in Planning area	% of Reserves in Mid Seral Stage or Greater (Trees >11" DBH)[1]	% of Reserves in Mature Stage (Trees >21" DBH)[1]
Galls	46%	20%
Foots	47%	19%
Millers	53%	11%
Frontals	50%	36%
Project Total	**47%**	**19%**

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

Data obtained through this analysis suggests that within the Galls/Foot planning area, reserves capable of providing the maximum amount of shade are limited throughout the project. This analysis likely overstates the problem as hardwoods were not included and in many areas they are known to contribute ample shade to stream channels. In addition, this data looks at the RR as a whole, and does not focus on the primary shade producing area, located adjacent to the stream channel. In any event, it is apparent that the RRs, as a whole, have been reduced from expected historic conditions (100% mature), and are not functioning at their full potential to provide shade to stream channels. This analysis also suggests that reserves capable of providing large wood are lacking throughout the entire planning area. As the RRs mature over time, it is expected that both the amount of shade and the potential for large wood inputs will increase (barring a catastrophic wildfire or flood event).

Adjacent to the known and presumed fish bearing reaches on BLM administered lands within the planning area, the reserves are generally functioning to provide ample shade to stream channels, but function in a reduced capacity to input new key pieces of large wood. The small section (679 feet in length) of the BLM RR that surrounds the West Branch of Galls Creek (reach # 443) was determined to provide 70% canopy cover to the stream channel, and is dominated by a mix of hardwoods and conifers (average DBH of 17-20") in the overstory (USDI 2001). No key pieces of large wood were documented in the channel throughout this reach by BLM surveyors in 2001.

In the Foots Creek basin, less than 1,000 feet of fish bearing channels flow through BLM lands, including a very short segment of cutthroat habitat on the upper Left Fork of Foots Creek, and ~ 700 feet of steelhead and cutthroat habitat on the upper Right Fork of Foots Creek. These segments were found to have ~ 70% canopy cover over their channels. No key pieces of large wood were documented in either channel by BLM surveyors in 2001, but it was noted that potential future inputs were available adjacent to the channels.

The short BLM segment of RR adjacent to the assumed fish bearing reach (reach # 3657) of Millers Gulch was described by BLM surveyors as providing 95% stream canopy cover, with an overstory dominated by alder and Douglas fir, while an upstream perennial tributary reach (# 3708) was dominated by similar vegetation and provided 70% canopy cover to the stream channel (USDI 2001). BLM surveyors noted that large wood was lacking in the stream channel at the time of the survey (2001), and that large future inputs (mature trees) were lacking as well.

Effects to Riparian Reserves

No Action Alternative

The no action alternative would have no direct or indirect effects to RR's within the RRGH 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. Benefits will be limited in RR's impacted by roads, as barring major road decommissioning (none currently planned aside from the segments already discussed to be decommissioned under this timber sale) the existing road system will likely remain in use, perpetuating canopy openings adjacent to the fish bearing stream reaches. Implementation of one of the action alternatives being developed under the Johns Peak EIS could decrease trail densities and discourage future trails from being created in RR's in the watershed. Over time, these trails would recover as vegetation colonized the disturbed areas, helping to stabilize soils and reduce the potential for displaced sediment to enter the aquatic system.

As this alternative would not contribute any direct or indirect affects to the reserves, no cumulative effects will result from implementation of the no action alternative.

Alternative 2

The only activities proposed in RRs under this project are the decommissioning of ~ 3/4 miles of riparian road, renovation of ~ 3.8 miles of riparian road, PCT, and log haul. All other activities would avoid the reserves. Decommissioning the riparian roads would not require the removal of shade producing overstory vegetation, and hence would not have a negative effect to the reserves. Over many years, as vegetation colonized and established itself over the old road prism, this activity would be expected yield a positive effect. Eventually mature trees will close in the canopy openings created by the old road prisms. Renovation and haul will not affect shade or rates of large wood input; neither of these activities would require the removal of large trees or shade producing vegetation.

PCT, and future planned fuels reduction activities may treat some riparian vegetation, but large overstory shade producing trees would not be treated. Hence, shade levels afforded to stream channels would not be changed. A 50' no treatment buffer (standard PDF) would be left adjacent to all perennial stream channels (with the exception of the one riparian fuels study basin in the Foots Creek drainage). Treatment of small diameter trees and brushy species in the Reserves may actually increase the health of the Reserve, as larger tree species may be "released" (Beechie et al, 1999). Decreased competition for resources may allow for quicker growth of the desired conifer species. Quicker growth would allow trees to assume characteristics of a mature stand sooner, capable of providing increased shade and potential large wood inputs to the stream channel. No treatment units are proposed adjacent to the short segments of fish bearing stream channels located on BLM administered lands, so this potential benefit would be limited to non-fish bearing tributary stream segments.

Cumulatively, the long-term beneficial effects expected from decommissioning riparian roads and treating some small diameter riparian vegetation, coupled with the slow recovery of other RRs on federal lands and the anticipated reduction of riparian OHV trails, it is anticipated that shade levels will eventually increase over stream channels within the planning area. Stream temperatures during the summer months may eventually lower as a result of this. 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. Riparian areas on private lands are anticipated to remain in their current status.

H. WILDLIFE

This section discusses terrestrial wildlife habitats and the impacts to threatened, endangered and special status wildlife species.

Issues/Concerns

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

- Some oppose logging and road construction actions because of perceived negative effects to wildlife. Native wildlife populations and/or species may decline in number as a result of habitat loss, fragmentation, and disturbance due to forest openings resulting from roads, logging and/or fire management activities.

- Some are opposed to cutting any large trees because doing so will impact recruitment of snags and large woody material.

- Vegetation manipulations, regardless of the vegetation type (trees, brush, grasslands) affect wildlife primarily by modifying habitat. The proposed action focuses on the removal of trees in forested stands, and nearly all effects would be to forested habitat.

- Degrading habitats for special status species may result in further population declines and/or trends away from long term viability of the species.

- Logging may degrade suitable habitat for northern spotted owls resulting in perceived adverse effects.

The *No Action Alternative* describes anticipated effects of not implementing an action at this time.

Affected Environment

The vegetation condition classes presented in the table below provide habitat for the terrestrial wildlife species found in the proposed Galls-Foot planning 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 (based on known range and habitat associations) to occur in the proposed planning area. This includes species that migrate through the area.

Table 3-7 Current Vegetation Condition

Vegetation Condition Class	Approximate Acres in Planning Area – BLM Administered Land	Representative Species (from Brown 1985)
Grassland	126	gopher snake, California ground squirrel, western meadowlark
Brushland/Shrubland	372	western fence lizard, wrentit, dusky-footed woodrat
Hardwood/Woodland	3,291	acorn woodpecker, western gray squirrel, common garter snake
Seedling/Sapling	669	Cassin's vireo, deer mouse, black-tailed deer
Small Conifer	1,729	Golden-crowned kinglet, porcupine,
Mature Conifer	2,255	northern spotted owl, northern flying squirrel, pileated woodpecker

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 or assessment species.

Threatened/Endangered Species

Northern spotted owl
The northern spotted owl (Strix occidentalis caurina) is a federally listed threatened species. There are five known spotted owl sites on BLM administered land within the proposed planning area. These sites have been monitored at various intensities during the last 10 years (1996-2005). All of these sites are known to have been occupied (range; 1-9 years) out of the 10-year period. Portions of the proposed project are also within the provincial home range radius (1.3 mile) of four other known northern spotted owl sites. All of these sites are known to have been occupied during the 10-year period (range; 2-10 years)

There are approximately 3,145 acres of suitable spotted owl habitat and 1,975 acres of dispersal-only habitat on BLM administered land within the proposed planning area. Suitable habitat includes nesting/roosting and foraging habitat and generally has the following attributes: high degree of canopy closure (approximately 60%+), multilayered canopy, large snags, and coarse woody debris. Dispersal-only habitat provides spotted owls some degree of protection and some foraging opportunity during dispersal and other activities, and generally has the following attributes: conifer stands with an average diameter of approximately 11 inches and 40-60 percent canopy closure.

Northern Spotted Owl Critical Habitat

The proposed project is not located in designated critical habitat for the northern spotted owl.

Special Status 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 or assessment species. The table below lists the special status species that are known or suspected to be present in the proposed planning area. Only those species that could reasonably be present in the planning area are included – not species that would be considered an "accidental" in the planning area.

Table 3-8. Known or Suspected Special Status Species

Common Name	Scientific Name	Status
Northern Spotted Owl	Strix occidentalis caurina	FT - Known
Northern Goshawk	Accipiter gentilis	BS - Suspected
Lewis' Woodpecker	Melanerpes lewis	BS - Suspected
Foothill Yellow-legged Frog	Rana boylii	BA - Suspected
Pacific Pallid Bat	Antrozous pallidus	BA - Suspected
Fringed Myotis Bat	Myotis thysanodes	BA - Suspected
Townsend's Big-Eared Bat	Corynorhinus townsendii	BS - Suspected
Traveling Sideband	Monadenia fidelis celeuthia	BS - Known

FT = Federal threatened; FC = Federal Candidate; BS = Bureau Sensitive; BA = Bureau Assessment

Generally, Bureau Sensitive Species have restricted ranges and have natural or human-caused threats to survival (USDI 1990). Where BLM actions could have a significant effect on their range-wide status, management direction is to protect and manage the species and their habitat so that the Bureau actions will not contribute to the need to list the species as federally threatened or endangered. Bureau Assessment species are species that are of concern and may need protection or mitigation in BLM activities. However, the level of concern for these species is less than for the Bureau Sensitive species because of a variety of factors. For example, there may be less significant threats to the species, or the species may have quite large ranges.

Survey and Manage Species

The Northwest Forest Plan provides extra protection for some species through Survey and Manage (S&M) standards and guidelines (S&Gs). The S&Gs generally require that surveys be conducted for certain species prior to ground-disturbing activities and that located sites be protected. NWFP protocol surveys were conducted in suitable habitat within the proposed planning area for great gray owl, red tree vole, and terrestrial mollusks. The results of the surveys follow:

Great gray owl – No nesting great gray owls were located.

Red tree vole – No red tree voles were detected.

Mollusks: Five Monadenia fidelis celeuthia sites were located. This snail is not a Survey and Manage species, but it is a Bureau Sensitive species. The surveyor (LGL Limited) could not say with certainty that the snails were M. f. celeuthia due to the difficulty in identifying subspecies, but the specimens closely resembled M. f. celeuthia so they are being recognized as M. f. celeuthia.

Environmental Consequences

Alternative A - No Action

Because no projects are planned under this alternative, the effects to wildlife that are discussed in the action alternative would not immediately occur. However, habitat conditions in the proposed planning area are dynamic and various natural processes will continue to change the character of the habitat over time. For example, drought and overstocking have stressed many of the large remnant trees in the project area, particularly pine, and these trees will continue to be lost. As snags, these trees would continue to benefit wildlife, but data indicate that snags are present in adequate numbers across the landscape to meet wildlife needs – in the various conditions there are 10-20 snags per acre (See Appendix C, Silviculture Prescription). The larger live trees add an element of diversity to the landscape and provide adequate tree size for nesting, roosting, foraging, and denning by wildlife species in the project area, e.g.; red-tailed hawk, porcupine, and black bear.

Encroachment of shrubs and conifers into the oak-woodland savannah habitat is prevalent in the planning area and this encroachment will continue without some type of intervention/disturbance, whether human-caused or natural, e.g., fire. The larger oaks, which are important to some wildlife species for some of their life functions (e.g., nesting and foraging), are experiencing die-off as a result of the encroachment of shrubs and conifers. As the encroachment continues, more large oaks will die and there will be less food (acorns) for deer, squirrels, woodpeckers, etc. Unfortunately, if fire is the disturbance agent, fuel loads are so high due to tree and shrub encroachment that many of the acorn-producing oaks would be killed.

Most of the shrubland habitat is fire-dependent, and due to the lack of fire, much of it is in a decadent state. Without some type of intervention/disturbance to set back succession, early seral vegetation would continue to be deficient in the shrublands.

Alternative 2

Timber Harvest Effects

General

An overview of the effects of timber management on wildlife/wildlife habitat is provided in Chapter 4, pages 51-83, of the BLM Medford District Resource Management Plan (RMP). Additional site-specific impacts are addressed in the following discussion.

In order to accomplish the timber management objectives in the proposed project area, existing wildlife habitat conditions would be modified on approximately 1,740 acres of commercial conifer forest stands. Due to the variety of stand conditions in the proposed project area, numerous prescriptions/marking guidelines have been developed. With the exception of the approximately 425 acres of Douglas fir regeneration, all prescriptions have the stated objective of improving existing tree/stand vigor and growth. Conifer stands that have been selected for treatment are primarily in the small conifer and mature/large conifer vegetation condition classes.

All prescribed treatments would reduce canopy closure, remove some snags, and reduce understory vegetation where it currently exists. It is inherent with forest disturbance, whether natural or anthropogenic, that some species of wildlife are winners and others are losers. The habitat components described above (canopy closure, vertical structure, and snags) are important to a variety of wildlife species associated with the conifer stands proposed for treatment.

The winner/loser scenario is played out by innumerable species throughout all forested habitats when there is disturbance. As practical examples, Janes (1988) and Hayes et al (2003) found that thinning in mixed conifer and Douglas-fir forests (respectively) benefited some bird species and was detrimental to others. Janes noted population increases in terrestrial insectivores and declines in bark and foliage gleaners. The declines were attributed to decreases in canopy foliage, stem density, and snags, and the increases were attributed to the presence of more woody debris on the forest floor. Similarly, Hayes et al (2003) found that detections of 9 breeding bird species decreased and detections of 8 species increased relative to controls following thinning in young Douglas fir stands.

Although some species in the project area would be adversely affected by changes in the habitat conditions described above, these impacts would be mitigated on both landscape and project scales by land use allocations and management actions adopted in the Medford District RMP, and by measures incorporated in the design of the project.

Land Use Allocation Mitigation:

(1) Late Successional Reserves - The large LSR network incorporated in the Medford District RMP mitigates the impacts of local projects by providing for late-successional forest habitat on a landscape scale. LSR forest structure is characterized by multispecies and multilayered stands; moderate to high canopy closure; moderate to high accumulations of down logs and snags; and moderate to high numbers of trees with physical imperfections, e.g., cavities and broken tops (NWFP ROD pg. B-5). Also within the planning area are 2 smaller LSRs (100 acre spotted owl activity centers) that will continue to provide the habitat characteristics described above.

(2) Riparian Reserves –As described in Chapter 2, Riparian Reserves are established on streams, wetlands and unstable areas. These reserves provide important habitat elements for the many wildlife species found in the planning area. No timber harvest is proposed within riparian reserves.

Project Design Mitigation

Snag Retention

Snags are not targeted for removal; therefore the only snags that would be removed are those that would be cut for safety concerns. Snags in adequate numbers to support 100 percent of the current snag-dependent species in the planning area would likely remain on the landscape. In the mid-sized stands snag density is approximately 20 snags/acre with an average DBH of 16 inches, and in the mature stands snag density is approximately 10 snags/acre with an average DBH of 22 inches (Appendix C, Silvicultural Prescription).

In summary, within the proposed project area, the distribution and numbers of individual species would change. However, with the mitigation described above, adequate habitat would remain in the project area to support the full complement of species that are now present.

Priority Species

Threatened/Endangered Species

The northern spotted owl is listed as a threatened species under the auspices of the Endangered Species Act of 1973, as amended (Act). There are approximately 3,145 acres of suitable spotted owl habitat, and 1,975 acres of dispersal-only habitat in the proposed project area. It is estimated that Alternative 2 would remove or downgrade approximately 1,325 acres of suitable habitat (approximately 645 acres would be removed and 680 acres would be downgraded to dispersal-only habitat). Additionally, 35 acres of dispersal-only habitat would be removed, and 150 acres would be degraded. The table below displays the estimated pre and post-project spotted owl habitat conditions in the proposed project area.

