United States Department of the Interior

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

IN REPLY REFER TO:
1792(ORM060)

JUL 0 1 2011

Dear Interested Public:

The enclosed *Environmental Assessment* (EA) for the Cottonwood Forest Management Project is available for public review. The Bureau of Land Management (BLM), Ashland Resource Area, proposes to implement the Cottonwood Forest Management Project, designed to implement the 1995 Medford District Resource Management Plan (RMP). The Cottonwood Forest Management Project is located on BLM-administered lands in the Keene Creek drainage of the Jenny Creek Watershed.

The BLM proposes to harvest timber on 1,108 acres. Unit-specific activity fuels treatments and pre-commercial thinning are also included in the project proposal. Forest thinning treatments, designed under the principles of sustained yield forestry, are tailored to forest and site conditions to provide for long-term sustainable forest production. Forest management would be designed to improve tree vigor and growth, reduce the impacts of forest disease, and promote the maintenance of fire resilient species such as pine and incense cedar, while maintaining habitat for the northern spotted owl. An estimated 1.5 miles of permanent road and 0.6 mile of temporary road are proposed for construction to access harvest units. An estimated 36 miles of existing roads would be used as haul routes and improved as needed to meet BLM standards.

We welcome your comments on the content of the EA. We are particularly interested in comments that address one or more of the following: (1) new information that would affect the analysis, (2) information or evidence of flawed or incomplete analysis; (3) BLM's determination that there are no significant impacts associated with the proposed action, and (4) alternatives to the Proposed Action that would respond to purpose and need. Specific comments are the most useful. **Comments are due by 4:30 PM, August 4, 2011.**

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

All comments should be made in writing and mailed or delivered to Kristi Mastrofini, Ashland Resource Area, 3040 Biddle Road, Medford, OR 97504. Further information on this proposed project is available at the Medford District Office, 3040 Biddle Road, Medford, Oregon 97504 or by calling Kristi Mastrofini, Ashland Resource Area Planning, at (541) 618-2384.

Sincerely,

Donald J Hutchison, Actg

John Gerritsma
Field Manager
Ashland Resource Area

Enclosure

ENVIRONMENTAL ASSESSMENT

for the

COTTONWOOD FOREST MANAGEMENT PROJECT

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

(DOI-BLM-OR-M060-2011-0003-EA)

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

EA COVER SHEET

RESOURCE AREA: Ashland

ACTION/TITLE: Cottonwood Forest Management Project

EA NUMBER: DOI-BLM-OR-M060-2011-0003-EA

LOCATION: T. 38 S., R. 3 E., in sections 19, 20, 29, 32, 33, 34; T. 39 S., R. 3 E., in sections 3, 4, 5, 8, 9, 17, 20, 21, 28, 29, 31, 32. Willamette Meridian, Jackson County, Oregon.

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CHAPTER 1 - PURPOSE AND NEED

A. INTRODUCTION

The Bureau of Land Management (BLM), Ashland Resource Area, proposes to implement the Cottonwood Forest Management Project. The Cottonwood Forest Management Project is designed to implement specific management objectives for lands allocated to the production of timber resources under the Bureau of Land Management's 1995 Medford District Resource Management Plan (RMP). This Environmental Assessment (EA) documents the environmental analysis conducted to estimate the site-specific effects on the human environment that may result from the implementation of the Cottonwood Forest Management Project. The analysis documented in this EA will provide the BLM responsible official, the Ashland Resource Area Field Manager, with current information to aid in the decision-making process. This EA complies with the Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA; 40 CFR Parts 1500-1508) and the Department of the Interior's regulations on Implementation of the National Environmental Policy Act of 1969 (43 CFR part 46).

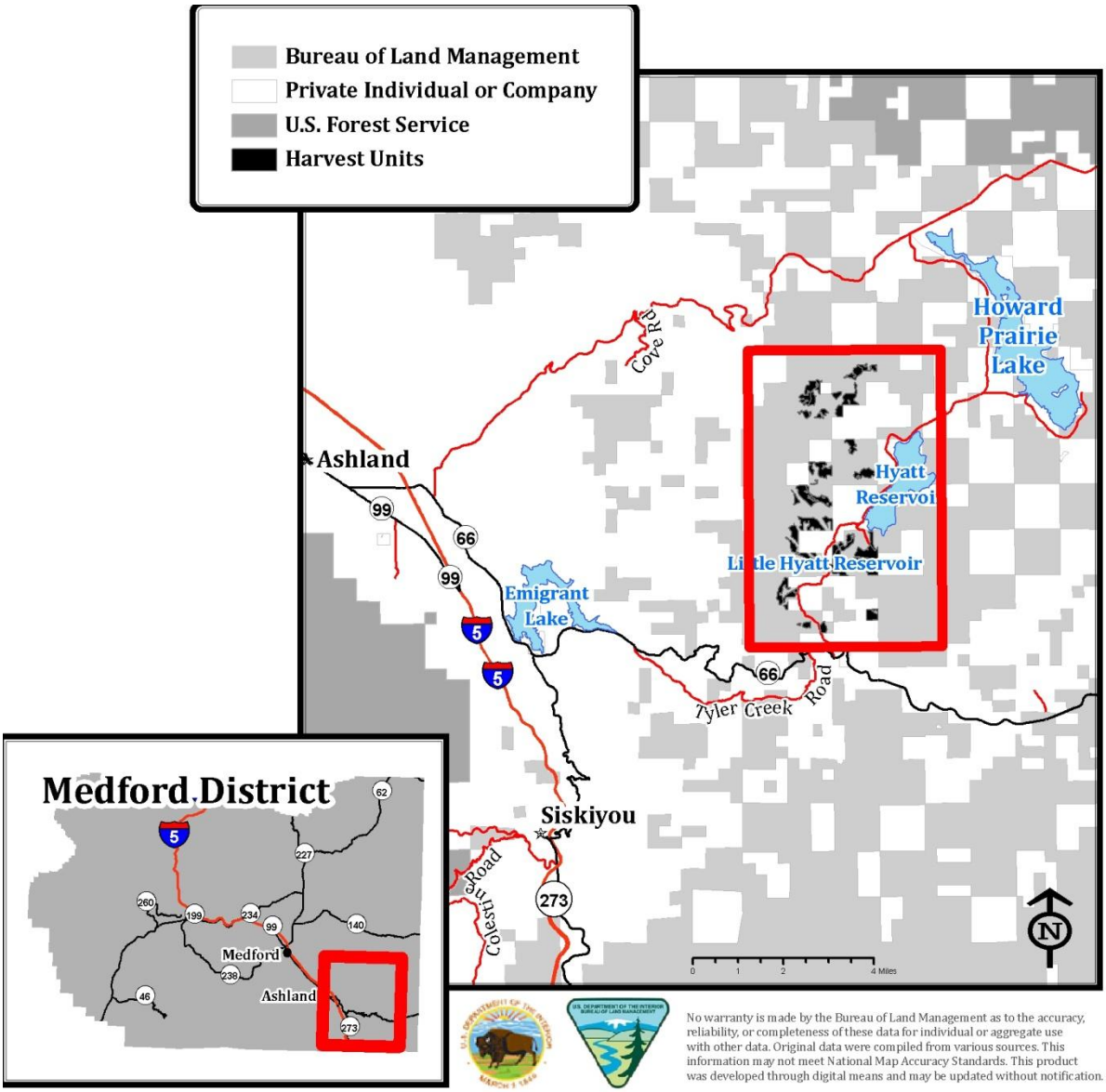
B. WHAT IS BLM PROPOSING & WHERE IS THE PROJECT LOCATED?