Table 3-9 Estimated Effects on Spotted Owl

Alternative 2 – Estimated Effects on Spotted Owl Habitat Within the Proposed Project Area			
Suitable Habitat (Acres)		**Dispersal-only Habitat**	
Pre-project	Post-project	Pre-project	Post-project
3,145	1,820	1,975	2,625

The Galls-Foot project would take place within portions of the median home range radius (1.3 miles) of 9 historic northern spotted owls sites – 5 sites are within the planning area, and 4 sites are adjacent to the planning area. All sites have been monitored at various intensities during the last 10 years (see Affected Environment for more detail). All of the sites are known to have been occupied during the 10-year period. Five of the sites are known to have produced young during this period. The removal and downgrading of approximately 1,325 acres of suitable habitat in the planning area (approximately 42 percent of the suitable habitat) would almost certainly impair the ability of at least some of the owls to breed, feed, and shelter. Some mitigation is provided for 4 of sites by the Standards and Guidelines of the NWFP. These sites were found prior to January 1994, and approximately 100 acres of the best habitat are protected at these sites. These reserves are intended to preserve an intensively used portion of the breeding season home range (USFS/USDI 1994). The ultimate fate of the owls as a result of the proposed habitat modification is unknown due to the variability in individual owl response to habitat modification.

Northern spotted owls would likely be adversely affected by the proposed project; therefore formal consultation with the U.S. Fish and Wildlife Service (Service) is required. The consultation was completed through a programmatic consultation with the Service for timber sales and other projects in the Rogue River/South Coast basin that are to be sold (timber sales) or implemented (other projects) in fiscal years 2006 through 2008. The Biological Assessment , *FY 2006 Programmatic Biological Assessment for the Reinitiation of Consultation on Activities that May Affect Listed Species in the Rogue River/South Coast Provinces,* and the Biological Opinion for this assessment , *FWS Log #: 1-15-06-F-162,* are available for review at the Medford District Office.

The Service evaluated the impact of habitat removal in the Rogue River/ South Coast basins, which include the proposed Galls-Foot project, in their biological opinion. The following is the text of their conclusion for the northern spotted owl:

CONCLUSION

After reviewing the current status of the spotted owl and spotted owl critical habitat, the environmental baseline, the effects of the proposed action. (Note: the proposed action in this text is all sales and other projects in the Rogue River/South Coast basins, not just the Galls Foot timber sale), *and the cumulative effects, it is the Service's biological opinion that the FY 2006-2008 management activities proposed by the District are not likely to jeopardize the continued existence of the spotted owl and are not likely to destroy or adversely modify designated critical habitat for the spotted owl. The Service reached these conclusions based on the following factors:*

Spotted Owl

The adverse effects caused by the proposed action involving the removal or downgrading of 31,207 acres of spotted owl suitable NRF habitat are compatible with the survival and recovery needs of the spotted owl for the following reasons:

(1) With the exception of 960 acres of NRF habitat downgrade in two LSRs, all of the affected NRF habitat lies within the Matrix and Adaptive Management LUA where timber harvest was expected to occur under the conservation strategy for the spotted owl in the Plan. In its 1994 biological opinion addressing adoption of the Plan by the Forest Service and the BLM, the Service determined that harvest activities in the Matrix were compatible with the survival and recovery of the owl in the context of implementing the Plan's conservation program (USDA/USDI 1994a). As noted above in the Status of the Species section of this Opinion, Courtney et al. (2004) affirmed the validity of the Plan's conservation program for the spotted owl. On that basis, the proposed action is not likely to impair the ability of the action area to adequately provide for large blocks of habitat (i.e., LSRs) that support clusters of breeding spotted owls and for dispersal habitat between LSRs.

(2) Based on information provided in the Environmental Baseline section of this Opinion, the spotted owl population within the Action Area is currently considered to be relatively stable. The estimated 24 historic owl sites where habitat loss caused by the proposed action is likely to result in significant disruptions to the nesting, roosting, and foraging activities of spotted owls represent 2.9 percent of the 819 owl sites in the Action Area, and 3.3 percent of the 728 owl sites in the affected watersheds.

(3) Some treatments associated with the proposed action (such as LSR restoration and fuels reduction; thinning in dense stands, road management, silvicultural treatments, and snag development) may have long-term benefits in restoring owl habitat to more sustainable ecological conditions.

(4) Over two-thirds of the NRF harvest proposed by the District involves thinning or other selective harvest methods and the affected stands would retain dispersal-only habitat (or better).

(5) Less than 4.1 percent of the 910,800 acres of suitable NRF habitat in the Action Area would be removed or downgraded by timber harvest activities.

Medford BLM Review of RMP Relative to Recent Studies

Scoping has identified recent studies as being pertinent in the ongoing debate over northern spotted owl persistence and population viability. The following is Medford District BLM's RMP review of those studies:

Evaluation of the Medford Resource Management Plan Relative to Four Northern Spotted Owl Reports

8-24-05

I. Introduction

The Medford District Record of Decision (ROD) and Resource Management Plan (RMP), June 1995, incorporates and adopts the Northwest Forest Plan ROD (April 1994) based on the Interagency (BLM and Forest Service) Final Supplemental Environmental Impact Statement (February 1994) and the Medford District Final Environmental Impact Statement (October 1994).

The overall objectives of the Northwest Forest Plan (NFP) and the Medford RMP/ROD are to manage for healthy forest ecosystems with habitat that will support populations of native species, particularly those associated with late-successional habitat, and respond to the need for a sustainable supply of timber and other forest products. In addition, these plans are based on the principles of adaptive management. Adaptive management is a continuing process of monitoring, research, evaluation and adjusting, as determined necessary, with the objectives of improving the implementation and achieving the goals of the RMP/ROD. Under the concepts of adaptive management new information is evaluated and a decision is made to determine if adjustments or changes are deemed necessary (Medford RMP/ROD, June 1995).

The Bureau of Land Management (BLM), Forest Service (FS), and US Fish and Wildlife Service (USFWS) have conducted a coordinated review of four recently completed reports containing information on the NSO. The reviewed reports (hereinafter collectively referred to as "the 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, November 2004); and
- *Northwest Forest Plan – The First Ten Years (1994-2003): Status and trend of northern spotted owl populations and habitat, PNW Station Edit Draft* (Lint, Technical Coordinator, 2005).

The interagency review and summary of the findings from those reports is described below. The BLM planning regulations require that the District Manager monitor and evaluate the plan at "established intervals … and at other times as appropriate to determine whether there is sufficient cause to warrant amendment or revision of the plan" (see 43 CFR 1610.4-9). As a key element of the Northwest Forest Plan monitoring strategy, completion of the NSO status and trend portion of *The First Ten Years* monitoring report, as well as the other timely studies pertinent to the NSO, is considered appropriate to warrant this focused evaluation. The monitoring report and this evaluation carry out the process of monitoring and adaptive management envisioned by the Northwest Forest Plan, as adopted and implemented through the Medford District RMP.

Following is the interagency review and summary of key findings from the four reports regarding the NSO. This summary has been reviewed by report authors Dr. Steven P. Courtney and Dr. Robert G. Anthony to ensure that it accurately reflects their findings. In addition, agency representatives Terry Rabot and Joseph Lint reviewed the document to verify that the USFWS five-year review and the ten-year NSO status and trend report, respectively, were appropriately incorporated.

II. Review and Summary of Key Findings Regarding the Northern Spotted Owl

The most important conservation concerns addressed in the reports are: 1) the precipitous NSO population declines in Washington, and declining trends in the three northern Oregon demographic areas, as described by Anthony *et al.* 2004; and 2) the three major current threats identified by Courtney *et al.* (2004), i.e., lag effects from prior harvest of suitable habitat, habitat loss due to wildfire in portions of the range, and competition from barred owls.

Anthony *et al.* (2004) indicated that NSO populations were doing poorest in Washington, with precipitous declines on all four study areas. The number of populations that declined, and the rate at which they declined, were noteworthy (Anthony *et al.* 2004). In northern Oregon, NSO population declines were noted in all three study areas. The declines in northern Oregon were less than those in Washington, except in the Warm Springs study area, where the decline was comparable to those in Washington (Anthony *et al.* 2004). The NSO has continued to decline in the northern portion of its range, despite the presence of a high proportion of protected habitat on federal lands in that area. Although Courtney *et al.* (2004) indicated that population declines of the NSO over the past 14 years were expected they concluded that the accelerating downward trends on some study areas in Washington where little timber harvest was taking place suggest that something other than timber harvest is responsible for the decline. Anthony *et al.* (2004) stated that determining the cause of this decline was beyond the scope of their study, and that they could only speculate among the numerous possibilities, including competition from barred owls, loss of habitat from wildfire, timber harvest including lag effects from prior harvest, poor weather conditions, and defoliation from insect infestations. Considering the fact that the NSO is a predator species, Anthony *et al.* (2004) also noted the complexities of relationships of prey abundance on predator populations, and identified declines in prey abundance as another possible reason for declines in apparent survival of NSO.

In southern Oregon and northern California, NSO populations were more stationary than in Washington (Anthony *et al.* 2004). The fact that NSO populations in some portions of the range were stationary was not expected within the first ten years, given the general prediction of continued declines in the population over the first several decades of Northwest Forest Plan (NWFP) implementation (Lint 2005). The cause of the better demographic performance on the southern Oregon and northern California study areas, and the cause of greater than expected declines on the Washington study areas are both unknown (Anthony *et al.* 2004). Courtney *et al.* (2004) noted that a rangewide population decline was not unexpected during the first decade, nor was it a reason to doubt the effectiveness of the core NWFP conservation strategy.

Lint (2005) indicated that loss of NSO habitat did not exceed the rate expected under the NWFP, and that habitat conditions are no worse, and perhaps better than expected. In particular, the percent of existing NSO habitat removed by harvest during the first decade was less than expected. Courtney *et al.* (2004) indicated that models of habitat growth suggest that there is significant ingrowth and development of habitat throughout the federal landscape. Courtney *et al.* (2004) also noted that management of matrix habitat has had a lower impact on NSO populations than predicted. Owls are breeding in substantial numbers in some matrix areas. The riparian reserve strategy and other habitat management guidelines for the matrix area appear to preserve more, better, and better-distributed dispersal habitat than earlier strategies, and there is no evidence to suggest that dispersal habitat is currently limiting to the species in general (Courtney *et al.* 2004). Anthony *et al.* (2004) noted declining NSO populations on some study areas with little harvest, and stationary populations on other areas with consistent harvest of mature forest. No simple correlation was found between population declines and timber harvest patterns (Courtney *et al.* 2004). Because it was not clear if additional protection of NSO habitat would reverse the population trends, and because the results of their study did not identify the causes of those trends, Anthony *et al.* (2004) declined to make any recommendations to alter the current NWFP management strategy.

Reductions of NSO habitat on federal lands are lower than those originally anticipated by the Service and the NWFP (Courtney *et al.* 2004). The threat posed by current and ongoing timber harvest on federal lands has been greatly reduced since 1990, primarily because of the NWFP (Courtney *et al.* 2004). The effects of past

habitat loss due to timber harvest may persist due to time-lag effects. Although noting that it is probably having a reduced effect now as compared to 1990, Courtney *et al.* (2004) identified past habitat loss due to timber harvest as a current threat. The primary current source of habitat loss is catastrophic wildfire (Courtney *et al.* 2004). Although the total amount of habitat affected by wildfires has been small, there is concern for potential losses associated with uncharacteristic wildfire in a portion of the species range. Lint (2005) indicated that the NWFP recognized wildfire as an inherent part of managing NSO habitat in certain portions of the range. Courtney *et al.* (2004) stated that the risk to NSO habitat due to uncharacteristic stand replacement fires is sub-regional, confined to the dry eastern and to a lesser extent the southern fringes of the NSO range. Wildfires accounted for 75 percent of the natural disturbance loss of habitat estimated for the first decade of NWFP implementation (Courtney *et al.* 2004). Lint (2005) cautioned against relying solely on the repetitive design of the conservation strategy to mitigate effects of catastrophic wildfire events, and highlighted the potential to influence fire and fire effects through active management.

Anthony *et al.* (2004) indicated that there is some evidence that barred owls may have had a negative effect on NSO survival in the northern portion of the NSO range. They found little evidence for such effects in Oregon or California. The threat from barred owl competition has not yet been studied to determine whether it is a cause or a symptom of NSO population declines, and the reports indicate a need to examine threats from barred owl competition.

The synergistic effects of past threats and new threats are unknown. Though the science behind the NWFP appears valid, new threats from barred owls, and potential threats[4] from West Nile virus and Sudden Oak Death may result in NSO populations in reserves falling to lower levels (and at a faster rate) than originally anticipated. If they occur, such declines could affect NSO recovery (Courtney *et al.* 2004). According to Courtney *et al.* (2004), there exists a potential for habitat loss due to Sudden Oak Death in the southern portion of the range, however the threat is of uncertain proportions. In addition, Courtney *et al.* (2004) indicated there is no way to predict the impact of West Nile virus, which is also identified as a potential threat. The reports do not provide supporting analysis or recommendations regarding how to deal with these potential threats. Courtney *et al.* (2004) concluded that the risks currently faced by the northern spotted owl are significant, and their qualitative evaluation is that the risks are comparable in magnitude to those faced by the species in 1990.

According to the USFWS (November 2004), the current scientific information, including information showing declines in Washington, northern Oregon, and Canada, indicates that the NSO continues to meet the definition of a threatened species. Populations are still relatively numerous over most of the species' historic range, which suggests that the threat of extinction is not imminent, and that the subspecies is not endangered even in the northern part of its range where greater than expected population declines were documented (USFWS, November 2004). The USFWS (November 2004) did not consider the increased risk to NSO populations due to the uncertainties surrounding barred owls and other factors sufficient to reclassify the species to endangered at this time.

In summary, although the agencies anticipated a decline of NSO populations under land and resource management plans during the past decade, the reports identified greater than expected NSO population declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California. The reports did not find a direct correlation between habitat conditions and changes in NSO populations, and they were inconclusive as to the cause of the declines. Lag effects from prior harvest of suitable habitat, competition with barred owls, and habitat loss due to wildfire were identified as current threats; West Nile virus and Sudden Oak Death were identified as potential new threats. Complex interactions are likely among the various factors. The status of the NSO population, and increased risk to NSO populations due to uncertainties surrounding barred owls and other factors, were reported as not sufficient to reclassify the species

[4] Courtney *et al*. (2004) distinguish between operational threats (perceived as currently negatively influencing the status of the NSO) and potential threats (factors that could become operational threats in 15-20 years, or factors that may be threatening the NSO currently and for which the extent of the threat is uncertain).

to endangered at this time. The reports did not include recommendations regarding potential changes to the basic conservation strategy underlying the NWFP, however they did identify opportunities for further study.

The full reports are accessible on the internet at the following addresses:

- Courtney et al. 2004: http://www.sei.org/owl/finalreport/finalreport.htm
- Anthony et al. 2004: http://www.reo.gov/monitoring/trends/Compiled%20Report%20091404.pdf
- USFWS, November 2004: http://www.fws.gov/pacific/ecoservices/endangered/recovery/5yearcomplete.html
- Lint, Technical Coordinator, 2005: http://www.reo.gov/monitoring/10yr-report/northern-spotted-owl/documents/owl_text%20and%20tables.pdf

III. Comparative Evaluation of the Medford District Resource Management Plan with the Four, Previously Referenced, Reports on the Northern Spotted Owl.

Following are excerpts from the Medford RMP and supporting Environmental Impact Statement (EIS) pertinent to the key findings from the four reports.

The interagency FSEIS (February 1994) discusses the broad-scale NSO population trends documented from 11 demographic studies analyzed in 1993 prior to the approval of the Medford RMP/ROD in 1995. These 11 NSO demographic studies provided individual datasets ranging from 4 to 9 years that were gathered between 1985 and 1993. The analyses of these data indicated declining trends in most of the western Oregon study areas.

The Medford District FEIS (November, 1994) discusses these trends, stating "owl populations have declined across much of their range and there is ample reason to believe that the pattern of population change is not the same everywhere," (p. 4-77, 4-79). And, these results are not unexpected since the data was [*sic*] gathered during a time of habitat decline that was of sufficient concern to serve as a reason for listing the owl as a threatened species" (p. 4-79).

The FSEIS (February 1994) further discusses the results of the 1985 to 1993 demographic studies and the results from the 1993 spotted owl population status and trend analysis (chapter 3&4, p. 212 – 245). The 1993 analyses estimated the owl population was declining at about 4.5 percent per year (lambda = 0.9548, 95 percent CI = 0.9162 to 0.9934). The FSEIS stated these results were "not surprising" given that the 1990 federal listing of the northern spotted owl was due to declining habitat and there was a strong inference that populations were also declining. Also, prior to the NFP and the Medford RMP, both Thomas *et al.* (1990) and the Northern Spotted Owl Recovery Team (USDI 1992) predicted that "habitat and owls would continue to decline for up to 50 years before reaching a new equilibrium."