This section provides a brief summary of BLM's proposal for forest management. A more detailed description of BLM's Proposed Action is included in Chapter 2, Alternatives. The proposed 1,108-acre Cottonwood Forest Management Project would harvest trees in conifer forest stands on BLM-administered land in the Keene Creek drainage of the Jenny Creek Watershed.

The BLM proposes to harvest timber on 1,108 acres. Forest thinning treatments, designed under the principles of sustained yield forestry, are tailored to forest and site conditions to provide for long-term sustainable forest production. Forest management would be designed to improve tree vigor and growth, reduce the impacts of forest disease, and promote the maintenance of fire resilient species such as pine and incense cedar, while maintaining habitat for the northern spotted owl. Unit-specific activity fuels treatments and pre-commercial thinning are also included in the project proposal. Forest management would be accomplished using a combination of timber sale and service contracts. Commercial timber harvesting would be accomplished utilizing tractor and cable harvest systems. Post-harvest fuels reduction would occur in commercial harvest units to treat small diameter fuels generated from harvest activities. About 1.5 miles of new permanent road construction is proposed and an estimated 0.6 miles of temporary operator spur roads would be constructed to provide access to harvest units. In addition, an estimated 36 miles of existing roads would be used as haul routes and maintained and improved as needed to meet BLM standards. An estimated 1.9 miles of existing roads are proposed for decommissioning.

The Project Area is defined as the area where action is proposed. The Public Land Survey System description for the Cottonwood Project Area is: T. 38 S., R. 3 E., in sections 19, 20, 29, 32, 33, 34; T. 39 S., R. 3 E., in sections 3, 4, 5, 8, 9, 17, 20, 21, 28, 29, 31, 32. Willamette Meridian, Jackson County, Oregon (Map 1-1).

Map 1-1. Vicinity Map - Cottonwood Project



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

The Cottonwood Project is designed to provide for long-term forest (timber) production in the Cottonwood Project Area consistent with timber management objectives of the 1995 Medford District Resource Management Plan. Specifically, this forest management proposal is designed to:

- Ensure sustainable forest production, and the renewable resources they provide, by managing forests to improve conifer forest vigor and growth, and reduce the risk of stand loss from fires, animals, insects, and disease (USDI 1995, p. 72).;

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

- Maintain stand structure for nesting, roosting, foraging, and dispersal habitat components within spotted owl habitat; and

- Maintain a transportation system within the Project Area that serves the management of resource program areas including timber management.

1. Need for the Proposed Cottonwood Project

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

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

One of the applicable laws governing the major portion of BLM-administered lands in the Cottonwood Project Area is the Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act of 1937 (O&C Act), for which sustainable timber production is the primary purpose. Matrix lands (also described in the RMP as General Forest Management Area) within the Cottonwood Project Area are to produce a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability (RMP, p. 38). Timber products produced from this area would be sold in support of the District's Allowable Sale Quantity declared in the RMP (RMP p. 73).

The Medford District RMP adopted a set of silvicultural treatments for managing conifer forests on Matrix lands (RMP Appendix E, Silvicultural Systems Utilized in the Design of the Resource Management Plan); the Cottonwood Forest Management Project proposes commercial forest thinning and selection harvest prescriptions designed to direct future stand growth, initiate new forest development, reduce the impacts of insect and diseases and increase fire resiliency on forest stands to the extent possible, while maintaining northern spotted owl habitat.

There is a need to maintain existing nesting, roosting, foraging, and dispersal habitat conditions, in the Cottonwood Project Area to contribute to the conservation and recovery of Federally listed species and their habitats in compliance of BLM's resource management plan (RMP p. 50-51) and the Endangered Species Act.

In 2008, the U.S. Fish and Wildlife Service issued a Recovery Plan for the Northern Spotted Owl (NSO). The recovery plan was subsequently challenged in Court and efforts to revise the recovery plan are underway; a revised recovery plan is expected to be completed in 2011. Recovery plans are not regulatory documents; rather, they provide guidance to bring about recovery and establish criteria to be

used in evaluating when recovery has been achieved. The BLM continues to work with the Service to incorporate Recovery Goals and Actions that are consistent with BLM laws and regulations.

In order to maintain future options in the Cottonwood Project Area for aiding in the recovery of the northern spotted owl, the responsible official directed the interdisciplinary team to design the Cottonwood Forest Management Project in a manner to maintain the current acreage and distribution of northern spotted owl habitat within the project area.

> **Nesting, roosting and foraging (NRF) habitat** is characterized by forested stands with older forest structure with characters such canopy closure of 60 percent or greater, trees with large crowns, multiple canopy layers, snags and down wood. However, southwest Oregon NRF habitat varies greatly and one or more of these habitat components might be lacking or even absent.
>
> **Dispersal-only habitat** for spotted owls is defined as stands that typically have a canopy closure of 40 percent or greater, and are open enough for flight and predator avoidance, but do not meet the habitat criteria of NRF habitat. Dispersal-only habitat is used throughout this document to refer to habitat that does not meet the criteria of NRF (nesting, roosting, or foraging) habitat, but has adequate cover to facilitate movement between blocks of suitable NRF habitat.

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

The Medford District RMP provides direction for road management to "Develop and maintain a transportation system that serves the needs of users in an environmentally sound manner" (RMP p. 84). New road construction is needed to access BLM land currently inaccessible by roads and some roads in the Project Area need improvement to maintain or improve road surfaces, cross drains, and roadside drainage ditches to reduce road related erosion and sedimentation to stream courses. Road construction and improvements are designed for the Cottonwood Forest Management Project to provide access units proposed for forest management and to reduce road related erosion and sedimentation to stream courses.

D. DECISION FRAMEWORK

This Environmental Assessment will provide the information needed for the responsible official, the Ashland Resource Area Field Manager, to select a course of action to be implemented for the Cottonwood 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.

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

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

Contributes toward the Districts Allowable Sale Quantity

> The Cottonwood Forest Management Project is located on BLM-administered lands allocated to produce a sustainable supply of timber. Timber products removed to meet Timber Resource Objectives (ROD/RMP p.17, 72-73) would contribute toward the District's Allowable Sale Quantity.

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

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

E. LAND USE CONFORMANCE & LEGAL REQUIREMENTS

Conformance with Land Use Plans

The BLM initiated planning and design for this project to conform and be consistent with the Medford District's 1995 Record of Decision (ROD) and Resource Management Plan (RMP), which 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 1995 Medford District Resource Management Plan was amended by the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines.*

Statutes and Regulations

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

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

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

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

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

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

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

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

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

F. RELEVANT ASSESSMENTS AND PLANS

Watershed Analysis (USDI 2000)

Watershed Analysis is a procedure used to characterize conditions, processes and functions related to human, aquatic, riparian and terrestrial features within a watershed. Watershed Analysis is issue driven. Analysis teams of resource specialists identify and describe ecological processes of greatest concern in a particular "fifth field" watershed, and recommend restoration activities and conditions under which other management activities should occur. Watershed Analysis is not a decision making process. Rather, Watershed Analyses provides information and non-binding recommendations for agencies to establish the context for subsequent planning, project development, regulatory compliance and agency decisions (See Federal Guide for Watershed Analysis 1995 p. 1).

The Cottonwood Project Area falls within the Jenny Creek Fifth-field Watershed. Jenny Creek was designated under the 1995 Medford District RMP as a Tier 1 Key Watershed. Watershed Analysis was completed for the Jenny Creek Watershed in 1995. The watershed analysis focused on the use of existing information available at the time the analysis was conducted, and provides baseline information. Additional information, determined to be necessary for completing an analysis of the Cottonwood Forest Management Project, has been collected and is considered along with existing information provided by the 1995 Jenny Creek Watershed Analysis. Management Objectives and Recommendations provided by the Watershed Analysis were considered and addressed as they applied to the Cottonwood proposal.