Regarding predicted population trends from implementation of the NFP and the Medford RMP/ROD, the FSEIS (February 1994, p. 228) stated that "given this history [of a declining population trend] it would be surprising if the future rate of population growth of owls was equal to or greater than 1.0 with a stable population structure." (lambda of less than 1.0 indicates a declining population.) Also, analysis of effects in the Medford District FEIS (November, 1994) on future NSO population trends shows that, "with the full range of environmental heterogeneity represented within the reserves (of the RMP) there is reason to believe that owl population performance will vary in both positive and negative ways throughout the range" (page 4-78). It should be noted that these predictions of population trends in 1994 and 1995, under the NFP, were general, providing a qualitative rather than quantitative expectation of population trajectory. The reports did not find a direct correlation between habitat conditions and changes in NSO populations, and they were inconclusive as to the cause of the population declines [in Washington and northern Oregon]. However, as stated before, the Medford

District FEIS (October, 1994) stated that future NSO population trends "would vary in both positive and negative ways throughout the range" (page 4-78) because of the "environmental heterogeneity of habitat represented within the reserves." This statement recognized the varying age classes of forest stands within the reserved land base, as a direct result of past timber harvest practices, and that NSO population trajectories would likely respond both positively and negatively.

Negative inter-specific competition between barred owls and northern spotted owls was known to scientists at the time of NFP development. However, because there was not sufficient information to address this problem or issue through land management practices it was not addressed by the NFP or the Medford RMP/ROD. Anthony *et al.* (2004) pointed out that "there is some evidence the barred owls may have had a negative effect on NSO survival in the northern portion of the NSO range" but that "the threat from Barred Owl competition has not yet been studied to determine whether it is a cause or a symptom of NSO population declines."

Stand replacement wildfire was identified in the Medford RMP/ROD as having a potential to negatively affect late-successional forest ecosystems. The FSEIS (February, 1994) and the NFP recognized catastrophic wildfire as an inherent risk to NSO suitable habitat in certain portions of their range and addressed this threat by building redundancy into the late-successional reserve system. Even though stand-replacing wildfire is identified as a continuing threat to NSO suitable habitat in the reports it is not considered a widespread threat throughout the range of the NSO. Stand replacing wildfire did have some local negative effects on Federal land, which were most notable in the Klamath Province (Attach. A, page A-3, NFP ROD, April 1994).

IV. Conclusions

Based on the above evaluation of pertinent elements of the RMP and its associated EIS, I find that effects on NSO populations identified in the four reports are within those anticipated in the RMP EIS, and that the RMP goals and objectives are still achievable in light of the information from the reports. As such, I find that the latest information on the NSO does not warrant a change in RMP decisions pertinent to the NSO, and therefore does not warrant amendment or revision of the Medford RMP. I also find that the underlying analysis in the Medford EIS remains adequate for purposes of tiering NEPA analyses of NSO effects from proposed actions implementing the RMP.

-Signed-
__W.A. Freeland_____ _____8/24/05___
Acting District Manager, Medford District Date

Special Status Species (SSS)

Documented Species

Two SSS (i.e., Federal listed, Bureau Assessment or Sensitive Species) are known to be present in the proposed planning area. These species are northern spotted owl (addressed above) and traveling sideband.

Traveling Sideband

Five locations were found within the proposed project boundary for this snail species. These locations are protected with no-treatment buffers in order to maintain microsite conditions.

Suspected Species

Six special status species are suspected to be present in the proposed planning area based on known range and habitat associations. These species are northern goshawk, Lewis' woodpecker, foothill yellow-legged frog, fringed myotis, Pacific pallid bat, Townsend's big-eared bat.

Northern Goshawk

The proposed action would modify approximately 1,325acres of potentially suitable habitat for the northern goshawk. This habitat modification would likely adversely affect the ability of goshawks to breed, feed and shelter should they be present in the planning area.

Although the proposed project could adversely affect the goshawk at the project level if it is present, the Standards and Guidelines of the NWFP accommodate the habitat requirements of the northern goshawk within the NWFP area and provides for persistence of the species at that scale (BLM 1997). The proposed project conforms to the Standards and Guidelines of the NWFP; therefore, the project would not lead to listing the species as threatened or endangered which complies with the BLM Special Status Species policy.

Lewis' Woodpecker

In Southwest Oregon, Lewis' woodpeckers are primarily a winter population (Rogue Valley Audubon Society 2001); however, some limited nesting may occur. Lewis' woodpeckers are associated with open oak-pine woodland habitat. The treatments prescribed for the commercial portions of the project are not likely to adversely affect this species since the treatments normally target dense conifer stands. Some of the pine restoration treatments could potentially benefit this species in the long-term by promoting development of the historic open pine forests.

Foothill Yellow-legged Frog

Habitat for these frogs is low-gradient streams with bedrock and gravel substrates, along with the adjacent grass/sedge banks (Corkran and Thoms 1996). The required stream buffers would protect the habitat of this species.

Fringed Myotis

Fringed myotis are associated with a variety of habitats including conifer forests and oak-woodlands. They roost in mines, caves, abandoned buildings, and crevices and cavities in large trees. There are several known mine sites within the planning area; however none are located within proposed harvest units. Some trees that would be harvested could be used by bats as roost sites. Riparian and other reserves and the snag retention guidelines would mitigate this potential impact (USDI 1994).

Pacific Pallid Bat

Preferred habitat is canyons and other rocky areas near water sources in arid areas. This species is known to roost in large snags on ridgetops in the general area of the project. This species could use snags and rock outcrops throughout the planning area. Prescriptions call for snag retention which will mitigate impacts to this species.

Townsend's Big-Eared Bat

Townsend's big-eared bats are generally associated with mine adits in the general area of the proposed project. There are several known mine sites within the planning area; however none are located within proposed harvest units. Therefore, this species should not be affected by the proposed project.

Survey and Manage Species

Protocol surveys were conducted for great gray owls, red tree voles, and various mollusk species as required by the NFP. No target S&M species were found in the project area.

Road Effects

Road Construction and Decommissioning

Under Alternative 2, 4.6 miles of new road would be constructed. The proposed new roads traverse a variety of habitat types, and would remove approximately 25-30 acres of habitat. In relation to the size of the proposed project area, the loss of this amount of habitat would be inconsequential. However, 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.

The new construction would be blocked or barricaded to vehicular traffic (i.e., automobile and truck) after construction as a mitigation measure. However, barricades are seldom 100 percent effective in eliminating autos and trucks, and they don't stop any of the OHV-type of vehicle use. Consequently, even with barricades in place the negative impacts of noise disturbance, increased poaching potential, and the potential for over hunting remain. However, these impacts would be reduced to some extent because many vehicles would be deterred by the barricades.

Barricades, however, don't mitigate the edge effects and microclimatic changes that roads produce. Various studies (e.g., Ortega and Capen 1999; Marsh and Beckman 2004) show that the negative impacts of roads to wildlife habitat are not limited to the road prism - there is a zone of influence that extends into the adjacent habitat. For example, Marsh and Beckman (2004) found that some terrestrial salamanders decreased in abundance up to 80 meters from the edge of a forest road due to soil dessication from the edge effects. Ortega and Capen (1999) found that ovenbird (a forest-interior species) nesting density was reduced within 150 meters of forest roads. This study suggests that even narrow forest roads fragment habitat and exert negative effects on the quality of habitat for forest-interior species.

While roads are generally not good for wildlife, some species take advantage of the edge created by roads. These are the opportunistic habitat generalists that thrive on human disturbance of natural landscapes, e.g., some rodent species, brown-headed cowbirds, and some sparrows. Generally, these species, are not threatened in any way, and do not necessarily need additional habitat.

Approximately 4.5 miles of road would be decommissioned. This would decrease the impact of disturbance and the increased potential for poaching in the short-term, and would likely mitigate the microclimatic change to adjacent habitat as vegetation reestablishes in the road prism.

In summary, although decommissioning and barricading/gating provide mitigation for some of the negative impacts of roads to wildlife, there are long-term negative impacts of roads that aren't mitigated by these measures.

Cumulative effects

Cumulative effects are defined as the collective environmental impact of all past, present, and reasonably foreseeable future actions in the affected area. For this analysis the affected area is defined as the South Rogue-Gold Hill watershed. Watershed analysis facilitates cumulative effects analysis (RMP ROD pg.96). Also, various animals including spotted owls tend to concentrate their activities in watersheds where they breed (Irwin et al 2004). Due to these factors, the South Rogue-Gold Hill watershed is an appropriate scale for cumulative effects analysis.

The proposed project implements the objectives of the NWFP. A primary focus of the NWFP is conservation and recovery of the northern spotted owl; therefore, the cumulative effects analysis focuses on spotted owl habitat.

Until implementation of the NWFP began in 1994, timber harvest on both federal and private land in the analysis area focused on the harvest of large-diameter trees due to their economic value. Since 1995 the focus on federally-managed land in the analysis area has been thinning/density management in overstocked stands to improve forest health and reduce fire hazard. An exception to these goals is in regeneration harvest units where the goal is to initiate a new stand of trees.

On private land, timber harvest continues to focus on larger diameter timber stands where they exist. However, for analysis purposes it is assumed that all large-diameter timber stands have been removed from private land in the analysis area or will be removed soon.

The suitable spotted owl habitat baseline in the analysis area at the time the NWFP was signed in 1994 is estimated to have been approximately 4,220 acres on federal land. The 1994 baseline acreage accounts for habitat lost through timber harvest and natural causes and for suitable habitat in growth up to that point. The baseline acreage was derived from watershed analysis data (USDI BLM 2001). The baseline data assume that all functional suitable habitat was removed from private land by that time, which is not an unreasonable assumption given the harvesting history in the area.

Since 1994 no timber harvest has occurred in the analysis area on BLM managed land, and there has been no loss due to natural disturbance, e.g., wildfire. Therefore, the current spotted owl suitable habitat acreage in the analysis area is approximately 4,220 acres. The Galls-Foot project would remove or downgrade approximately 1,325 acres; thus, reducing suitable habitat to approximately 2,895 acres.

Upcoming projects in the analysis area have been planned through fiscal year 2009. Therefore, for the analysis, 2009 is considered the "reasonably foreseeable future". Through this period it is estimated that timber harvest would remove or downgrade (to dispersal habitat) an additional 520 acres of suitable spotted owl habitat. This estimate is based on the amount of suitable spotted owl habitat in the proposed project areas and the percentage of suitable spotted owl habitat that has been treated in similar projects. Therefore, at the end of this period there would be approximately 2,375 acres of suitable spotted owl habitat in the analysis area. This value does not account for development of suitable habitat during that period because a method to predict in-growth of suitable habitat is not available. However, the amount of unsuitable habitat developing into suitable habitat in a 5-year period would be expected to be minimal.

Based on the 1994 baseline, this represents approximately a 44 percent loss of suitable spotted owl habitat in the analysis area due to present, and reasonably foreseeable actions. Habitat loss of this magnitude obviously impedes the ability of some spotted owls in the analysis area to feed, breed and shelter. The Service in their BO (Log # 1-15-06-F-162) for timber sales and other projects in the Rogue River/South Coast basins concluded that the timber sales and other projects from 2004 through 2008 are not likely to jeopardize the northern spotted owl or destroy or adversely modify critical habitat for the northern spotted owl. Their analysis was on a larger scale, but their environmental baseline, cumulative effects, and the effects of the proposed actions included the South Rogue-Gold Hill watershed, the Galls-Foot Project, and the "reasonably foreseeable future" projects discussed above. The Service's findings indicate that habitat removal and downgrading in the analysis area would not preclude the conservation and recovery of the spotted owl which is a primary goal of the NWFP.

J. BOTANY

This section discloses the impacts to threatened, endangered, special status and invasive plant (including fungi) species.

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

Issues

- Degrading habitat for threatened, endangered, sensitive or other special status species may result in further population declines and/or trends away from recovery of the species.
- Invasive plant species may become established or more widespread as a result of habitat manipulation.
- Habitat alteration including reduced canopy cover and soil compaction associated with harvest activities degrades habitat for native plant (including special status plant and fungi species) populations.
- Ground disturbance associated with harvest activities may impact stems and propagules of native plant species (including special status plant and fungi) species.
- Ground disturbance and road building provide vectors for expansion of invasive plant populations.

The *No Action Alternative* describes anticipated effects of not implementing an action at this time

Bureau Special Status Plants 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 biological opinions, and ensures that actions authorized, funded, or carried out by the BLM do not contribute to the need for the species to become listed. Additionally, Bureau Assessment, Tracking, and District Watch species are included on the Special Status Plant list but special protection or management is discretionary.

Some species on the SSP list may have Survey and Manage status. Survey and Manage standards and guidelines are designed to mitigate the impacts from land management activities on rare species associated with late-successional habitat. These actions include: (1) manage known sites; (2) survey prior to habitat-disturbing activities; and, (3) conduct extensive and general regional (strategic) surveys. These Survey and Manage species also have management recommendations that address known site protection measures.

The proposed treatment areas were surveyed for vascular and nonvascular (lichens and bryophytes) plants on the Medford District Special Status Plant list and Medford District Noxious Weed list. Surveys were conducted during the 2005 field season by professional botanists using the intuitive controlled survey method. Areas of high potential habitat for target species were surveyed completely. New road locations were surveyed during the 2005 and 2006 field season.

The surveys documented 281 occurrences of 23 Bureau Special Status plant species within or adjacent to the proposed treatment areas. Five species (109 occurrences) also have S&M status.

	FEO	STO	BSO	BAO	BTO	MW	Total
Species (S&M)	1	1 (1- A)	1 (1-C)	6	11 (2-B, 1-C)	3	23
Occurrences (S&M)	6	1 (1-A)	40 (40-C)	61	163 (23-B, 43-C)	8	279

The Galls Foot Project Area is within the range of *Fritillaria gentneri* and *Lomatium cookii,* federally listed endangered plants. There are no known populations of *Lomatium cookii* in the project area. *Fritillaria gentneri* occurs at six sites that could be impacted by proposed treatments. Three of these sites are within or adjacent to commercial treatment units and will be protected by a no treatment buffer. One of these sites is also a proposed pre-commercial treatment unit. Pre-commercial treatments may be allowed within the buffer area during the plant's dormancy period to improve habitat conditions. The remaining three sites are adjacent to haul roads. Maintenance and renovation treatments will be restricted in these areas. Protection and mitigation measures are in accordance with the Biological Opinion (FWS) 1-14-03-F-511, 20 October 2003. Table 3-10 lists the Special Status Plants found within or adjacent to treatment units.

Table 3-10. Special Status Plants within or adjacent to Galls Foot treatment units.

Scientific Name	Common Name	Status	NatureServe Status	Occur
Anoectangium aestivum		MW	G3G5/S?	1
Chaenotheca ferruginea		BTO/B	G4G5/S3	18
Chaenotheca furfuracea		BTO	G4G5/S3	5
Chlorogalum pomeridianum ssp. *novum*		MW		6
Clarkia heterandra	Small-fruit Clarkia	BAO	G4?/S1?	33
Crumia latifolia		BAO	G3/S3	6
Cypripedium fasciculatum	Clustered lady's-slipper	BSO/C	G4/S3	40
Cypripedium montanum	Mountain lady's-slipper	BTO/C	G4G5/S3S4	43
Enemion stipitatum	Siskiyou false rue-anemone	BTO	G4?/S3	12
Eucladium verticillatum		BAO	G4/S1	2
Eucephalus vialis	Wayside aster	STO/A	G3/S3	1
Fabronia pusilla		BTO	G4/S1	1
Festuca elmeri	Elmer's fescue	BAO	G5/S1	9
Fissidens pauperculus		BTO	G3?/S1	1
Fritillaria gentneri	Gentner's fritillary	FEO	G1/S1	6
Funaria muhlenbergii		BAO	G4/S2	1
Galium californicum ssp.	California bedstraw	MW	G5T4?/SNR	1

californicum				
Gelatinodiscus flavidus		BTO/B	G3/S2	5
Hedwigia detonsa		BTO	G4G4/S2	1
Lithophragma heterophyllum	Many-leaf prairie star	BTO	G4/S3	64
Mimulus douglasii	Douglas' monkeyflower	BTO	G4G5/S3	2
Parmelina quercina		BTO	G4/S1	11
Tripterocladium leucocladulum		BAO	G1/S1	10

FEO = Federally Endangered Oregon
BSO = Bureau Sensitive in Oregon
BAO = Bureau Assessment in Oregon
BTO = Bureau Tracking in Oregon
MW = Medford District Watch
A=S&M Category A, rare, pre-disturbance surveys practical
B=S&M Category B, rare, pre-disturbance surveys not practical
C=S&M Category C, uncommon, pre-disturbance surveys practical
Occur = number of occurrences (populations)
G = Global Rank
S = State Rank
T = Trinomial (subspecies, variety, race) Rank
1 = Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurences.
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.
4 = Not rare and apparently secure but with cause for long-term concern, usually with more than 100 occurrences.
5 = Demonstrably widespread, abundant, and secure.
? = Not yet ranked or assigned rank is uncertain.