Water Quality Restoration Plan for the Jenny Creek Watershed (2008)

The BLM is recognized by Oregon Department of Environmental Quality (DEQ) as a Designated Management Agency for implementing the Clean Water Act on BLM-administered lands in Oregon. The BLM signed a Memorandum of Understanding (MOU) 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 MOU, the BLM completed the Water Quality Restoration Plan (WQRP) for BLM-administered lands in the Jenny Creek Watershed (USDI 2011), within the Upper Klamath Subbasin. This document describes how the BLM will meet Oregon water quality standards for 303(d) listed streams on BLM-administered lands within the Jenny Creek Watershed. The WQRP was originally submitted to the DEQ in May 2008, prior to completion of the Total Maximum Daily Load (TMDL). The DEQ issued the Upper Klamath and Lost River Subbasins TMDL and Water Quality Management Plan (WQMP) in December 2010. The Jenny Creek WQRP was updated to reflect the Upper Klamath and Lost River Subbasins TMDL and re-submitted to the DEQ in January 2011. The DEQ has not responded with feedback on the BLM's WQRP.

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.

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

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

Southwest Oregon Fire Management Plan

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

entities and citizen initiatives. The FMP introduces fire management concepts addressing fire management activities in relation to resource objectives stated in the current Land and Resource Plans (parent documents) of the Federal agencies, the laws and statutes that guide the state agencies and private protective associations, and serve as a vehicle for local agencies and cooperators to more fully coordinate their participation in relation to those activities.

G. SCOPING AND ISSUES

Scoping is the process the BLM uses to identify issues related to the proposal (40 CFR 1501.7) and determine the extent of environmental analysis necessary for an informed decision. It is used early in the NEPA process to identify (1) the issues to be addressed, (2) the depth of the analysis, and (3) potential environmental impacts of the Proposed Action.

A letter briefly describing the Proposed Action and inviting comments was mailed to adjacent landowners, interested individuals, organizations, and other agencies on October 29. 2010. The BLM led a field trip to the project area on November 6, 2011. The purpose of the field trip was to view and discuss the project proposal in the field with interested individuals and organizations. Comments were originally requested to be received by December 1, 2010; the scoping period was extended to December 30, 2010 in response to a request from the public for additional time to prepare their comments. Comment letters received were reviewed by the interdisciplinary team of specialists and by the Responsible Official, the Ashland Resource Area Field Manager. Issues identified to be relevant to the analysis of the proposed action were incorporated into the list of relevant issues in Section G, 1, Relevant Issues.

1. Relevant Issues

An interdisciplinary (ID) team of resource specialists reviewed the proposal and all pertinent information, including public input received, and identified relevant issues to be addressed during the environmental analysis. Some issues identified as relevant to this project proposal were analyzed in association with broader level environmental analyses. Where appropriate, this EA will incorporate by reference the analysis from broader level NEPA documents (40 CFR § 1508.28), to be considered along with project specific analysis. The following issues related to the Proposed Action were identified by the interdisciplinary team based on internal and external scoping.

- Logging (particularly tractor yarding) and road construction could increase soil compaction, and alter hydrologic flow, including peak flow and low flow.
- There is potential for adverse effects to water quality from increased sediment produced from disturbance associated with timber harvest activities including road construction, timber yarding, and timber hauling.
- There could be short-term increases in sediment from roadbed and drainage ditch disturbance associated with road maintenance activities.
- Proposed tractor logging and road construction may cause soil compaction, displacement, and reduced site productivity.
- The effects of timber harvest and road construction, when combined with other past, ongoing, and reasonably foreseeable future actions on public and private lands, could potentially contribute to adverse cumulative effects to soils, water quality, hydrologic function, late-successional forest ecosystems, and other terrestrial and aquatic habitats.
- Increased sedimentation to streams from the implementation of the project proposal could potentially impact aquatic habitat and fish.

- What is the potential for effects to sensitive or listed fish species that reside downstream of the project area.

- Timber harvest and road construction has the potential to affect northern spotted owl nesting, roosting, foraging, and dispersal habitat; the northern spotted owl is listed as a Threatened species under the Endangered Species Act.

- Timber harvest, including the treatment of Douglas-fir dwarf mistletoe infected trees, could reduce the complexity of forest structure including vertical and horizontal diversity, snags, and downed wood that provides habitat for variety of wildlife species.

- Thinning in forest stands with latent infections of Douglas-fir dwarf mistletoe can stimulate the growth of mistletoe and its adverse effects on growth and vigor forest stands.

- Changes in forest structure lead to changes in habitat distribution for a variety of wildlife species, including Bureau Special Status species. People responding to scoping requests specifically mentioned or requested information northern spotted owls (also addressed under Threatened and Endangered Species) goshawks, rare birds, Pacific Fisher.

- Some commenters expressed concern for maintenance of old-growth forest or individual trees.

- Lower volumes associated with light thinning in many project units could affect the overall economic feasibility of project implementation.

- Seasonal restrictions for resource and fire protection reduce operating time which can affect economic feasibility of project operations.

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

- Forest management and logging can increase the risk of introduction and spread of noxious weeds.

- Timber harvesting would increase surface fuels over the short-term (6 months to 2 years) in stands treated. Some people expressed concern that logging slash be treated in a timely manner to mitigate fire hazard.

- 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.

- 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 affect air quality within the Project Area and surrounding areas.

- The Pacific Crest National Scenic Trail (PCNST) passes through several of the proposed thinning units. The area in the vicinity of the PCNST is designated by the Medford District RMP as Visual Resource Management (VRM) Area 2; project activities have the potential to impact landscape scenery as viewed from the PCNST.

- Some stated concerns that reopening closed roads that have somewhat recovered from previous use have greater impacts than the use of existing well-traveled roads.

- The 2005 Report *Logging to Control Insects: The Science and Myths Behind Managing Forest Insect "Pests"*, also known as the Black Report, was submitted by several commenters who suggested that logging could exacerbate insect and disease problems.

- Analysis should address the effects of managing forests on carbon storage.

- There is potential for effects to survey and manage species (wildlife and vascular and non-vascular plants).

- There is a potential for effects on levels of coarse woody material and snags that are needed to support the natural biota for the site as a result of project implementation.

- Is the Cottonwood Forest Management Project consistent with the Aquatic Conservation Strategy Objectives?

2. Issues Considered but not Further Analyzed

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

Manage the Project Area Consistent with the Cascade Siskiyou National Monument and Wilderness: Comments were received stating concerns that the implementation of the Cottonwood Project could disqualify the area for future inclusion in the Cascade Siskiyou National Monument and/or South Cascades Wilderness.

Rationale for Eliminating from Detailed Analysis: While there is a citizen's movement underway working to expand the boundaries of the CSNM and to create new wilderness areas, the Project Area is currently located on lands allocated by the 1995 Medford District RMP as Matrix lands with the primary objective of providing for long-term timber production. The BLM is obligated to managing the project area consistent with its current land use plan.

Additionally, portions of the project area that have been proposed as the Greensprings Mountain portion of the South Cascades Wilderness proposal have been previously analyzed for wilderness character by the BLM (Public Wilderness Proposal – Evaluation Form on file at Medford District BLM) and it has been determined that the area does not possess wilderness character. The BLM has retained authority to under Section 201 of FLPMA to inventory wilderness characteristics and to consider such information during land use planning.