There are ten species of rare or uncommon fungi on the Medford SSP list that are also Survey & Manage (S&M) species. These ten fungi are Bureau Sensitive and S&M Category B and F species. As Bureau Sensitive species, the District is responsible to assess and review the effects of the proposed action and is responsible for their conservation if they are affected by management actions. Usual techniques for assessment and conservation are pre-disturbance surveys and protection buffers. As S&M Category B species, it was determined that field level surveys prior to habitat disturbing activities are impractical because these species are difficult to identify and/or their occurrence is sporadic or unpredictable, therefore, pre-disturbance surveys are not required. Standards and guidelines are designed to provide for Category B species persistence by managing all known sites (Northwest Forest Plan range-wide) and reducing the inadvertent loss of undiscovered sites. Reducing the inadvertent loss is accomplished by conducting strategic surveys for the species to be completed by January 2011. Strategic surveys are managed regionally.

The one S&M Category F fungus that is also Bureau Sensitive is an uncommon species or the concern for persistence is unknown and its status is undetermined. S&M management direction is to conduct strategic surveys to collect information to determine species rarity, habitat requirements, range, distribution, and protection needs. Pre-disturbance surveys are not required. Managing known sites is not required and inadvertent loss of undiscovered sites is not likely to change the level of rarity.

Survey and Manage annual species review and strategic survey information after August 26, 2003 is unavailable. The Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (January 2001) recognizes that the annual species review process and strategic surveys are key elements of the decision. With the publication of the FSEIS To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines (January 2004), the US District Court's finding that the 2004 FSEIS failed to comply with NEPA, and the imminent release of the Final Supplement to the 2004 FSEIS, annual species review and strategic surveys were not performed beyond the 2003-2004 Strategic Survey Implementation Guide (August 26, 2003). For these ten fungi species suspected or documented on Medford BLM lands, information on range, habitat and habitat connectivity requirements,

distribution, and rarity is incomplete or unavailable. Information on many of the Survey and Manage species not currently suspected on Medford BLM lands is incomplete or unavailable; new information may affect where a species is suspected to occur.

Oregon State Office Information Bulletin No. OR-2004-145, Attachment 5, directs that field units will not be expected to conduct pre-project evaluations for nine of these Bureau Sensitive/S&M Category B species and that Bureau policy would be met by known site protection and large-scale inventory work (strategic surveys) to continue through fiscal year 2004. See Table 3-11.

Three of these 10 species are known to occur on or within the Medford District boundary (they may occur on other Federal or private land). None are known to occur in any treatment units. Table 3-11 lists the Bureau Sensitive/S&M B/F fungi.

Table 3-11. Medford District Bureau Sensitive/S&M B/F Fungi

Scientific Name	SSP Status	S&M	Med Occur	NatureServe Status	Med Sites	GeoBOB Sites
*Boletus pulcherrimus**	BSO	B	D	G2G3/S2	6	43
*Dermocybe humboldtensis**	BSO	B	S	G1G2/S1	0	4
*Gastroboletus vividus**	BSO	B	S	G2?/S1	1	5
*Phaeocollybia californica**	BSO	B	S	G2?/S2?	3	38
Phaeocollybia olivacea	BSO	F	D	G2/S2	13	115
*Phaeocollybia oregonensis**	BSO	B	S	G2?/S2	0	13
Ramaria spinulosa var. *diminutiva**	BSO	B	S	GUT2/S1?	0	1
*Rhizopogon chamaleontinus**	BSO	B	S	G1G2/S1S2	1	1
*Rhizopogon ellipsosporus**	BSO	B	D	G1G3/S1S3	5	6
*Rhizopogon exiguus**	BSO	B	S	G1G3/S1S2	1	3
					30	229

S&M B = Rare species, pre-disturbance surveys not practical, manage all known sites, strategic surveys required
S&M F = Uncommon species, status undetermined, pre-disturbance surveys not required, strategic surveys required
Med Occur = Medford District occurrence
* = referenced in Oregon State Office Information Bulletin No. OR-2004-145, Attachment 5
D = documented
S = Suspected
GeoBOB = Geographic biotic observations database for BLM in Oregon, Washington, and the part of northern California covering the Arcata, Redding, and Ukiah Field Offices

Medford District Sensitive Plants (FEO, STO, BSO)

Cypripedium fasciculatum (BSO) is a native long-lived perennial that is found in the shade of mature conifer forests including mixed successional forests and edges. It is found in eight states in the western United States albeit in usually low numbers per occurrence. There are 40 known sites in or adjacent to proposed treatment areas. These 40 sites represent 58% of all known *Cypripedium fasciculatum* sites in the Rogue River-Gold Hill watershed (fifth field).

Eucephalus vialis (STO) is a native perennial that is found in dry coniferous forests typically dominated by Douglas-fir. The species preferred habitat is thought to have been historically sustained by frequent fire return intervals that create open forest conditions with widely spaced conifers. *Eucephalus vialis* is known from southern Oregon/Northern California and the Willamette Valley. BLM manages State listed plants for their

conservation. State laws protecting these species apply to all BLM programs and actions to the extent that they are consistent with the Federal Land Policy and Management Act (43 U.S.C. 1701 et seq.) and other Federal laws. There is one known site in or adjacent to proposed treatment areas. This is the only documented site in the Rogue River-Gold Hill watershed (fifth field).

Fritillaria gentneri (FE) is a native bulbiferous perennial that is found in oak woodlands, forest edges, and shrublands. This rare lily is found primarily in Jackson and Josephine Counties where it occurs in perilously small, widely scattered patches. By policy, the BLM conserves listed species and the ecosystems upon which they depend and shall use existing authority in furtherance of the purposes of the ESA. There are six known populations in or adjacent to proposed treatment areas. These populations are within Recovery Unit 1 of the US Fish & Wildlife Service Recovery plan for *Fritillaria gentneri* but are not part of any Fritillaria management area as described in the plan. These six sites represent 25% of all known *Fritillaria gentneri* sites in the Rogue River-Gold Hill watershed (fifth field).

<u>Medford District Assessment, Tracking, and Watch Plants (BAO, BTO, MW)</u>
Anoectangium aestivum (MW) is a moss found on most continents. While this moss is known from North America, the 2005 discovery is the first for Oregon. The Galls Foot population is growing on tufa in a rocky meadow in a seep area of small a draw.

Chaenotheca ferruginea (BTO/B) is a black stubble or pin lichen. Its typical substrate is the sheltered bark or wood of large old trees. In the project area, it is found in late seral Douglas-fir forests on the trunks and bases of Incense cedar and Douglas-fir. *Chaenotheca ferruginea* is globally widespread in cool to temperate areas. Due to its strong association with large old trees, threats to this species are ranked moderate to imminent and its vulnerability is high. The 18 Galls Foot sites represent 62% of all known sites in the Rogue River-Gold Hill watershed.

Chaenotheca furfuracea (BTO) is a yellow stubble or pin lichen. Its typical substrate is protected recesses, on soil and rootlets, of upturned stumps and boles in shaded forests. In the project area, it is found in late seral Douglas-fir forests on the bases of Douglas-fir. Its vulnerability status is similar to *Chaenotheca ferruginea* above. The five Galls Foot sites represent 50% of all known sites in the Rogue River-Gold Hill watershed.

Chlorogalum pomeridianum ssp. novum (MW) is a locally discovered subspecies or variety and is, as yet, undescribed. It is a locally common endemic found in chaparral, oak woodlands and forest edges. It is known from the Butte Falls and Ashland Resource Areas. The six Galls Foot sites represent 86% of all known sites in the Rogue River-Gold Hill watershed.

Clarkia heterandra (BAO) is a native pink-flowered annual of the evening primrose family. This species is found in dry shady woodlands and forests. It is known from California and Jackson and Josephine Counties of southwest Oregon. Its NatureServe Oregon ranking of critically imperiled is uncertain. Locally, *Clarkia heterandra* is found in open Douglas-fir forests in large populations. Galls Foot populations can be many thousands of individuals. The 33 Galls Foot sites represent 45% of all known sites in the Rogue River-Gold Hill watershed and 22% of all sites in the GeoBOB database area (BLM in Oregon, Washington, and part of northern California).

Crumia latifolia (BAO) is a moss native to western North America and Russia. Its substrate is wet rocks or soil, often on calcareous rock. In the project area, it is usually in draws in conifer and white oak woodland communities. There are six known sites in or adjacent to proposed treatment areas. Globally, this moss is threatened by limestone quarrying.

Cypripedium montanum (BTO/C) is a native orchid that is found in a wide variety of habitats, from full sun on eastern mountain slopes to full shade in moist wooded valleys. Its range is western North America and Alaska. There are 43 known sites in or adjacent to proposed treatment areas; most sites consist of just a few individuals.

These 43 sites represent 51% of all known *Cypripedium montanum* sites in the Rogue River-Gold Hill watershed (fifth field).

Enemion stipitatum (BTO) is a native perennial found in oak woodlands, shrublands, and mixed evergreen forests in California and Oregon. The Galls Foot sites are in white oak woodlands and Douglas-fir forest edges with some populations in the thousands. The 12 Galls Foot sites represent 71% of all known sites in the Rogue River-Gold Hill watershed.

Eucladium verticillatum (BAO) is a moss native to North America. Its substrate is wet rocks. In Oregon it is considered critically imperiled. The two Galls Foot sites are in draws on the edge of Douglas-fir forest and white oak woodlands. These two sites represent 67% of all known sites in the Rogue River-Gold Hill watershed.

Fabronia pusilla (BTO) is a moss known from western North America, Europe, and North Africa. In Oregon it is considered critically imperiled. Its substrate is rock and bark in many types of plant communities. The single Galls Foot site represents 4% of all known sites in the Rogue River-Gold Hill watershed.

Festuca elmeri (BAO) is a native perennial grass found in California and Oregon. It is found in partially shaded conifer forests and oak woodlands. The Galls Foot populations range from tens of individuals to many thousands. In Oregon it is considered critically imperiled. The 9 Galls Foot sites represent 69% of all known sites in the Rogue River-Gold Hill watershed.

Fissidens pauperculus (BTO) is a moss known from western North America. It is considered critically imperiled in Oregon. Its substrate is moist soil. The single Galls Foot site is in a riparian area in a late seral Douglas-fir forest. The single Galls Foot site represents 50% of all known sites in the Rogue River-Gold Hill watershed.

Funaria muhlenbergii (BAO) is a moss known from western North America. It is considered imperiled in Oregon. Its substrate is soil. The single Galls Foot site is in a draw in open oak woodland. This population consists of just a few individuals. This single Galls Foot site represents 11% of all known sites in the Rogue River-Gold Hill watershed.

Galium californicum ssp. *californicum* (MW) is a native perennial bedstraw that is known in California and southern Oregon (Jackson and Curry Counties). It is a recent find in our area but may be more common. Its state rarity is not yet ranked for Oregon or California.

Gelatinodiscus flavidus (BTO/B) is a bright yellow cup fungus known from Oregon, Washington, and British Columbia. It fruits on cones, twigs, and down foliage. Previously thought to be restricted to Alaska yellow-cedar as its host, it occurs on Incense cedar litter. The 5 Galls Foot sites represent 56% of all known sites in the Rogue River-Gold Hill watershed.

Hedwigia detonsa (BTO) is a moss known from southwest Oregon and California. It is found on rock in river canyons and open forests. The single Galls Foot site is on a rock outcrop in open white oak woodland adjacent to a private quarry. This one Galls Foot site represents 3% of all known sites in the Rogue River-Gold Hill watershed.

Lithophragma heterophyllum (BTO) is a native perennial found in California and Oregon. It is found in shaded conifer forests. Sites can cover many acres and have thousands of individuals. The 64 Galls Foot sites represent 70% of all known sites in the Rogue River-Gold Hill watershed and 32% of all sites in the GeoBOB database area.

Mimulus douglasii (BTO) is a native annual monkey flower. It is usually found in bare open areas in Oregon and California. Both Galls Foot sites are in small meadows surrounded by forest and woodland. The 2 Galls Foot sites represent 8% of all known sites in the Rogue River-Gold Hill watershed.

Parmelina quercina (BTO) is a lichen known from southwest Oregon and California in North America. It is also known from New England, Quebec, Europe, Asia, and Africa. Its substrate is bark, especially bark of black oak in California. The Galls Foot sites are in black oak woodlands and dry Douglas-fir forest; substrate is the bole and branches of black oak. The 11 Galls Foot sites represent 33% of all known sites in the Rogue River-Gold Hill watershed and 25% of all sites in the GeoBOB database area.

Tripterocladium leucocladulum (BAO) is a moss known from western North America. Its substrate is soil, rock, or trees in shaded conifer forests. There are 10 known sites in or adjacent to proposed treatment areas. The 10 Galls Foot sites represent 50% of all known sites in the Rogue River-Gold Hill watershed.

Noxious Weeds and Introduced Plants

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 weeds are uncommon in the project area. These weed sites are mostly associated with roads. All species of noxious weeds in the project area are on the Oregon Department of Agriculture List B. "B" designated weeds are weeds of economic importance which are regionally abundant but may have limited distribution in some counties. Table 3-12 lists the noxious weeds and introduced plants within the project area.

<u>Oregon Department of Agriculture List B Noxious Weeds</u>

Yellow star-thistle (*Centaurea solstitialis*) is an annual or biennial with a deep taproot. The yellow flower heads are spined producing 35-80+ seeds. Large plants can produce over 100,000 seeds. Seed dispersal is mainly via gravity with longer distances by birds, animals, humans, vehicles, and commercial crops. Seeds can remain viable in the soil seedbank for six to 10 years. Nonnative honeybees are the main pollinator of yellow star-thistle, accounting for 50% of seed set. There are 6229 sites reported for the Medford District and four for the project area vicinity. Casual observation and recent records have verified several sites within the project area and/or along haul routes. This weed is a native of Eurasia and lowers forage value, increases farming and ranching costs, depletes soil moisture, displaces native plants, decreases plant diversity, is toxic to horses, and is an important source of honey. Successful control methods include chemical, biological, cultural, and mechanical (including pulling and mowing).

Bull thistle (*Cirsium vulgare*) is a taprooted biennial with spiny stems, leaves, and inflorescences. Each flower head can produce up to 250 seeds. Most seed falls within six feet of the parent plant and only 100 feet. Seed survival is very low, as is seedling and rosette survival. It is estimated to take 200 seeds to produce one flowering plant. Bull thistle seedlings are poor competitors and require bare mineral soil to survive. There are 1531 documented sites (incomplete records, data no longer tracked) reported for the Medford District and no sites documented for the project area vicinity. Casual observation and recent records have verified several sites within the project area and/or along haul routes. This weed is a native of Eurasia. Detrimental effects include displacement of native species, decrease of plant diversity, and reduced forage. Active control methods are not usually employed. Bull thistle is eventually outcompeted by other vegetation for light, moisture, and nutrients.

Scotch broom (*Cytisus scoparius*) is a perennial shrub native to Europe and Africa. It was introduced into the United States as an ornamental, and later used to stabilize roadcuts. Scotch broom invades roadsides, pastures, and other disturbed places. It produces a large amount of long-lasting seed (up to 80 years). It can form dense fields that displace native plants and degrade habitat for wildlife. Casual observation and recent records have verified a few sites within the project area and/or along haul routes. Successful control methods include

manually pulling the entire plant, chemical, controlled burning, and a combination of cutting and herbicide treatment.

Common St. Johnswort (*Hypericum perforatum*) is a perennial introduced from Eurasia as an ornamental plant. It can form dense stands in meadows, pastures, rangelands, disturbed sites, and along roads. It is toxic to livestock but also has medicinal value. Casual observation and recent records have verified several sites within the project area and/or along haul routes. Detrimental effects include displacement of native species, decrease of plant diversity, and reduced forage. Successful control methods include biological and chemical.

Himalayan blackberry (*Rubus discolor*) is a perennial introduced from western Europe that forms large impenetrable thickets of prickly canes. It colonizes disturbed sites including waste areas, pastures, forest plantations, roadsides, and waterways. Casual observation and recent records have verified several sites within the project area and/or along haul routes. Detrimental effects include displacement of native species, decrease of plant diversity, reduced forage, inaccessibility by humans and animals. Successful control methods include mechanical, prescribed burning, and chemical.