Project units 30-1, 21-4, 20-3, 20-1, 20-2, and 17-6 are within the Greensprings Mountain portion of the South Cascades Wilderness Proposal. On 6/19/2006 a BLM Ashland Resource Area interdisciplinary team led by the Medford District Outdoor Recreation Planner analyzed the Greensprings Mountain portion of the South Cascades Wilderness proposal for its wilderness characteristics. (Public Wilderness Proposal – Evaluation Form on file at Medford District BLM, Proposal ID number: OR11 43). The wilderness characteristics analyzed were; is the area of sufficient size, is the unit in a natural condition, does the unit have outstanding opportunities for solitude, and does the unit have outstanding opportunities for primitive and unconfined recreation?

The analysis showed that the area did not possess sufficient size (5,000 contiguous acres). The Greensprings Mountain portion was also determined to not be in a natural condition due to the presence of old harvest units throughout. Outstanding opportunities for solitude were found to be lacking because the unit is within the rural interface area. It was also determined that the Greensprings Mountain portion of the proposed South Cascades Wilderness does not possess outstanding opportunities for primitive and unconfined recreation due to its lack of outstanding features. It was determined that there are no wilderness characteristics present in the Greensprings Mountain portion of the South Cascades Wilderness proposal.

Current condition of nearby LSRs: Commenters raised the question: "What is the current condition of the nearby LSRs? Are they functioning?"

Rationale for eliminating from detailed analysis: There are three mapped late-successional reserves with inclusions in the Jenny Creek Watershed: LSR 227 to the northeast, LSR 248 to the southwest and the previously designated Soda Mountain LSR 247 (now incorporated into the Cascade Siskiyou National Monument as Old-Growth Emphasis Area (USDI 2008, p. 26-27)). The BLM does not propose forest management within any of the nearby late-successional reserves. Because the Cottonwood Forest Management Project does not affect any of the above referenced reserves, NEPA does not require an analysis or discussion of the specific conditions of these LSRs as part of the Cottonwood Forest Management Project Environmental Assessment. The role of late-successional reserves as identified under the Northwest Forest Plan, was to provide for the maintenance and enhancement of a well distributed network of late-successional forests to provide habitat for populations of species associated with late-successional and old-growth forests (NWFP p. B-5; RMP, p. 32 and Appendix A). The Northwest Forest Plan EIS (FSEIS) recognized that late-successional reserves are composed of a variety of vegetation age classes; under Alternative 9 of the FSEIS (adopted and incorporated by the Medford District RMP), 42 percent of late-successional reserves were covered by late-successional forest (FSEIS, p. 3&4-39). The ability of these reserves to meet the objectives of the Northwest Forest Plan was analyzed and disclosed in the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl.

Lack of commercial logging can be a major asset for a community: Commenters suggested that no logging provides a greater economic benefit to communities than logging.

Rationale for elimination: The allocation of BLM-administered lands to commodity and non-commodity resource management occurred with BLM's Record of Decision and Resource Management Plan. About 30 percent of BLM-administered lands on the Medford District are allocated to timber resource management. The ROD and RMP was based on analysis contained in the Proposed Resource Management Plan Environmental Impact Statement (USDI 1994), which included an analysis of economic effects of various alternatives.

CHAPTER 2 - ALTERNATIVES

A. INTRODUCTION

This Chapter describes the Proposed Action developed by the ID Team to achieve the objectives and to respond to the need statements in Chapter 1. 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, are an essential part of the Proposed Action. The PDFs are included as features of the Proposed Action in the analysis of anticipated environmental impacts.

B. ALTERNATIVES ANALYZED IN DETAIL

1. Alternative 1 – No-Action

The No-Action Alternative describes a baseline against which the effects of the Proposed Action can be compared. This alternative describes the existing conditions and the continuing trends, given the effects of other present actions and reasonably foreseeable actions identified. Under the No-Action Alternative, no vegetation management would be implemented; there would be no commercial cutting of trees, no roads would be constructed or improved, and there would be no pre-commercial thinning or fuels reduction. The analysis of the No-Action Alternative answers the question: What would occur to the resources of concern, if the Proposed Action does not take place?

Only normal programmed road maintenance would be performed. Selection of the No-Action Alternative would not constitute a decision to reallocate these lands to non-commodity uses. The decision maker does not need to make a specific decision to select the "No-Action" Alternative. If that is the choice, the Proposed Action would simply be dropped and the decision process aborted. Future harvesting, other connected actions and road management in this area would not be precluded and could be analyzed under a subsequent NEPA document.

2. Alternative 2 - Proposed Action

Section a. below describes the Proposed Action in detail. A narrative and table summary of the Proposed Action (Table 3-1) is followed by a table of harvest units (Table 2-2), a road use table (Table 2-3), a table detailing proposed new road construction (Table 2-4), and a table detailing road decommissioning (Table 2-5). The tables of harvest units provide the following information for each unit: unit number, acreage, harvest prescription, harvest method, and associated fuels or precommercial thinning treatments. The road use and road construction tables provide details for project roads (existing or proposed) by road number, approximate length, surface type, and seasonal restrictions. The road decommissioning table identifies roads that would be decommissioned following harvest activities.

Section C, Components of the Proposed Action describes the silvicultural objectives and prescriptions, commercial harvest methods, fuels reduction treatments, required Project Design Features, silvicultural prescriptions, and fuels reduction treatments.

a. Description of the Proposed Action

Alternative 2, the Proposed Action, was developed to achieve the objectives described in Chapter 1, and the needs for the Cottonwood Forest Management Project. The Proposed Action would treat 1,108acres of vegetation using the various silvicultural prescriptions as described in Section C, 1. Pre-commercial thinning is proposed on 18 acres within the timber harvest Unit 32-5. Post-harvest fuels reduction would occur in commercial treatment units as identified.

Table 2-1 summarizes the project by silvicultural treatment prescriptions and timber harvest methods. Treatment prescriptions are described in more detail in Section C, 1, Silvicultural Objectives and Prescriptions. Unit specific information, including fuels reduction treatments are displayed in Table 2-2 and Maps 2-1, 2-2, 2-3 and 2-4.

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

Silvicultural Prescriptions	Est. Acres
Maintain NSO Nesting, Roosting, and Foraging Habitat	456
Maintain NSO Dispersal Habitat	652
Total	**1,108**
Non-commercial Prescriptions	**Est. Acres**
Pre-commercial Thinning within Commercial Units	18
Timber Harvest Method	**Est. Acres**
Cable Yarding	57
Tractor Yarding	1,051

Table 2-2. Units by Silvicultural Prescription and Harvest Method

Unit No.	Acres	Silvicultural Prescription		Harvest Method	Associated Treatments (PCT, Fuels)
		Forest Type	NSO Habitat Type		
4-1	13	White Fir Site	Dispersal	Tractor	Activity fuel
4-2	75	Mixed Conifer Site	Dispersal	Tractor	Activity fuel
5-1	19	White Fir Site	Dispersal	Tractor	Activity fuel
5-4	14	White Fir Site	NRF	Tractor	Activity fuel
5-5	2	White Fir Site	NRF	Tractor	Activity fuel
5-8	10	White Fir Site	NRF	Tractor	Activity fuel
5-9	8	White Fir Site	NRF	Tractor	Activity fuel
8-3	13	White Fir Site	NRF	Tractor	Activity fuel
8-4	53	White Fir Site	NRF	Tractor	Activity fuel
8-6	3	White Fir Site	NRF	Tractor	Activity fuel
9-1	30	White Fir Site	Dispersal	Tractor	Activity fuel
9-2	45	Mixed Conifer Site	Dispersal	Tractor	Activity fuel
17-2	38	White Fir Site	Dispersal	Tractor	Activity fuel
17-3	57	Mixed Conifer Site	Dispersal	Cable	Activity fuel
17-4	13	Mixed Conifer Site	NRF	Tractor	Activity fuel
17-5	19	Mixed Conifer Site	Dispersal	Tractor	Activity fuel
17-6	63	Mixed Conifer Site	NRF	Tractor	Activity fuel
20-1	32	Mixed Conifer Site	Dispersal	Tractor	Activity fuel
20-2	60	Mixed Conifer Site	NRF	Tractor	Activity fuel
21-1A	11	White Fir Site	NRF	Tractor	Activity fuel
21-1B	5	White Fir Site	NRF	Tractor	Activity fuel
21-1C	19	White Fir Site	NRF	Tractor	Activity fuel
21-2	64	Mixed Conifer	Dispersal	Tractor	Activity fuel
21-3	79	Mixed Conifer	Dispersal	Tractor	Activity fuel
21-4A	67	Mixed Conifer	NRF	Tractor	Activity fuel
21-4B	12	Mixed Conifer	NRF	Tractor	Activity fuel

Unit No.	Acres	Silvicultural Prescription		Harvest Method	Associated Treatments (PCT, Fuels)
		Forest Type	NSO Habitat Type		
21-5	16	White Fir	Dispersal	Tractor	Activity fuel
28-3	35	Mixed Conifer	NRF	Tractor	Activity fuel
30-1	40	Mixed Conifer	NRF	Tractor	Activity fuel
30-2	22	Mixed Conifer Site	NRF	Tractor	Activity fuel
30-3	6	Mixed Conifer Site	NRF	Tractor	Activity fuel
32-2	14	White Fir Site	Dispersal	Tractor	Activity fuel
32-3	60	White Fir Site	Dispersal	Tractor	Activity fuel
32-4A	2	Mixed Conifer Site	Dispersal	Tractor	Activity fuel
32-4B	13	Mixed Conifer Site	Dispersal	Tractor	Activity fuel
32-5	18	Mixed Conifer Site	Dispersal	Tractor	PCT/Activity fuel
33-1	11	White Fir Site	Dispersal	Tractor	Activity fuel
33-2	13	White Fir Site	Dispersal	Tractor	Activity fuel
33-3	34	White Fir Site	Dispersal	Tractor	Activity fuel
Total	**1,108**				
Abbreviations: NSO = Northern Spotted Owl NRF = Nesting, Roosting, Foraging					

The Proposed Action would construct approximately 1.5 miles of new road to provide access to proposed Units 20-1, 20-2, and 28-3(Map 2-4, Table 2-4). Up to 6temporary operator spurs, each ranging from 50 to500 feet in length (for a total of 0.1 to 0.6 miles), could be constructed to facilitate temporary access for timber harvesting. Two of the temporary spurs are located outside of Units 17-4 and17-5(Maps 2-3 and 2-4). Up to four temporary operator spurs (50 to 500 feet in length) are identified along the boundary of Units 17-2 and 17-3 to facilitate temporary access to Unit 17-3 (Map 2-3). For analysis purposes it is assumed all six temporary spur roads would be constructed. Temporary operator spurs identified for the Cottonwood Project are not located or designed for general transportation uses. They would be constructed with a narrower clearing and road width, and would have no turnouts or culverts. Construction, log removal, waterbarring, seeding with native seed, mulching, and barricading would occur prior to the wet season of the year of construction.

Two designated skid trails were identified outside of existing units in order to avoid skid trail crossings on the PCNST in Units 21-2 and 21-4A. A third designated skid trail was identified outside of units to provide additional access for harvesting the bottom of Unit 21-4B. A fourth designated skid trail is located outside of Unit 21-1A to harvest the upper slope of the unit. Designated skid trails differ from temporary operator spur roads, in that they are only used for skidding equipment (tractor or skidder) and are not designed to accommodate log trucks (Map 2-4).

An estimated 36 miles of existing roads would be used as haul routes and maintained as needed to meet BLM road maintenance standards identified in BLMs Western Oregon Districts Transportation Management Plan. The following road improvements are identified for the Cottonwood Project.

> Road 39-3E-21.2 would have a log and earth barricade removed. The road would be brushed and saplings in the running surface would be removed. Grass growing in the roadbed would not be bladed off unless needed to reduce fire danger. Road grading would only occur in areas needing drainage improvement or for safe passage of vehicles. After harvest operation is completed the road would be water barred and the log and earth barricade would be replaced.

Road 39-3E-17.3 had trees across the road in the past; forest users created a very sinuous route as a result of driving around the trees. The slash created from the fallen trees would be spread over the user created route to restore the road and forest traffic to the correct location.

Road 39-3E-9.05 would need widening for safety at the junction of the 9.05 and 39-3E-3.00. At about milepost 0.18 the road crosses a stream through a stream ford. The corner just north of the ford would be widened to accommodate log truck travel. The road would need light brushing but would not need blading or any work to the road surface. After the harvest operation is complete the road would be decommissioned. There are underground utilities running along the 39-3E-3.00, they would need to be located before constructing a barricade.

Approximately 1.9 miles of road would be decommissioned under the proposed action (Table 2-5).

Table 2-3. Alternative 2 Existing Roads to be Used for Haul in the Project Area

Road Number	Approx. Length (miles)	Existing Surface:	Control	Seasonal Restriction (for log hauling)
38-3E-19.00 A-B	3.03	BST	BLM	0
38-3E-32.00 A	1.93	ASC	BLM	1
38-3E-32.00 B	0.85	NAT	BLM	2
38-3E-32.03	0.30	NAT	BLM	2
38-3E-32.05	0.22	NAT	BLM	2
38-3E-33.00	2.90	ASC	BLM	1
38-3E-33.02	0.40	NAT	BLM	2
38-3E-33.03	1.20	ASC	BLM	1
38-3E-33.04	1.00	ASC	BLM	1
39-3E-03.00 A-C	2.43	ASC	BLM	1
39-3E-03.00 D	0.15	ASC	PVT	1
39-3E-03.00 E	1.33	ASC	BLM	1
39-3E-05.03 A	0.40	ASC	BLM	2
39-3E-05.03 B	0.16	NAT	BLM	2
39-3E-08.01	0.20	NAT	BLM	2
39-3E-08.02	0.25	NAT	BLM	2
39-3E-09.01 A	0.42	ASC	BLM	1
39-3E-09.02	0.29	NAT	BLM	2
39-3E-09.03	0.80	NAT	BLM	2
39-3E-09.05	0.88	NAT	BLM	2
39-3E-17.00 A1-A2	1.08	ASC	BLM	1
39-3E-17.02	0.20	NAT	BLM	2
39-3E-17.03	0.53	NAT	BLM	2
39-3E-21.00 A	2.21	ASC	BLM	1
39-3E-21.02	1.30	NAT	BLM	2
39-3E-27.08	0.20	NAT	BLM	2

Road Number	Approx. Length (miles)	Existing Surface:	Control	Seasonal Restriction (for log hauling)
39-3E-27.08	1.12	NAT	PVT	2
39-3E-29.00	0.80	PRR	BLM	1
39-3E-30.00	0.07	PRR	BLM	1
39-3E-32.00 A-D	1.81	PRR	BLM	1
40-3E-03.00	2.98	BST	BLM	0
Little Hyatt Prairie Rd.	4.42	ASC	CNTY	1
Total mileage	**35.86**			

Table 2-4. Alternative 2 - Proposed New Road Construction in the Project Area

Road Number	Approximate Length (miles)	Existing Surface:	Control	Possible Improvements	Seasonal Restriction
		Depth (inches) and Type		Depth (inches)	(for log hauling)
39-3E-28.02	0.20	NAT	BLM	New Construction	2
39-3E-17.04	1.30	NAT	BLM	New Construction	2
Total mileage:	**1.5**				