Medusahead (*Taeniatherum caput-medusa*) is an annual grass introduced from Eurasia. It inhabits disturbed sites, grassland, openings in chaparral, oak woodlands, and rangelands, especially on sites with clay soils where deep soil moisture is available late in the growing season. Casual observation and recent records have verified several sites within the project area and/or along haul routes. This weed is a native of Eurasia. Detrimental effects include displacement of native species, decrease of plant diversity, and reduced forage. Successful control methods include chemical, mechanical, prescribed burning, and re-vegetation.

Table 3-12 Noxious weeds and Introduced plants within the Galls Foot Project Area.

Scientific Name	Common Name	ODA List*
Aira caryophylla	silver hairgrass	
Anthriscus caucalis	burr chervil	
Avena fatua	wild oat	
Brassica nigra	black mustard	
Briza minor	little quakinggrass	
Bromus brieziformis	rattlesnake brome	
Bromus hordaceous	soft brome	
Bromus japonicus	Japanese brome	
Bromus matritensis	compact brome	
Bromus rigidus	ripgut brome	
Bromus tectorum	cheatgrass	
Centaurea solstitialis	yellow star-thistle	B
Cerastium glomeratum	sticky chickweed	
Cirsium vulgare	bull thistle	B
Crepis capillaries	smooth hawksbeard	
Cynosurus echinatus	bristly dogstail grass	
Cytisus scoparius	Scotch broom	B
Dactylis glomerata	orchardgrass	
Erodium cicutarium	redstem stork's bill	
Geranium dissectum	cutleaf geranium	
Hypericum perforatum	common St. Johnswort	B

Hypochaerus radicata	hairy catsear	
Lactuca serriola	prickly lettuce	
Lolium perenne	perennial ryegrass	
Lotus corniculatus	birdfoot deervetch	
Phleum pratense	timothy	
Plantago lanceolata	narrowleaf plantain	
Poa bulbosa	bulbous bluegrass	
Poa pratensis	Kentucky bluegrass	
Rosa eglanteria	sweetbriar rose	
Rubus discolor	Himalayan blackberry	B
Rubus laniniatus	cutleaf blackberry	
Rumex crispus	curly dock	
Taeniatherum caput-medusa	medusahead	B
Taraxacum offincinale	common dandelion	
Torilis arvensis	spreading hedgeparsley	
Tragopogon dubius	yellow salsify	
Trifolium dubium	suckling clover	
Trifolium pratense	red clover	
Trifolium repens	white clover	
Valerianella locusta	Lewiston cornsalad	
Verbascum thapsis	common mullein	
Vicia sativa	garden vetch	
Vulpia myuros	rat-tail fescue	

ENVIRONMENTAL CONSEQUENCES

Alternative 1 – No Action

Under the No Action Alternative there would be no direct effects to any special status plant or fungi species within the boundaries of the project area. Habitat associated with Special Status Species, including canopy cover and humidity, would remain unchanged for the short term. Noxious weed and invasive plant species present in the project area would continue to persist and expand. Under the No Action Alternative treating existing weed populations would be of lower priority in the project area.

Long term and indirect effects on habitat for Special Status Plant Species would result from the No Action alternative. In the project area changes in plant species composition, including encroachment of woody vegetation and accumulation of understory brush, are a result of long term, uninterrupted successional trends. Over the long-term increased canopy coverage and competition from understory species could modify both occupied and unoccupied forest, woodland, shrubland, and meadow habitat for Bureau Special Status Species and result in the decline or loss of individual plant populations.

In the project area both forest and non-forest stands are at high risk for high severity fires due to dense stand conditions coupled with drought conditions. High severity fires that burn through the upper organic layers of the soil can destroy the stems and propagules of plant species. The resulting habitat may favor early seral species that can tolerate open, dry, non-forest conditions. This includes weeds species that are adapted to open canopies.

Alternative 2 – Proposed Action

Special Status Vascular and Nonvascular Plants

Special Status Plants not protected by "no treatment" buffers or seasonal restrictions may be directly impacted by proposed treatments (see Table 3-13). Plants may be harmed or killed by direct physical damage from machinery, log skidding, foot traffic, burning, and slash piling. Seasonal restrictions on operations generally cover the period of Special Status species above-ground growth. Operations occurring outside this period could take place while these plants are below ground and dormant and would not be subject to direct physical damage. Potential death and damage to individuals would initially decrease local population (subpopulation) numbers. With time, local population numbers are expected to increase due to the beneficial indirect effects of improved condition of occupied and potential habitat. Loss of some individuals will not contribute to the need to list the species as threatened or endangered.

All protection/mitigation buffer areas that allow some treatment are designed to produce beneficial habitat changes. Generally, proposed treatments would produce stand conditions that are less dense and decadent with stand structure resembling a more natural pre-Euro-American settlement condition. Buffer area sizes vary depending on habitat characteristics.

While creating "no treatment" buffers and avoiding any management activities within those buffers would provide the maximum protection for any individual site from disturbance, the overall habitat conditions would deteriorate over time due to forest densities increasing. Habitat modification through Special Status Plant sites is designed to have a beneficial effect. There would be no direct effects on Bureau Special Status plant species by implementing the Proposed Action alternative. Mitigating measures including buffers, seasonal restrictions, and weed management are designed to maintain or improve existing habitat conditions. Utilizing the Project Design Features (PDF Chapter 2) and protection measures should assure persistence of all Special Status plant species in the watershed.

Table 3-13. Special Status Plant Protection/Mitigation by Proposed Treatment

	Buffer No Treatment	Seasonal Restriction	Other Restriction	No Protection Necessary	Other
Anoectangium aestivum					**PCT**
Chaenotheca ferruginea			**RX PCT RD**		
Chaenotheca furfuracea			**RX NC PCT RD**		
Chlorogalum pomeridianum ssp. *novum*	**RX PCT**				
Clarkia heterandra				**RX PCT RD**	
Crumia latifolia			**PCT**	**RD**	
Cypripedium fasciculatum	**RX NC**	**PCT**	**RD**		
Cypripedium montanum	**RX NC PCT**		**RD**		
Enemion stipitatum				**RX PCT**	
Eucladium verticillatum			**PCT**		
Eucephalus vialis		**RX PCT**			
Fabronia pusilla				**RD**	

Festuca elmeri				**RX NC PCT**	
Fissidens pauperculus			**RD**		
Fritillaria gentneri		**RX PCT RD**	**RD**		
Funaria muhlenbergii				**RX PCT**	
Galium californicum ssp. *californicum*		**RX**			
Gelatinodiscus flavidus			**RX PCT**	**RD**	
Hedwigia detonsa				**RD**	
Lithophragma heterophyllum				**RC PCT NC RD**	
Mimulus douglasii				**RX PCT**	
Parmelina quercina				**RX PCT RD**	
Tripterocladium leucocladulum				**RX PCT NC**	

RX = Proposed treatment, commercial harvest
PCT = Proposed treatment, pre-commercial thinning
NC = Proposed treatment, new road construction
RD = Proposed treatment, existing road

Federal timber sales and non-commercial vegetation projects in the watershed considered under cumulative effects have mostly been for forest health and fuels hazard reduction. These treatments attempt to remedy the effects of long-term fire suppression and, as such, are generally beneficial to native plant communities (including rare plants and fungi). If left untreated the chances for a stand replacing, catastrophic fire are increased.

Past or proposed timber harvest and other vegetation treatments on private land are incompletely known. It is assumed that most timber harvest projects and other vegetation treatments on private land will have adverse affects on native plant communities (including rare plants and fungi) due to timber removal prescriptions, logging methods, and less resource protection measures. Federal laws protecting endangered and special status plants do not apply to private land without a federal nexus. Noxious weed control treatments are expected to be very limited, i.e. restricted to residential areas and federal projects conducted on private lands.

Noxious Weeds and Introduced Plants

Project design features are incorporated to minimize spread of noxious weeds and invasive alien plant species. However, not all weed seed transported by humans can be excluded. Additionally, long distance weed seed transport can be accomplished by wind, water, and animals. With suitable weed habitat increasing (short-term) via proposed treatment accomplishments and natural seed transport mechanisms available, total exclusion of new weed establishments is unattainable. Treatments with more likelihood for establishment of noxious weeds are new road construction (4.44 miles), fuels treatment areas, and existing roads. With adequate funding for vegetation inventory and weed treatment, existing noxious weed population sizes are expected to decrease and new establishments are expected to remain small (< 2 acres).

Survey & Manage/Bureau Sensitive Fungi

The 10 species of fungi that are Survey & Manage list species (where pre-disturbance surveys were impractical because these species were difficult to identify and/or their occurrence was sporadic or unpredictable) and Bureau Sensitive species were not surveyed for. All 10 species are associated with a forest component found in the project area, i.e. habitat exists in the project area to support these species, see Table 3-14. All fungi on this

list are mycorrhizal and depend on wind and/or animals to spread the spores. Known sites nearest the project area range from 1.2 to 57.6 air miles. Four species occur on the Medford District and four species occur within the Medford District boundary but on other lands (US Forest Service, State of Oregon, and private).

Table 3-14 Galls Foot Forest Community Component x S&M/Sensitive Fungi

	PSME	PIPO	ABCO	Oaks	Pina	Near
Rhizopogon ellipsosporus	●					1.2
Phaeocollybia olivacea	●		●	●	●	9.7
Phaeocollybia californica	●					14.9
Rhizopogon exiguus	●					16.5
Gastroboletus vividus			●		●	22.5
Boletus pulcherrimus	●	●	●			24.2
Rhizopogon chamaleontinus	●					25.9
Ramaria spinulosa var. diminutiva	●				●	45.4
Dermocybe humboldtensis	●	●				48.4
Phaeocollybia oregonensis			●			57.6

Bolded species = occurs on or within Medford District
PSME = Douglas-fir, forest community component
PIPO = Ponderosa pine, forest community component
ABCO = White fir, forest community component
QUKE = California black oak, forest community component
Pina = Pinaceae family (includes pine, fir, Douglas-fir, spruce, hemlock), forest community component
Near = nearest known site, air miles to the project area

Because these species were considered impractical to survey for, much of the surveys and species information came from the Regional Ecosystem Office and the Regional Mycologist's staff. Survey areas and methods were not designed to meet the objectives of site specific, pre-disturbance surveys. Survey methods used in selected areas were line transects, plotless transects, and randomized plots. Of the four species found on the Medford District, three were discovered by BLM or contract botanists performing pre-disturbance surveys.

The 2004 FSEIS to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines (set aside by U.S. District Court, 1-9-06) addresses incomplete or unavailable information. For these 10 fungi, species specific information on connectivity and habitat requirements, range (including occurrences within the project area), and disturbance effects is lacking.

The 10 species of fungi are all mycorrhizal, forming associations with their hosts, mostly conifers. 8.6% of the commercial forest land in the watershed will be treated in the Galls Foot Forest Management Project. Forest tree harvest would have varying degrees of adverse impacts depending on the level of tree removal and ground disturbance. Commercial harvest effects to fungi include changes in microsite conditions (including temperature, humidity, light intensity, and wind), edge effects, localized loss of the mycelial network and connections, loss of host trees necessary to sustain the fungi, fungal species composition change, fungal species diversity decrease, fungal biomass decrease, decreased soil moisture, decrease in organic soil layer, soil compaction/bulk density increase, and a decrease in the amount of coarse woody debris that may serve as a source of moisture in the dry months.

Pre-disturbance surveys for special status fungi species are not required for proposed treatments within the project area. According to BLM Information Bulletin No. OR-2004-145, pre-disturbance surveys in proposed project areas for these fungi are not practical to conduct and are not expected; protection of known sites along with large-scale inventory work will provide the measures and means to meet agency policy.

Pre-disturbance surveys for Bureau Sensitive Species fungi and S&M Category B and F species fungi species are not required for proposed treatment areas within the Galls Foot project area. According to BLM Information Bulletin No. OR-2004-145, pre-disturbance surveys in proposed project areas for the Bureau Sensitive Species fungi are not practical to conduct and are not expected; protection of known sites along with large-scale inventory work will provide the measures and means to meet agency policy.

K. RECREATION, OHV, VISUAL RESOURCES, CULTURAL RESOURCES, NOISE AND TRAFFIC

Issues/Concerns

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

- There is opposition to new road construction because construction of new roads may increase OHV activity, which may impact the environment and local residents.

- Timber harvest changes the look and character of the hillsides and the views that local residents and tourists have of the forest.

- There are concerns that the current level of OHV use and the ongoing BLM planning effort (John's Peak/Timber Mountain) to manage OHV use within the planning area are not being considered or coordinated.
- Noise from helicopter logging or other activities associated with the project could be irritating to local residents.

- Traffic could increase as a result of the proposed action impacting local residents.

- People living in neighborhoods near or adjacent to the Galls Foot project area have expressed their concerns for the overlap of the Galls Foot Planning area with the Timber Mountain/Johns Peak Off-Highway Vehicle (OHV) area. More specifically, people are concerned that:
    - Forest thinning and fuels reduction will open up vegetation making it easier for people on OHVs to ride in areas previously inaccessible due to thick vegetation;
    - Road construction would provide additional access for OHVs;
    - Increasing OHV access points (as described above) combined with limited police presence to help regulate OHV use will increase social and environmental effects of OHVs in the project area.

Recreation and OHV

Affected Environment

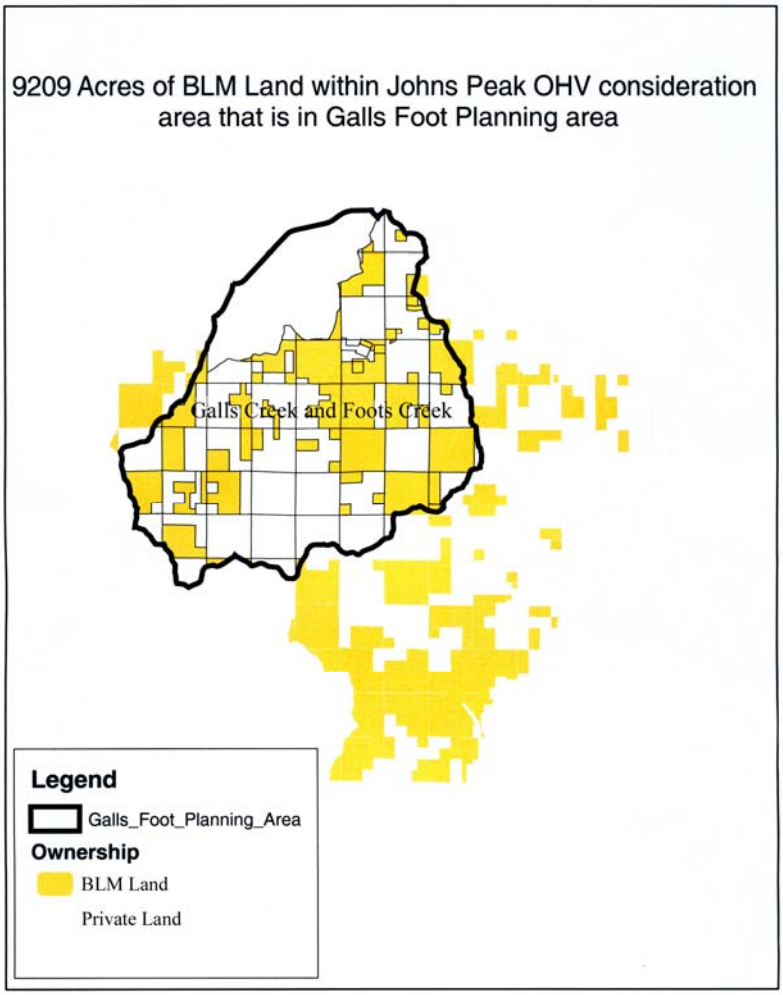
Recreation use across the Medford District BLM is described in the Medford District Proposed Resource Management Plan/Environmental Impact Statement. BLM lands fall into two recreation management categories, special recreation management areas and extensive recreation management areas. Special Recreation Management Areas are those areas identified with high concentrations of recreation use and developed facilities; examples of areas designated on the Medford District as Special Recreation Management Areas include Hyatt Lake-Howard Prairie Lake, Pacific Crest National Scenic Trail, Rogue National Wild and Scenic River. Extensive recreation use areas are all BLM-administered lands not included in Special Recreation Management Areas identified in the RMP (PRMP/EIS, p. 3-71). An estimated 799,243 acres provide for dispersed recreation use across the Medford District (PRMP/EIS p. 3-84). The Galls Foot project does not fall within any Special Recreation Management Areas (RMP Map 9). The BLM lands within the planning area provide an estimated 11,113 acres (1.4 percent) of the Medford District's Extensive Recreation Use Areas. As the Galls Foot

planning area is located in Matrix and Riparian Reserve land allocations (see Chapter 1) and not located within a Special Recreation Management Area, the primary objective for matrix lands is sustainable timber production.