Table -2-5. Alternative 2 - Proposed Road Decommissioning in the Project Area

Road Number	Approximate Length (miles)	Existing Surface:	Control	Seasonal Restriction
		Depth (inches) and Type		(decommissioning)
39-3E-5.04	0.66	NAT	BLM	2
39-3E-5.05	0.15	NAT	BLM	2
39-3E-9.05	0.93	NAT	BLM	2
39-3E-9.06	0.16	NAT	BLM	2
Total mileage:	**1.90**			

Abbreviations:

NAT = Natural, GRR = Grid Rolled Rock, PRR = Pit Run Rock, ASC = Aggregate Surface Course, ABC = Aggregate Base Course

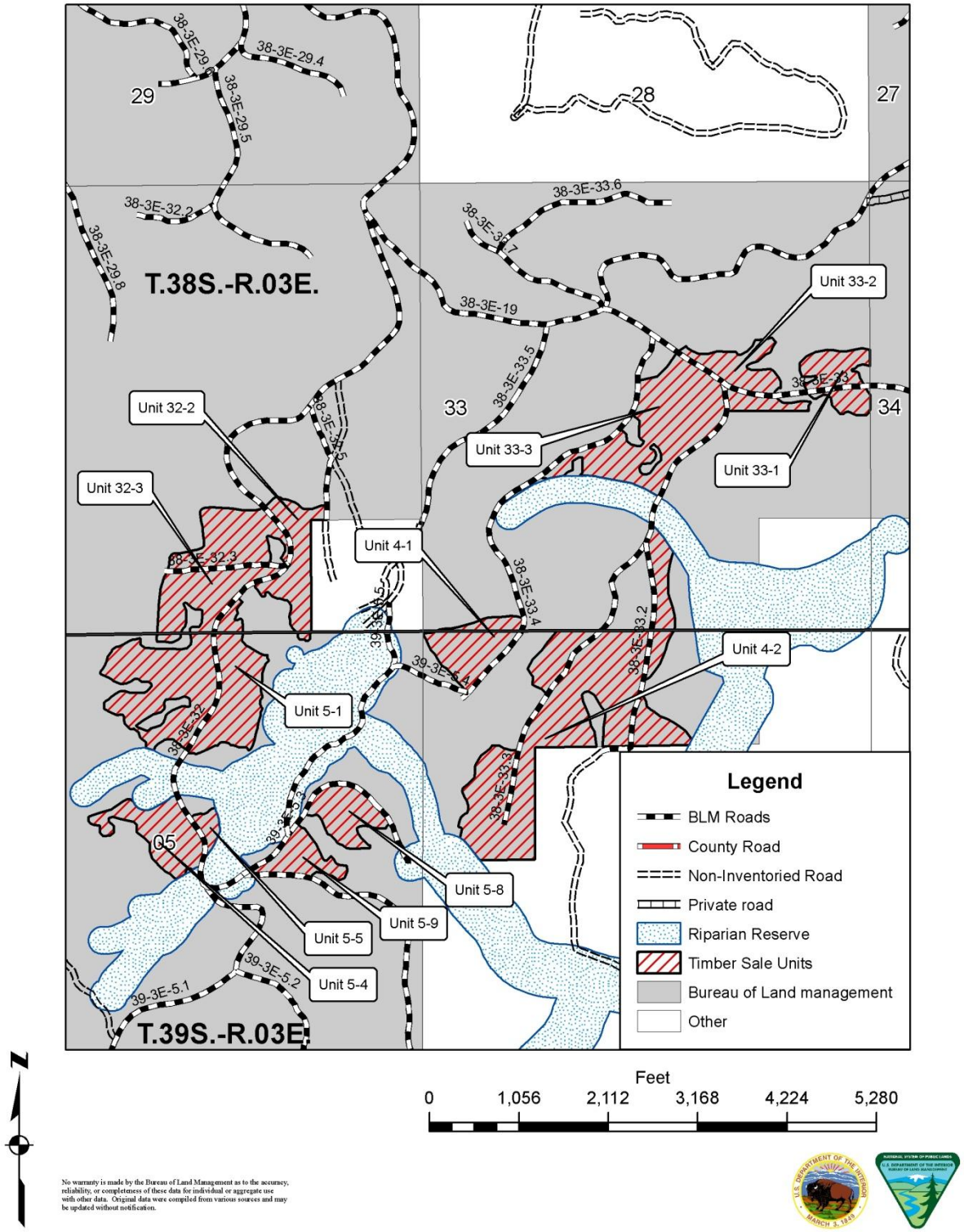
BLM = Bureau of Land Management, PVT = Private

Seasonal Restrictions:

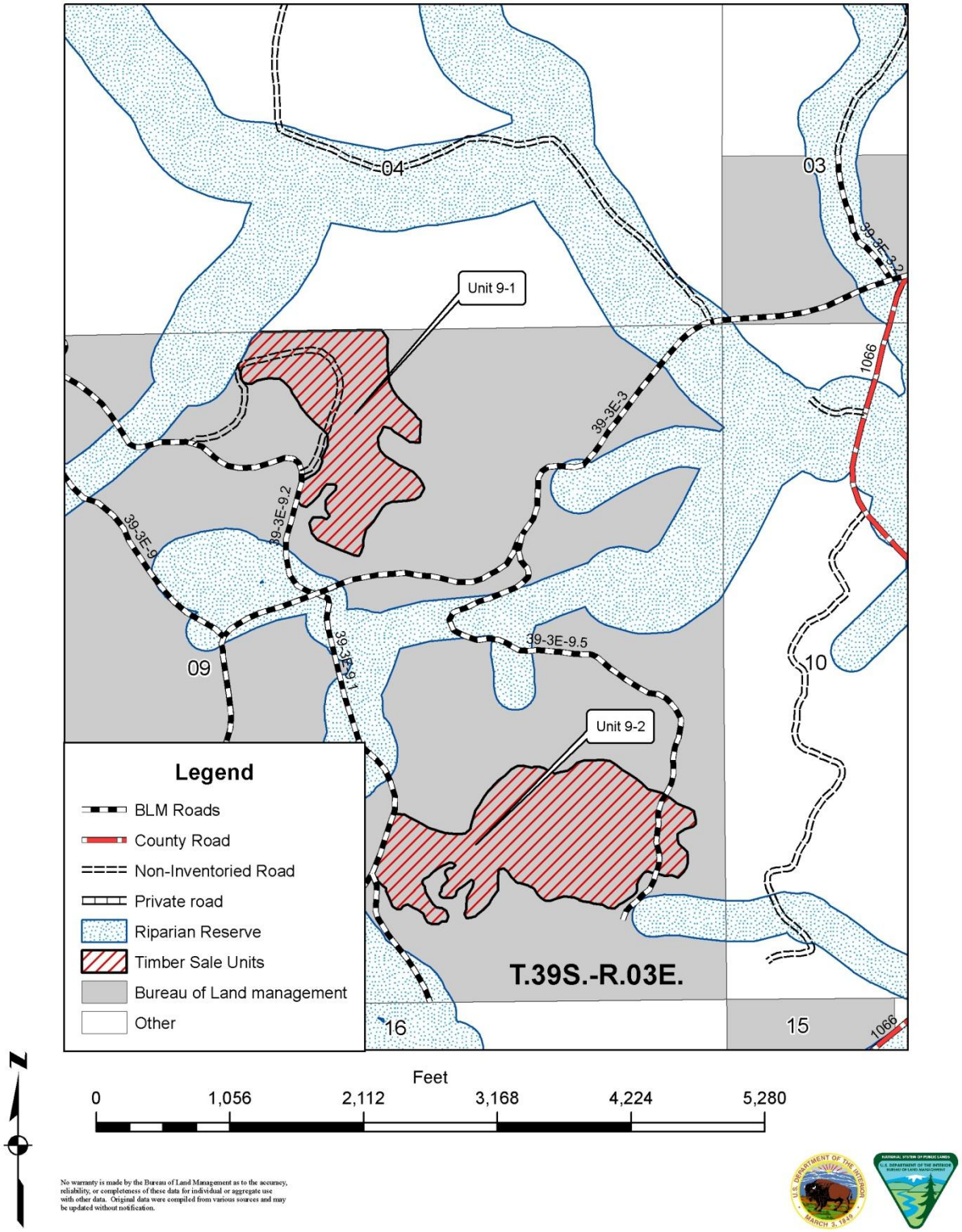
0 = no restrictions; 1 = hauling restricted between October 15th and May 15th;
2 = hauling restricted between October 15th and June 15th
Restrictions may be waved during frozen conditions

If additional rock is placed on haul roads seasonal restrictions could be modified as approved by the Authorized Officer.