The dispersed recreation occurring within the Galls Foot planning area includes hiking, horseback riding, mountain biking, driving for pleasure, hunting, target practice, dispersed camping, and off-highway vehicle (OHV) use. Horseback riding and hiking use is primarily from people who reside in or adjacent to the project area, where use of public land for outdoor recreation is a matter of convenience due to the proximity of public land to their residence. Most dispersed camping occurs in association with hunting (primarily deer hunting season).

OHV use is occurring in the Galls Foot planning area, which is overlain by the Timber Mountain Johns Peak OHV area. The Timber Mountain/Johns Peak area is a popular recreation area for off-highway vehicles (OHV's) and has been used by OHV enthusiasts for about 40 years. In 1995 the Medford District RMP designated 16,250 acres in the Timber Mountain/Johns Peak area to be managed to provide for OHV use, with use "limited" to existing roads and designated trails. Since the 1995 RMP did not identify an OHV area boundary, the Timber Mountain/Johns Peak EIS planning process has identified a consideration area for managed OHV use. An estimated 9,209 acres of BLM administered lands in the Galls Foot planning area falls within the Timber Mountain/Johns Peak OHV consideration area. See map 3-2 below.

Map 3-2 – Johns Peak Consideration Area and the Galls Foot Planning Area



Off-highway vehicle use has increased on BLM lands throughout southwest Oregon in recent years. Factors contributing to the increased popularity of OHV use include; greater public interest in unconfined, outdoor recreational opportunities; rapid population growth across western cities; and rising disposable income for use on recreational pursuits.[5] All terrain vehicle (ATV) permits are required to ride a motorcycle, 3-wheeler, or 4-wheeler (quad) on federal lands. Four-wheel drive vehicles are also required to obtain ATV permits if using the vehicle off-road.

The BLM currently provides three BLM Law Enforcement Rangers and four contract Deputy Sheriff's from Jackson and Josephine County Sheriff's Departments. These Rangers/Deputies are responsible for patrolling an estimated 859,100 acres of BLM administered lands throughout Jackson and Josephine Counties. BLM Rangers are charged primarily with enforcement of Federal Laws/Rules/Regulations that pertain to the use, management, and development of public lands and their resources. Rangers can cite OHV riders for various violations to include: littering, resource damage, exceeding allowable noise levels, careless and reckless driving, and failure to possess OHV registration. Rangers are also deputized by the respective counties and can therefore enforce all State and County Laws as they apply to OHVs. The sheriff's deputies enforce all state and county laws and can cite for the following: riding without a helmet for those under 18 years of age, riding with a suspended driver's license, riding on a highway with an OHV that is not street legal and for expired vehicle tags. Because the Timber Mountain Johns Peak OHV area does not have an identified trail system, there is no means for enforcing where OHV riders can and cannot ride in the Timber Mountain/Johns Peak OHV area. The exception is when OHV riders leave trails and create new trails which cause resource damage. When a course of action is selected for managing the Timber Mountain/Johns Peak OHV area, it is anticipated that law enforcement capabilities would be improved allowing Rangers and Deputies to better regulate confine use to designated routes and trails.

Effects of Alternative 1 (No-Action)

People who enjoy the use of the Galls Foot planning area for their outdoor recreation experiences would continue to use the area undisturbed from any timber sale operations on public lands. The current trend of increased OHV use would likely continue over the next 5 to 10 years. Assuming the No-Action Alternative of the Timber Mountain/Johns Peak OHV Management Plan and EIS, specific trail systems would not be designated. Non-commercial hazardous fuels reduction treatments planned over the next few years in association with Galls Creek Fuels Reduction Project would create more open vegetation conditions that could lead to an increase of OHV use in areas previously not used. However, it would be difficult to predict exactly where use may or may not increase as many variables influence where use might occur such as topography, accessibility from public roads, and unregulated or regulated access across private lands (open roads and drives versus fences, locked gates, landowners who use OHVs themselves, etc.). No commercial forest thinning would occur on BLM-administered lands, thick forest stands that help deter OHV use in some areas would remain intact. There would be no increase in areas accessible to OHV use on BLM from new road construction.

Without the benefit of an OHV plan designating a specified trail system, all existing trails would continue to be open for OHV use. Law enforcement would be hindered in enforcing violations of new trail construction, resource damage, and other violations without a clear route designation. When a course of action is selected for managing the Timber Mountain/Johns Peak OHV area, it is anticipated that law enforcement capabilities would be improved allowing Rangers and Deputies to better regulate confine use to designated routes and trails.

Effects of Alternative 2 (Proposed Action)

Timber management operations occurring intermittently in the Galls Foot project area over a three year period could disrupt recreation in several ways: 1) timber sale units and landing areas could be closed for public safety concerns or generally just avoided by the public while operations are taking place; 2) known OHV trails within

[5] US Department of the Interior, Bureau of Land Management. 2001. National Management Strategy for Motorized Off-Highway Vehicle Use on Public Lands. Washington, D.C.

or in close proximity to timber sale units could be temporarily closed during timber operations 3) noise disturbance from helicopters, logging trucks, and other timber harvesting equipment could occur, 4) increased road congestion from logging trucks and timber operators could occur. It is difficult to predict or quantify the degree of effect to each person as people may be affected differently depending on the values each person places on the various uses of public lands. Those people who are more tolerant or even appreciate the need for forest management activities adjust more readily to the short term inconveniences. Those who are generally opposed to forest management on public lands are more reactive to management occurring in their neighborhood or areas they use for recreation.

Regardless of the degree each person may be affected, the loss of use of up to 1.3 percent of the Extensive Recreation Use Areas available across the Medford District, intermittently, for up to 3 years would not be significant to the recreating public for the following reasons: 1) standard safety precautions such as signing and closures would be used to avoid conflicts between the recreating public and timber sale operations; 2) the Galls Foot project area does not provide a unique or special recreation experience that can not be had elswhere, there are hundreds of thousands of acres of public lands providing dispersed recreation opportunities within 30 minutes to 2 hours driving time of the project area; 3) recreation use for extensive recreation management areas is considered relatively light across the Medford District; 4) timber sale operations would not take place on the entire area at one time, disruptions would only last the life of the contract (about 3 years), would occur intermittently as seasonal operating restrictions would limit operations during certain times of the year; and 4) 391,400 acres of BLM-administered lands across the Medford District are open to OHV use and another 425,450 acres is managed for limited OHV use providing alternative riding opportunities during project operations.

More open vegetation conditions would increase the ability of OHV riders to access areas previously inaccessible. Without an OHV management plan in place to facilitate better enforcement of OHV use in the area, use will increase in some areas. However, it would be difficult to predict exactly where use may or may not increase as many variables influence where use might occur such as topography, accessibility from public roads, and unregulated or regulated access across private lands (open roads and driveways versus fences, locked gates, etc.). Without the benefit of an OHV management plan for the Timber Mountain Johns Peak OHV area, designating a specified trail system, all existing trails would continue to be open for OHV use. Law enforcement would be hindered in enforcing violations of new trail construction, resource damage, and other violations without a clear route designation that would be provided by an OHV management plan. However, when a course of action is selected for managing the Timber Mountain/Johns Peak OHV area, it is anticipated that law enforcement capabilities would be improved allowing Rangers and Deputies to better regulate confine use to designated routes and trails.

Visual Resource Management

"Visual Resources are the land, water, vegetation, structures, and cultural modifications that make up the scenery of BLM-administered land." Medford District BLM-administered lands have been classified under a Visual Resource Management (VRM) Inventory Class system established by the BLM. The criteria used to determine VRM classes were scenery quality ratings, public sensitivity ratings and distance zone-seen area mapping criteria. Approximately 60 percent of the viewsheds in the Medford District RMP planning area have fragmented land ownership patterns with private lands dominating the viewed landscape (RMP/EIS p. 3-70). The majority of the Galls Foot planning area is classified as either VRM Class III or IV (RMP Map 10). A small portion of section 19 and 30 (T36S, R3W) is within the 1 mile corridor of Interstate 5 that is classified as VRM Class II.

Class II Objective: The objective to this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Findings: Units 1, 2, and 3 fall within this zone. The characteristic landscape within this zone is typical of an area that has had much vegetative manipulation, and retains the look of a fragmented forest view. The proposed treatments and harvest methods will result in a less fragmented view, more in concert with the appearance of adjacent stands. Critical viewpoints are from the I-5 corridor. Views are brief from this aspect and the units will be undetectable to the untrained eye. The silvicultural prescriptions scheduled for these units meet VRM Class II objectives.

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.

Findings: Most of the units within T37S R4W in the project area are in VRM Class III land. The characteristic landscape within this zone is typical of a highly managed and altered forest scene. Past activities such as extensive mining, complete conifer harvest on adjacent private lands and extensive hardwood stands scattered throughout, create a highly modified forest scene. The proposed treatments and harvest methods will not increase visual contrasts. Critical viewpoins are scattered throughout the area on the various roads and are not subject to scenic viewing by the public due to their remote locations and difficulty of access. The silvicultural prescriptions scheduled for these units meet VRM Class III objectives.

Class IV Objectives: The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Findings: The remainder of the units within the project area are in VRM Class IV lands. The characteristic landscape within this zone is of the same nature as the Class III lands. The proposed treatments and harvest methods will not increase visual contrasts. Critical viewpoints are scattered throughout the area on the various roads and are not subject to scenic viewing by the public due to their remote locations and difficulty of access. The silvicultural prescriptions scheduled for these units meet VRM Class IV objectives.

The Galls Foot Forest Management Project was evaluated through the VRM Contrast Rating Worksheet utilized in the field. This tool is used to evaluate the existing visual scene, and assess the probable change to the characteristic landscape from proposed actions. This analysis concluded that the proposed action meets visual resource management objectives for the three different VRM classes inventoried within the project area.

Cultural Resources

The proposed sale area was surveyed to SHPO protocol standards. There is an extensive history of mining in the area but most of that activity was on lands which are private or are now patented mining claims. All cultural sites that were discovered on BLM lands were flagged, recorded, and will be avoided. The locations of any historic and prehistoric sites discovered, along with any artifacts found, are sensitive and are not revealed to the public. As all known cultural sites will be avoided; there are no negative impacts to cultural resources anticipated from this project.

Noise and traffic

Issues/Concerns

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

- Noise from helicopter logging or other activities associated with the project could be irritating to local residents.

- Traffic could increase as a result of the proposed action impacting local residents.

The Jackson County zoning within the planning area is 88% forest and woodland resource. It is expected that forest management activities will be occurring on the lands zoned forest and woodland resource.

During the implementation of the Galls Foot project, traffic on the roads within the planning area is expected to increase. There would be a small increase of vehicle traffic from workers traveling to and from the work site. Traffic will increase as a result of log truck traffic hauling on Galls Creek and Foots Creek roads. During the most intensive and productive periods of commercial timber sale operations, up to 25 log truck trips could be expected in a day. These truck trips would be spread over several road routes within the planning area but ultimately would all use Rogue River Highway and Interstate 5. Commercial Timber sale operations are typically performed using three year contract periods. Timber haul does not usually occur during the entire year and is highly variable with periods of little to no activity and other periods of more intensive activity. Highway vehicle traffic is regulated by state and county laws and regulations. The BLM does not have jurisdiction over traffic traveling on state and county roads.

During portions of the commercial conifer thinning, helicopters will fly through the area's airspace and increase the amount of noise typically heard in the area of the project. Helicopters can work based on Visual Flight Rule (VFR) conditions. The safety is up to the pilots and if clouds, fog or wind are not threatening the safety of the operation and they can see from the landing to the woods they will fly. A loaded helicopter, carrying material that could be released, may not fly over any structure at any altitude. An unloaded helicopter may fly over a structure or people if they maintain the proper altitude. In many locales that is 1000 feet but in rural settings it can be 500 feet. When loaded, the aircraft must maintain a minimum horizontal distance of 500 feet from any structures or people. The aircraft may pass over private property under load if they maintain this distance. Individual property owners do not control airspace over private property. The pilots must maintain Federal Aviation Administration (FAA) requirements. BLM has no jurisdiction or control over flight regulations.

There can be short term disturbance through noise as a result of helicopter logging. The use of helicopters is based on the need to limit road development in the project area and the Northwest Forest Plan direction to emphasize the use and testing of aerial systems and low impact logging practices in the Applegate Adaptive Management Area. The short term noise disturbance is a trade off against the development of new roads that would be needed to implement project goals. Helicopter logging typically reduces the number of miles of road construction required to reach a given piece of ground.

Employment

The Galls Foot project is expected to provide several small contracts along with one or more large timber sale contracts. The small contracts would provide opportunities for small local companies to bid on and perform work. In addition to small contracts, stewardship and fuel hazard reduction projects will allow opportunities for local forestry contractors to bid on contract work in the project area. It is expected that the total package of proposed work on this project will take 4-8 years to complete. The forest products harvested from the project would help in part to provide some of wood products used by the local community.

Effects of Climate

Shifts in global climates will create more frequent fire, more extensive events, and greater area burned, resulting in decline of fire dependent species and an increase in annual and weedy species (McKenzie and others 2004). Areas burned will roughly double. (CB 898)

I. PUBLIC PARTICIPATION

Public outreach and scoping occurred for the Galls Foot Forest Management Project. The Galls Foot Project was first announced the summer of 2005 with the listing of the project in Medford's Messenger, a general project announcement newsletter published quarterly. More focused public outreach also occurred for the Galls Foot Forest Management Project. Outreach included mailings to interested organizations, community groups, other agencies, tribes, adjacent land owners, and other individuals; and meetings with neighbors and organized neighborhood groups. Two separate, outreach by mail efforts were made. The first was sent November 17, 2005, to all private landowners in the Foots Creek and Galls Creek drainages, announcing timber sale and fuel reduction activities were being planned in the area. A description of the activities expected and a map were included in the mailing, along with a request for public input regarding BLM's proposed management activities. BLM also requested that anyone who wanted to continue to be kept informed of project activities return the "Interest Response Form" provided. Organized groups and individuals who in the past had asked to be informed of all BLM land management activities were also included in this first mailing. Approximately 400 letters were sent. On April 6th, 2005, a meeting took place in the field to discuss the Galls Foot project with five interested neighbors.

The second mailing, sent on September 22, 2006, provided the public with an update concerning the development of the Galls Foot Forest Management Project and another chance to provide comments. Two detailed maps and several pages explaining the timber harvest and fuel management objectives, the type of cutting and transportation system objectives were provided in the mailing. Approximately 150 letters were mailed for this second outreach requesting comments to be sent to the BLM by October 30, 2006. Copies of both letters along with large format maps were filed in the reference section of the Gold Hill library.

Notification of the availability of this Environmental Assessment was sent to adjacent landowners, individuals who have previously asked to receive notification of BLM projects and to the following agencies, organizations, and tribes:

Additional copies of this EA are available upon request from the Ashland Resource Area, Bureau of Land Management, 3040 Biddle Rd., Medford, OR 97540, (541)618-2497. The EA is expected to be posted on the Medford BLM web site.

Organizations and Agencies

Applegate River Watershed Council
Association of O&C Counties
Audubon Society
City Of Gold Hill
City Of Rogue River
Headwaters
Jackson County Stockmen's Association
Jackson County Commissioners
Jackson Co. Soil and Water Conservation District
Klamath Siskiyou Wildlands Center
League of Wilderness Defenders/Friends of the Rogue-Kalmiopsis
Northwest Environmental Defense Center
Oregon Department Forestry
Oregon Natural Resources Council
Oregon Department of Fish and Wildlife
Oregon Department of Environmental Quality

Rogue River National Forest (RRNF)
Southern Oregon University
Southern Oregon Timber Industries
The Pacific Rivers Council
The Wilderness Society

Federally Recognized Tribes
Cow Creek Band of Umpqua Indians
Confederated Tribes of Grand Ronde
Confederated Tribes of Siletz
Klamath Tribe
Quartz Valley Indian Reservation (Shasta Tribe)
Shasta Nation
Other Tribes

Confederated Bands [Shasta], Shasta Upper Klamath Indians
Confederated Tribes of the Rogue-table Rock and Associated Tribes

CRITICAL ELEMENTS

The following elements of the human environment are subject to requirements specified in statute, regulation, or executive order and must be considered in all Environmental Assessments.