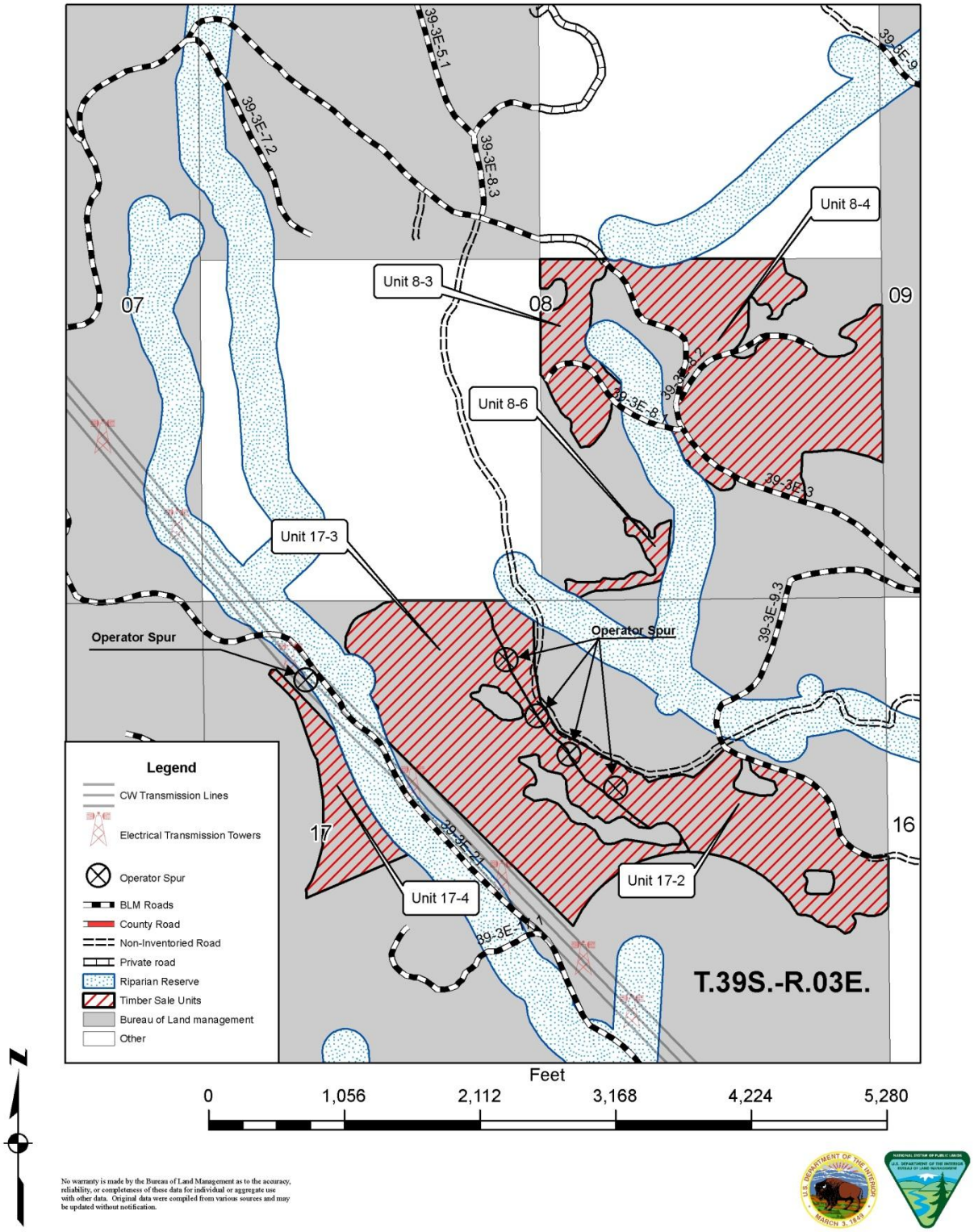
Map 2-1. Alternative 2 – Proposed Action