Critical Elements

Critical Element	Affected Yes	Affected No	Critical Element	Affected Yes	Affected No
Air Quality		X **	T & E Species		X **
ACECs		X	Wastes, Hazardous/Solid		X
Cultural Resources		X	Water Quality		X **
Farmlands, Prime/Unique		X	Wetlands/Riparian Zones		X **
Floodplains		X	Wild & Scenic Rivers		X
Nat. Amer. Rel. Concerns		X	Wilderness		X
Invasive, Nonnative Species		X	Energy Resources (EO 13212)		X
			Environmental Justice		X

**These affected critical elements would be impacted by implementing the proposed action. The impacts are being reduced by designing the proposed action with Best Management Practices, Management Action/Direction, Standard and Guidelines as outlined in the Environmental Impact Statements (EIS)/Record of Decisions *(RMP) (USDI BLM 1995)(USDA FS; USDI BLM 1994*) tiered to in Chapter 1. The impacts are not beyond those already analyzed and disclosed by the above mentioned documents.

References for Introduction

Regional Ecosystem Office. 1995. Ecosystem analysis at the watershed scale: Federal guide for watershed analysis. Portland, OR

References for Vegetation/Silviculture section

Atzet, T. and D.L. Wheeler. 1984. Preliminary plant associations of the Siskiyou mountain province. USDA Forest Service, Siskiyou National Forest, Grants Pass, OR.

Drew, T.J. and J.W. Flewelling. 1979. Stand density management: an alternative approach and its application to Douglas-fir plantations. Forest Science, Vol. 25, No. 3, pp. 518-532.

Oliver, Chadwick D. and Larson, Bruce C. 1996. Forest Stand Dynamics. p. 141

Oliver, William, W. and Fabian C.C. Uzoh. 1997. Maximum stand densities for ponderosa pine and red and white fir in northern California. In: Proc. 18th Annual Forest Vegetation Management Conference; 1997 January 14-16, Sacramento, CA.

U.S. Department of Agriculture, Forest Service. 1998. Pacific Northwest Region, Fremont-Winema National Forest, Klamath Ranger District and Others. South Cascades Late-Successional Reserve Assessments (LSRA) RO227.

U.S. Department of the Interior, Bureau of Land Management, Medford District. 1994. Medford District resource management plan/environmental impact statement. Medford, OR.

Waring, R. H., W.G. Thies, and D. Muscato. 1980. Stem growth per unit of leaf area: a measure of tree vigor. Forest Science Vol. 26, No.1, March 1980, pp.112-117.

References for fire/fuels/air quality section

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

Agee, J.K. 1996. *The influence of forest structure on fire behavior*. P. 52-68, in Procedings of the 17th Forest Vegetation Management Conference. Jan. 16-18, 1996 Redding, CA.

Agee, J.K., C.S. Wright, N. Williamson, and M.H. Huff. 2002. *Foliar moisture content of Pacific Northwest vegetation and its relation to wildland fire behavior*. Forest Ecology Management 167: 57-66.

Agee, J.K., Skinner, C.N., *Basic principles of forest fuel reduction treatments*. Forest Ecology and Management 2005. © 2005 Elsevier B.V.

Agee, J.K. Clinton S. Wright, Nathan Williamson, Mark H. Huff. 2002. *Foliar moisture content of Pacific Northwest vegetation and its relation to wildland fire behavior.* Forest Ecology and Management, 167: 57-66.

Agee, J.K., Berni Bahro, Mark A. Finney, Philip N. Omi, David B. Sapsis, Carl N. Skinner, Jan van Wagtendonk, C. Phillip Weatherspoon. 2000. The use of shaded fuel breaks in landscape fire management. Forest Ecology and Management 127: 55-66/

Albini, F.A., *Estimating Wildfire Behavior and Effects*. USDA Forest Service GTR, INT-30. 1976

Atzet, T., Wheeler, David. "*Historical and Ecological Perspectives on Fire Activity in the Klamath Geological Province of the Rogue River and Siskiyou National Forests*" USDA- Forest Service Pacific Northwest Region Portland, Oregon July 1982.

Cohen, Jack D. 2000. *What is the Wildland Fire Threat to Homes?* Presented as the Thompson Memorial Lecture. April 10, 2000, School of Forestry, Northern Arizona University, Flagstaff, AZ.

Countryman, Clive M. 1972. *The Fire Environment Concept*. Pacific Southwest Forest and Range Experiment Station. U.S. Department of Agriculture, Forest Service. Berkeley California.

Countryman, C.M. 1955. *Old-Growth Conversion Also Converts Fire Climate.* Fire Control Notes: 15-19.

Franklin, J.F., and Agee, J.K. "Forging a Science-Based National Forest Fire Policy" from: Issues in Science and Technology fall 2003

Graham, Russel T., A.E. Harvey, B. Theresa, and R. Jonaliea. 1999. The effects of thinning and similar stand treatments on fire behavior in Western forests. PNW-GTR-463. Portland, OR: USDA, Forest Service, Pacific Northwest Research Station, 27 pp.

Hessel, Amy E., Don McKenzie, and Richard Schellhaas. 2004. *Drought and Pacific Decadal Oscillation Linked to Fire Occurrence in the Inland Pacific Northwest.* Ecological Applications 14(2): 425-442.

Huff, M.H., Agee, J.K., The Role of Prescribed Fire in Restoring Ecosystem Health and Diversity in Southwest Oregon: Part 1. Ecosystem Conditions. Report to Pacific Northwest Research Station Directors Office-Northwest Forest Plan Issue. September 2000.

Mote, Philip., and Contributors, Impacts of Climate Variability and Change in the Pacific Northwest. The JISAO Climate Impacts Group. Contribution #715

Odion, D.C., E.J. Frost, J.R. Strittholt, H. Jiang, D.D. DellaSala, and M.A. Moritz. 2004. Patterns of fire severity and forest conditions in the Western Klamath Mountains, California. Conservation Biology, 18(4):927-936.

Omi, P.N. and E.J. Martinson. 2002. Effects of fuels treatments on wildfire severity. Western Forest Fire Research Center, Colorado State University.

Pollet, J. and P.N. Omi. 2002. Effects of thinning and prescribed burning on crown fire severity in ponderosa pine forests. Internat. J. Wildland Fire, Vol 11:1-10.

Pullen, Reg. 1995. *Overview of the Environment of Native Inhabitants of Southwest Oregon, Late Prehistoric Era.* Medford BLM

Sensenig, T.S., Development, Fire History and Current and Past Growth, of Old-Growth and Young-Growth Forest Stands in the Cascades, Siskiyou and Mid-Coast Mountains of Southwestern Oregon. A DISSERTATION to Oregon State University. June 12, 2002. Copyright 2002 by ProQuest, UMI Microform 3061918.

SNEP. 1996. Summary of the Sierra Nevada ecosystem project report. Davis: University of California, Centers for Water and Wildland Resources.

Taylor, A.H. and C.N. Skinner. 1998. Fire history and landscape dynamics in a late-successional reserve, Klamath Mountains, California, USA. Forest Ecology and Management 111:285-301. *In* Brown, et. al. 2004. Forest restoration and fire. Conservation biology, 18(4):903-912.

USDI Bureau of Land Management. 2001. South Rogue-Gold Hill watershed analysis. Medford (OR): Medford District. Bureau of Land Management.

VanWagtendonk, J.W. 1996. Use of a deterministic fire growth model to test fuel treatments. In: Status of the Sierra Nevada: Sierra Nevada Ecosystem Project, Final Report to Congress Vol. II, Assessment Summaries and Management Strategies. Wildland Resources Center, Univ. of Calif., Davis.

Weatherspoon, C.P. 1996. Fire-Silviculture Relationships in Sierra Forests. Sierra Nevada Ecosystem Project: Final Report to Congress, Vol. II, Assessments and scientific basis for management options. Davis: University of California, Centers for Water and Wildland Resources.

Weatherspoon, C.P. and C.N. Skinner. 1995. An assessment of factors associated with damage to tree crowns from the 1987 wildfires in northern California. Forest Science 41:430-451.

References for soils section

Adams, P.W. and H.A. Froelich. 1981. Compaction of Forest Soils. Pacific Northwest Extension Puclication. PNW 217.

Agee, J.K. 1993. Fire Ecology of Pacific Northwest Forests. Washington, DC: Island Press. P.388.

Amaranthus, M.P.,R.M. Rice, N.R. Barr, and R.R. Ziemer. 1985. Logging and forest roads related to increased debris slides in southwest Oregon. Journal of Forestry, Vol. 83, No. 4, pp. 229-233.

Atzet, Thomas, Powers, R.F., McNabb D.H., Amaranthus, M.P., Gross, E.R., 1987. Maintaining Long-Term Forest Productivity in Southwest Oregon and Northern California. In: D.A Perry, R. Meurisse, B. Thomas, R. Miller, J. Boyle, J.Means, C.R. Perry, and R.F. Powers. Maintaining the Long-Term Productivity of Pacific Northwest Forest Ecosystems. Timber Press, Portland, Oregon. 1989 pp.193.

Beschta, Robert, nd. Cumulative Effects of Forest Practices in Oregon prepared for the Oregon Department of Forestry available at http://www.cof.orst.edu/cof/teach/for341/Cumulative%20Effects%20of%20Forestry%20on%20Soils/CHAPT6Soils.htm

Childs, S.W., S.P. Shade, D.W.R. Miles, E. Shepard, and HA Froehlich. 1989. Soil physical properties: importance to long-term forest productivity. pp. 53-66. In: D.A Perry, R. Meurisse, B. Thomas, R. Miller, J. Boyle, J.Means, C.R. Perry, and R.F. Powers. Maintaining the Long-Term Productivity of Pacific Northwest Forest Ecosystems. Timber Press, Portland, Oregon.

Clayton, James L. 1981, Soil Disturbance Caused by Clearcutting and Helicopter Yarding in the Idaho Batholith. Intermountain Forest and Experiment Station. Research Note INT-305

Elliot, K.J., Vose, J.M. 2005. Initial Effects of Prescribed Fire on Quality of Soil solution and Streamwater in the Southern Appalachian Mountains. USDA Southern Research Station. Reprinted in Southern Journal of Applied Forestry, Vol. 29, No.1, Feb 2005 pp.5-15.

Froehlich, Henry A., 1972. The Effects of Soil Compaction by Logging on Forest Productivity. Final Report, Contract no. 53500-CT4-5(N), Bureau of Land Management, Portland, OR.

Froehlich, H.A. and Berglund, E.R., nd, The Effect of Soil Compaction during Thinning on the Growth of Residual Trees. Final Report for Bureau of Land Management Contract No. 53500-CT4-5(N).

Gucinski, Hermann; Furniss, Michael J.; Ziemer, Robert R.; Brookes, Martha H. 2001. Forest Roads: A Synthesis of Scientific Information. Gen. Tech. Rep. PNWGTR- 509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Haupt, Harold F., 1960, as reported in Megahan's Effect of Silvicultural Practices on Erosion and Sedimentation in the Interior West – A Case for Sediment Budgeting

Landsberg, Johanna D., Miller, R.E., Anderson, H.W., and Tepp J.S., 2003. Bulk Density and Soil Resistance to Penetration as Affected by Commercial Thinning in Northeastern Washington. Pacific Northwest Research Station. Research Paper PNW-RP-551.

Megahan, Walter F., n.d., Effects of Silvicultural Practices on Erosion and Sedimentation in the Interior West – A Case for Sediment Budgeting. Intermountain Forest and Range Experiment Station, USDA Forest Service. Boise, Idaho

Morris, L.A and R. E. Miller. 1994. Evidence for long-term productivity change as provided by field trials. p. 41-80. In: W.J. Dydc, D.W. Cole, and N.B. Comerford (eds.) Impacts of Forest Harvesting on Long-Term Site Productivity. Chapman & Hall, London.

Perry D.A., Meurisse R., Thomas B., Miller R., Boyle J., Means J., Perry C.R., and Powers R.F. 1989. Maintaining the Long-Term Productivity of Pacific Northwest Forest Ecosystems. Timber Press, Portland, OR

Powers, R.F.; Sanchez, F.G.; Scott, D.A.; Page-Dumroese, D., 2004 (In press) The North American long-term soil productivity experiment: coast-to-coast findings from the first decade. In: Proceedings, National Silviculture Workshop. USDA Forest Service Gen. Tech. Rep. RM. pp. 191-206

Powers, R.F. and P.E Avers. 1995. Sustaining forest productivity through soil standards: a coordinated U.S. effort. p. 147-190. In: C.B. Powter, S.A Abbouc W.B. McGill (eds.) Environmental oil Science. Anthropogenic Chemicals and Quality Criteria. Canadian Soc. Soil Sci., Brandon, Manitoba.

Rice, R.M., Rothacher, J.S., Megahan, W.F., 1972. Erosional Consequences of Timber Harvesting: An Appraisal. In: National Symposium on Watershed in Transition. pp .326-328.

Swift, L.W., Jr. 1988. Forest Access Roads: Design, Maintenance, and Soil Loss. In: Swank, W.T.; Crossley, D.A., Jr. Ecological studies. Vol. 66: Forest Hydrology and Ecology at Coweeta. New York: Springer-Verlag: pp. 313-324.

Squyres, David, 2006. Personal conversation. BLM

Taylor, Alan H. and Skinner, Carl N., 2003. Spatial Patterns and Controls on Historical Fire Regimes and Forest Structure in the Klamath Mountains. Ecological Applications, 13(3), 2003, pp.704-719.

Tiarks, Allan E.; Buford, Marilyn A.; Powers, Robert F.; Ragus, Jerry F.; Page-Dumroese, Deborah S.; Ponder, Felix, Jr.; Stone, Douglas M., 1997. North American Long-Term Soil Productivity Research Program. In: Proceedings of the National Silviculture Workshop; 1997 May 19-22; Warren, PA. Gen. Tech. Rep. NE-238. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 140-147.

Tuttle, Martitia and Griggs, Gary, 1987. Soil Erosion and Management Recommendations at Three State Vehicular Recreation Areas, California. Environmental Geology and Water Science Vol. 10, No.2, p.111-123

USDA, Natural Resource Conservation Service 1989. Soil Survey of Jackson County Area, Oregon.

USDI, Bureau of Land Management, 1994. Medford District Proposed Resource Management Plan/Environmental Impact Statement. (PRMP)

USDI, Bureau of Land Management, 1995, Medford District Record of Decision and Resource Management Plan. (ROD)

References for Water Resources Section

A.C. Kendig and Co. and Cedarock Consultants, Inc. 2003. *Best Available Science Literature Review and Stream Buffer recommendations*. City of Renton. Project No. 182. Renton, WA. <http://www.ci.renton.wa.us/ednsp/images/caostrea.pdf>

Adams, P.W. and J.O. Ringer. 1994. *The effects of timber harvesting and forest roads on water quantity and quality in the Pacific Northwest: Summary and Annotated Bibliography*. Forest Engineering Department, Oregon State University, Corvallis, Oregon.

Beschta, R.L., M.R. Pyles, A.E. Skaugset, and C.G. Surfleet. 2000. *Peakflow responses to forest practices in the western Cascades of Oregon, USA.* Journal of Hydrology 233:102-120.

Bilby, R. E., K. Sullivan, S. H. Duncan. 1989. *The generation and fate of road-surface sediments in forested watersheds in southwestern Washington*. Forest Science, Vol. 35, No. 2, pp. 453-468, June 1989.

Church, Michael and Brett Eaton. June 2001. *Hydrological Effects of Forest Harvest in the Pacific Northwest*. The University of British Columbia, Vancouver, British Columbia.

Clayton, James L. April 1981. *Soil Disturbance Caused by Clearcutting and Helicopter Yarding in the Idaho Batholith*. USDA Forest Service. Research Note INT-305, 6 p. Intermountain Forest and Range Experiment Station, Ogden, Utah.

Duncan, S. H., R. E. Bilby, J. W. Ward, and J. T. Heffner. 1987. Transport *of road-surface sediment through ephemeral stream channels*. Water Resources Bulletin, Vol. 23, No. 1, pp. 113-119, February 1987.

Dyrness, C.T. 1967. *Soil Surface conditions following skyline logging*. USDA Forest Service Research Note PNW-55, 8 p. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon

Everest, F.H., R. L. Beschta, J. C. Scrivener, K.V. Koski, J. R. Sedell, and C. J. Cederholm. 1987. *Fine sediment and salmonid production: a paradox.* Streamside management: forestry and fishery interactions, chapter four, edited by E. O. Salo and T. W. Cundy. College of Forest Resources, University of Washington, Seattle, Washington.

Foltz, R. B. and K. A. Yanosek. 2005. *Effects of road obliteration on stream water quality*. From Proceedings of the 2005 Watershed Management Conference: Managing Watersheds for Human and Natural Impacts. Williamsburg, VA. July 2005

Furniss, M. J., R. D. Roelofs, and C. S. Yee. 1991. *Road construction and maintenance*. Influences of forest and rangeland management, chapter 8, edited by W. R. Meehan. American Fisheries Society Special Publication 19. Bethesda, Maryland.

Gordon, Sean. April, 2006. Unpublished internal communication to David Squyres via the E-mail system, United States Department of the Interior, Bureau of Land Management, Medford Oregon.

Grant, G. E., F. J. Swanson, M. G. Wolman. 1990. *Pattern and origin of stepped-bed morphology in high-gradient streams, Western Cascades, Oregon*. Geological Society of America Bulletin, v. 102, p. 340-352, March 1990.

Gucinski, Hermann; Furniss, Michael J.; Ziemer, Robert R.; Brookes, Martha H. 2001. *Forest Roads: A Synthesis of Scientific Information.* Gen. Tech. Rep. PNWGTR- 509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Harr, Dennis R. 1976. *Forest Practices and Streamflow in Western Oregon*. USDA Forest Service. General Technical Report PNW-49. 16 p. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Harr, R. D. 1976b. *Hydrology of small forest streams in western Oregon*. USDA Forest Service General Technical Report PNW-55, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Harr, R. D., R. L. Fredriksen, and J. Rothacher. 1979. *Changes following timber harvest in southwestern Oregon*. Res. Paper PNW-249, Pacific Northwest Forest and Range Experiment Station, USDA, Portland, Oregon.

Harr, R. D. October 1982. *Fog Drip in the Bull Run Municipal Watershed, Oregon*. Water Resources Bulletin 18:785-789. Pacific Northwest Forest and Range Experiment Station, Corvallis, Oregon.

Hicks B.J., R.L Beschta, and R.D. Harr. 1991. *Long-term changes in streamflow following logging in western Oregon and associated fisheries implications.* Water Resources Bulletin 227: 217-226.

Ingwersen, JB. June 1985. *Fog Drip, Water Yield, and Timber Harvesting in the Bull Run Municipal Watershed, Oregon.* Water Resources Bulletin 21:469-473.

Keppeler, Elizabeth T. 1998. *The Summer Flow and Water Yield Response to Timber Harvest*. USDA Forest Service General Technical Report PSW-GTR-168.

Lindell, Laurie and Jon Brazier. October 1986. *Cumulative Watershed Effects Analysis for the Little Applegate River Watershed*. Unpublished report prepared for United States Department of the Interior (USDI) Bureau of Land Management and the United States Department of Agriculture (USDA) Forest Service, Rogue River National Forest. 11 pages.

Luce, C. H. and T. A. Black. 1999. *Sediment production from forest roads in western Oregon*. Water Resources Research, Vol. 35, No. 8, pp. 2561-2570, August 1999.

Luce, C. H. and T. A. Black. 2001. Spatial *and temporal patterns in erosion from forest roads*. In Influence of urban and forest land uses on the hydrologic-geomorphic responses of watersheds. Edited by M.S. Wigmosta and S. J. Burges. Water Resources Monographs, American Geophysical Union, Washington, D.C. pp. 165-178.

Meehan, William, ed. 1991. *Influence of forest and rangeland management on salmonid fishes and their habitats*. American Fisheries Society Special Publication 19. Bethesda, MD.

Moore, R.D. and S.M. Wondzell. 2005. *Physical hydrology and the effects of forest harvesting in the Pacific Northwest: a review.* Journal of the American Water Resources Association, pp. 763-784, August 2005

Neary, D.G.; Ryan, K.C.; DeBano, L.F. (editors). 2005. *Wildland Fire in Ecosystems: Effects of fire on soils and water*. General Technical Report RMRS-GTR-42-volume 4. Ogden UT: USDA Forest Service, Rocky Mountain Research Station. 250 p.

Oregon Administrative Rules (OAR) 340-041. July 15, 2004. *OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY, WATER POLLUTION, DIVISION 41, WATER QUALITY STANDARDS: BENEFICIAL USES, POLICIES, AND CRITERIA FOR OREGON*. <http://arcweb.sos.state.or.us/rules/OARs_300/OAR_340/340_041.html>. Accessed 2004 Aug 26.

Oregon Administrative Rules (OAR) 340-041-0016(2). July 15, 2004. *Table 21, DISSOLVED OXYGEN & INTERGRAVEL DISSOLVED OXYGEN CRITERIA*.<http://www.deq.state.or.us/wq/wqrules/Div41/OAR340Div41Tbl21.pdf>. Accessed 2004 Aug 26.

Oregon Administrative Rules (OAR) 340-041. May 13, 2005. *Oregon Department of Environmental Quality, water pollution, division 41, water quality standards: beneficial uses, policies, and criteria for Oregon.* <http://arcweb.sos.state.or.us/rules/OARs_300/OAR_340/340_041.html>.

Oregon Department of Environmental Quality (ODEQ). December 2003a. *Applegate Subbasin Water Quality Management Plan (WQMP)*. <http://www.deq.state.or.us/wq/TMDLs/applegate/ApplegateWQMPfinal.pdf>. Accessed 2004 Aug 5.

Oregon Department of Environmental Quality (ODEQ). December 2003b. *Applegate Subbasin Total Maximum Daily Load (TMDL) HUC # 17100309*. <http://www.deq.state.or.us/wq/TMDLs/applegate/ApplegateTMDLfinal.pdf>. Accessed 2004 Aug 5.

Oregon Department of Environmental Quality (ODEQ). November 2003c. *Figure 271A: Fish Use Designations, Rogue Basin, Oregon*. <http://www.deq.state.or.us/wq/standards/FishUseMapsFinal/FFigure271A_Rogue.pdf>. Accessed 2004 Aug 26.

Oregon Department of Environmental Quality (ODEQ). November 2003d. *Figure 271B: Salmon and Steelhead Spawning Use Designations, Rogue Basin, Oregon*. <http://www.deq.state.or.us/wq/standards/FishUseMapsFinal/FFigure271B_Rogue.pdf>. Accessed 2004 Aug 26.

Oregon Department of Environmental Quality (ODEQ). November 2003e. *Table 271A: Designated Beneficial Uses Rogue Basin (OAR340-41-0271)*. <http://www.deq.state.or.us/wq/standards/GenBenUseTablesFinal/FTable271A_Rogue.pdf>. Accessed 2004 Dec 9.

Oregon Department of Environmental Quality (ODEQ). February 2004a. *2003 NPS Program Annual Report*. <http://www.deq.state.or.us/wq/nonpoint/NPSAnnualRpt03.pdf>. Accessed 2004 Aug 11.

Oregon Department of Environmental Quality (ODEQ). July 2004b. *Oregon's 2004 Water Quality Assessment Section 305(b)* report. <http://www.deq.state.or.us/wq/305bRpt/ORWQ305bRpt2004.pdf>. Accessed 2004 Aug 11.

Oregon Department of Environmental Quality. 2006a. *Oregon's2004/2006 integrated report*. Internet address [http:www.deq.state.or.us/wq/303dlist/wq2004intgrrpt.htm]. DEQ, Portland, Oregon.

Oregon Department of Environmental Quality (ODEQ). March 2006b. *2005 NPS Program Annual Report*. Oregon Depqrtment of Environmental Quality. Portland Oregon.

Oregon Water Resources Department. 1989. *Rogue River basin programs*. State of Oregon Water Resources Department. Salem Oregon.

Rosgen, Dave. 1996. *Applied River Morphology*. Printed Media Companies, Minneapolis, Minnesota.

Rothacher, J. 1971. *Regimes of streamflow and their modification by logging*. In: *Proceedings of a symposium: forest land uses and stream environment*, J. T. Krygier and J. D. Hall (Editors). Held October 19-21, 1970 at Oregon State University, Corvallis, Oregon. Forest Extension, Oregon State University, Corvallis, Oregon, pp. 40-54.

Samuelson, John. September 2006. Unpublished internal communication to David Squyres via the E-mail system, United States Department of the Interior, Bureau of Land Management, Medford Oregon.

Sidle, R. C. 1979. *Surface Erosion*. Presented at U.S. Forest Service workshop on Scheduling Timber Harvesting for Hydrologic Concerns, Nov. 27-29, 1979. Portland, OR.

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

Sullivan, K. 1985. *Long-term patterns of water quality in a managed watershed in Oregon: 1. suspended sediment*. Water Resources Bulletin, Vol. 21, No. 6, pp. 977-987, Dec. 1985.

Swift, L.W., Jr. 1984. *Gravel and grass surfacing reduces soil loss from mountain roads*. Forest Science, Vol. 30, No. 3, pp. 658-670, 1984.

United States Department of Agriculture (USDA) Forest Service and United States Department of the Interior (USDI) Bureau of Land Management. 1996. *Klamath Siskiyou Matrix of Pathways and Indicators*; approved National Oceanographic and Atmospheric Administration (NOAA)/National Marine Fisheries Service (NMFS), 1996. Unpublished.

U.S. Department of Agriculture (USDA), Forest Service and U.S. Department of the Interior (USDI), Bureau of Land Management. 1999. *Forest Service and Bureau of Land Management protocol for addressing Clean Water Act section 303(d) listed waters* (version 2.0). USDA Forest Service, Pacific Northwest Region, Regional Office, Portland, Oregon.

United States Department of the Interior (USDI) Bureau of Land Management. October 1994. *Medford District Proposed Resource Management Plan/ Environmental Impact Statement*.

United States Department of the Interior (USDI) Bureau of Land Management. June 1995. *Medford District Record of Decision and Resource Management Plan*.

United States Department of the Interior (USDI), Bureau of Land Management, Medford District Office, Ashland Resource Area. August 2001. *South Rogue-Gold Hill Watershed Analysis Version 1.1.*

United States Department of the Interior (USDI), Bureau of Land Management Ashland Resource Area. 2006a. *Streams Provisional Dataset for the Galls Foot Project*. Unpublished digital data.

United States Department of the Interior (USDI), Bureau of Land Management Ashland Resource Area. 2006b. *Stream Temperature Data Summaries for the Galls Foot Project*. Unpublished. 12 pages.

United States Department of the Interior (USDI) Bureau of Land Management. 2005. *Water Quality Restoration Plan/Rogue River-Gold Hill Watershed South of the Rogue River*.

United States Department of the Interior (USDI) Bureau of Land Management; United States Department of Agriculture (USDA) Forest Service; and USDA Natural Resources Conservation Service. 1998. *Riparian Area Management Technical Reference TR1937-15: A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas*.

Wemple, B.C. 1994. *Hydrologic integration of forest roads with stream networks in two basins, western Cascades, Oregon*. M.S. Thesis, Oregon State University, Corvallis, OR.

Wemple, B.C., J.A. Jones, and G.E. Grant. 1996. *Channel network extension by logging roads in two basins, western Cascades, Oregon.* Water Resources Bulletin 32(6):1-13.

Wemple, B. C., F. J. Swanson, J. A. Jones. 2001. *Forest roads and geomorphic process interactions, Cascade Range, Oregon*. *Earth Surf. Process Landforms* 26, pp. 191-204. John Wiley & Sons, Ltd. 2001.

Watershed Professionals Network (WPN). 1999. *Oregon Watershed Assessment Manual*. June 1999. Prepared for the Governor's Watershed Enhancement Board, Salem Oregon.

References for Fish Section

Beechie, T. J., G. Pess, P. Kennard, R. Bilby, and S. Boltan. 1999. *Modeling RecoveryRates and Pathways for Woody Debris Recruitment in Northwestern Washington Streams.* North American Journal of Fisheries Management: Vol. 20, no. 2, pp. 436-452.

Chamberlain, T. W., R. D. Harr, and F. H. Everest. 1991. Timber harvesting, silviculture, and watershed processes. American Fisheries Society Special Publication 19:181-205.

Dwire, K.A., Kauffman, J.B. 2003. *Fire and Riparian Ecosystems in Landscapes of the Western USA.* Forest Ecology and Management 178(1-2): 61-74.

Everest, Fred. 1973. *Ecology and Management of Summer Steelhead in the Rogue River*. Fishery Research Report Number 7, Oregon State Game Commission, Corvallis, OR.

Federal Register, 1999. *Designated Critical Habitat; Central California Coast and Southern Oregon/Northern California Coasts Coho Salmon.* Vol. 64, No. 86. 24049.

Hydrology Report, 2006. Prepared by D. Squyres, hydrologist, for the Biological Assessment for the Galls/Foot timber sale.

McMahon, T.E., deCalesta, D.S. 1990. *Natural and Prescribed Fire in Pacific Northwest Forests.* Ch. 18, pp. 233-245.

Meehan, W. R., Editor. 1991. *Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats.* American Fisheries Society Special Publication 19.

Oregon Department of Fish and Wildlife. 1991. Unpublished Data. *Aquatic Inventory Project and Physical Habitat Surveys*. Oregon Department of Fish and Wildlife, Corvallis, OR.

Oregon Department of Fish and Wildlife. 2002. Unpublished Data. *Presence Absence Surveys*. Oregon Department of Fish and Wildlife, Central Point, OR.

U.S. Department Of Interior, Bureau of Land Management, Medford District. 2001. *South Rogue-Gold Hill Watershed Analysis*. Version 1.1.

U.S. Department Of Interior, Bureau of Land Management, Medford District, Ashland Resource Area. 2001. *Unpublished data, Stream Surveys.*

U.S. Department Of Interior, Bureau of Land Management, Medford District, Ashland Resource Area 2001 and 2003. Unpublished data. Presence absence surveys.

U.S. Department Of Interior, Bureau of Land Management, Medford District, Ashland Resource Area 2005. Field observations.

U.S. Department Of Interior, Bureau of Land Management, Medford District, Ashland Resource Area 2005. Unpublished data. Sediment monitoring of Kane Creek.

U.S. Department Of Interior, Bureau of Land Management, Medford District, Ashland Resource Area 2005. Unpublished data. Temperature monitoring of Galls Creek.

Vandyke, Dan. 2006. District Fish Biologist, Oregon Dept. of Fish and Wildlife. Email memo to Chris Volpe regarding steelhead presence in Millers Gulch.

References for Wildlife Section

Corkran, C.C. and C. Thoms. 1996. Amphibians of Oregon, Washington and British Columbia. Lone Pine Publishing. Edmonton, Alberta. 175p.

Hayes, J.P., J. Weikel, M.Huso and J. Erickson. 2003. Response of birds to thinning young Douglas-fir forests. U.S. Geological Survey, Cooperative Forest Ecosystem Research Factsheet, USGS FS-033-03.

Irwin, L.L., D. Rock and S. Rock. 2004. Adaptive management monitoring of spotted owls. Upbubl. Annual Report. National Council for Air and Stream Improvement.Corvallis, Oregon.

Janes, S. 1998. Changes in breeding bird populations on the Panther Gap Timber Sale: Second spring following timber harvest. Medford District BLM.

Marsh, D.M. and N.G. Beckman. 2004. Effects of forest roads on the abundance and activity of terrestrial salamanders. Ecological Applications: Vol. 14, No. 6, pp. 1882-1891.

Ortega, Y.K. and D.E. Capen. 1999. Effects of forest roads on habitat quality for ovenbirds in a forested landscape. The Auk 116(4): 937-946.

Rogue Valley Audubon Society. 2001. Birds of Jackson County Oregon, distribution and abundance. Medford, Oregon. 28p.

USDI Bureau of Land Management. 1990. Oregon-Washington Special Status Species Policy. November 5, 1990.

USDI Bureau of Land Management. 1997. Instruction Memorandum No. OR-98-012.Northern Goshawk Management Guidelines. November 17, 1997. Unpublished Report.

USDI Bureau of Land Management. 2001. South Rogue-Gold Hill watershed analysis.Medford (OR): Medford District. Bureau of Land Management.

References for Botany Section

NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 5.0. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer.

USDA Forest Service and USDI Bureau of Land Management. 2004. Final supplemental environmental impact statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines. Portland, Oregon. 2 vols.