Map 2-2. Alternative 2 – Proposed Action

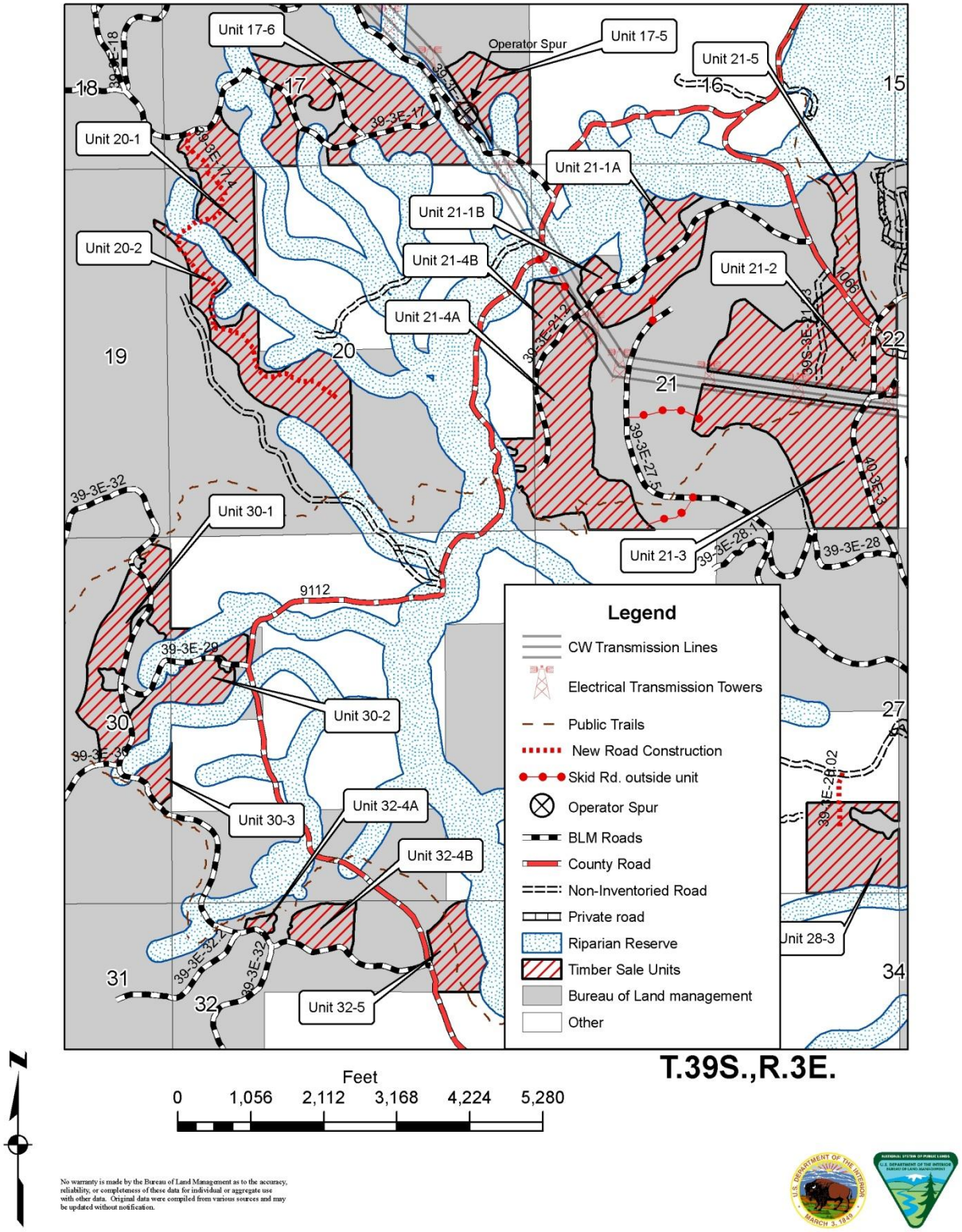


Map 2-3. Alternative 2 – Proposed Action



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

Map 2-4. Alternative 2 – Proposed Action



C. Components of the Proposed Action Alternative

1. Silvicultural Objectives and Prescriptions

The silvicultural objectives for harvest are as follows: 1) Reduce stand density to increase tree growth, quality, and vigor of the remaining trees while maintaining existing owl habitat; 2) Create diversified stand structure (height, age, and diameter classes) and old-growth stand characteristics; 3) Increase growing space and decrease competition for large or legacy pine, oak, and cedar (preserve existing genotypes which are physiologically better adapted to fire disturbance).

Trees would be marked for thinning within proposed treatment units by BLM personnel, with oversight from the Ashland Resource Area's silviculturist and wildlife biologist, to ensure that treatment units are marked according to the silvicultural prescriptions.

Northern Spotted Owl Nesting, Roosting, Foraging Habitat (NRF)
Forest stands that are currently providing for northern spotted owl nesting, roosting, and foraging habitat would be thinned to maintain NRF habitat function. The complex forest structure that forms NRF habitat consists of dead down wood, snags, dense canopy, multi-storied stands, or mid-canopy habitat. However, southwest Oregon NRF habitat varies greatly and one or more of these habitat components might be lacking or even absent. Vegetative features of NRF habitat in southwest Oregon are typified by mixed-conifer habitat, recurrent fire history, and patchy habitat components. The silvicultural strategy here includes the use of selective thinning.

Selective thinning in NRF habitat is designed to accelerate the growth of large trees while maintaining a minimum of 60 percent canopy cover at the stand level. Canopy cover is the proportion of the forest floor covered by the vertical projection of tree crowns. Canopy cover is usually estimated with devices like the moosehorn, aerial photography, or remote imagery. Spacing of the residual (leave) trees would involve crown spacing off the healthiest dominant and co-dominant trees to achieve an average crown spacing range of 1-6 ft. (dripline to dripline) at the stand level. Trees targeted for removal should include those with crown ratios less than 30%, exhibit crown decline, narrow crown widths, and contribute least to the canopy layer. Trees would be individually selected for removal that demonstrate these characteristics, unless it compromises the required minimum canopy cover of 60%. Spacing of the residual trees would use the crown widths of the healthiest dominant and co-dominant trees to achieve an average relative density range of 0.35 to 0.55 (35 to 55%). Relative density is the ratio of actual stand density to the maximum stand density attainable in a stand with the same mean tree volume.

Northern Spotted Owl Dispersal Habitat (DSP)
Forest stands that are currently providing for northern spotted owl dispersal only habitat would be thinned to retain approximately 40 percent canopy cover to maintain the current distribution of dispersal habitat. Dispersal habitat is described as forested habitat greater than 40 years old with an average tree diameter of 11 inches, a canopy cover of about 40 percent or more, and flying space for owls in the understory.

Stands in DSP habitat that meet the above criteria would be selectively thinned to accelerate the growth of large trees while maintaining approximately 40 percent canopy cover at the stand level. Spacing of the residual (leave) trees would involve crown spacing off the healthiest dominant and co-dominant trees to achieve an average crown spacing range of 3-15 ft. (dripline to dripline)at the stand level. Trees targeted for removal should include those with crown ratios less than 30%, exhibit crown decline, narrow crown widths, and contribute least to the canopy layer. Trees wouldbe individually selected for removal that demonstrate these characteristics, unless it compromises the required minimum canopy cover of 40%. Spacing of the residual trees would use the crown widths of the healthiest dominant and co-dominant trees to achieve an average relative density range of 0.25 to 0.45 (25 to 45%).

Figure 3-1. Photographs Illustrating >60% Canopy Cover (left) and 40% Canopy Cover (right)

Mixed Conifer Stands

These stands are comprised of a mix of tree species including Douglas fir, ponderosa pine, sugar pine, incense cedar, and white fir. Thinning objectives for mixed conifer stands are to improve tree vigor and growth, maintain a larger proportion of Douglas-fir species while maintaining the highest diversity of mixed conifer species for the stand. Species composition of the forest must be considered as well as individual tree physiology. A minimum of 20 percent early seral species should be maintained in the mixed conifer forest stands as described by Franklin and Dyrness (1973). Therefore, selection of treatment trees would be based on 1) species; 2) tree dominance; 3) age class or diameter; and 4) individual tree characteristics. Suitable sugar pine, Douglas-fir, incense cedar, and ponderosa pine (disease free, non-chlorotic, sugar pine, Douglas-fir, incense cedar, and ponderosa pine with crown ratios $\geq$ 30%) would be favored for leave over white fir. Leave 100-140 sq. ft. basal area per acre (BA/AC)[1] in DSP habitat and 160-200 sq. ft. BA/AC in NRF habitat at the stand level.

White Fir Stands

Stand density retention is relatively higher for white fir stands for several reasons: 1.) To prevent frost damage to conifer regeneration; 2.) To avoid basal scarring to residual white fir due to frost cracks; 3.) To decrease the likelihood of gopher damage. Avoid mechanical damage to white fir crop trees. The most susceptible trees occur after mechanical or fire injury. Consider potential tree wounding from mechanical damage from logging when selecting a leave tree, especially white fir (thin bark) leave trees. Strategically mark trees to limit basal scarring during commercial entry. Leave 120-160 sq. ft. BA/AC in DSP habitat and 160-200 sq. ft. BA/AC in NRF habitat at the stand level.

General Guidance Applicable to all Silvicultural Prescriptions

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

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

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

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

- Large diameter limbs indicating that the tree was once open grown and had a large crown. Limbs (live or dead) are usually heavy and gnarled, are covered with mosses and lichens, and are close to the ground.

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

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

Trees with bird nests, wildlife cavities, wide forks with flat nesting spots, or loose bark (bat roosts) would be not be removed.

Leave all snags of various size and decay classes (safety hazard trees required to be felled would be left on the forest floor to provide coarse woody material). Favor large deformed or unique green trees in the stand for future snag recruitment. When available, leave green trees (any diameter) immediately adjacent to snags that are greater than 20 inches dbh. These trees will provide additional structural and habitat diversity.

Leave all coarse woody debris of various size and decay classes. When available, leave green trees (any diameter) immediately surrounding large (greater than 20 inches dbh and 8 feet in length) pieces of coarse woody debris. Retention of green trees would minimize coarse woody debris disturbance and maintain the functional integrity of the coarse woody debris.

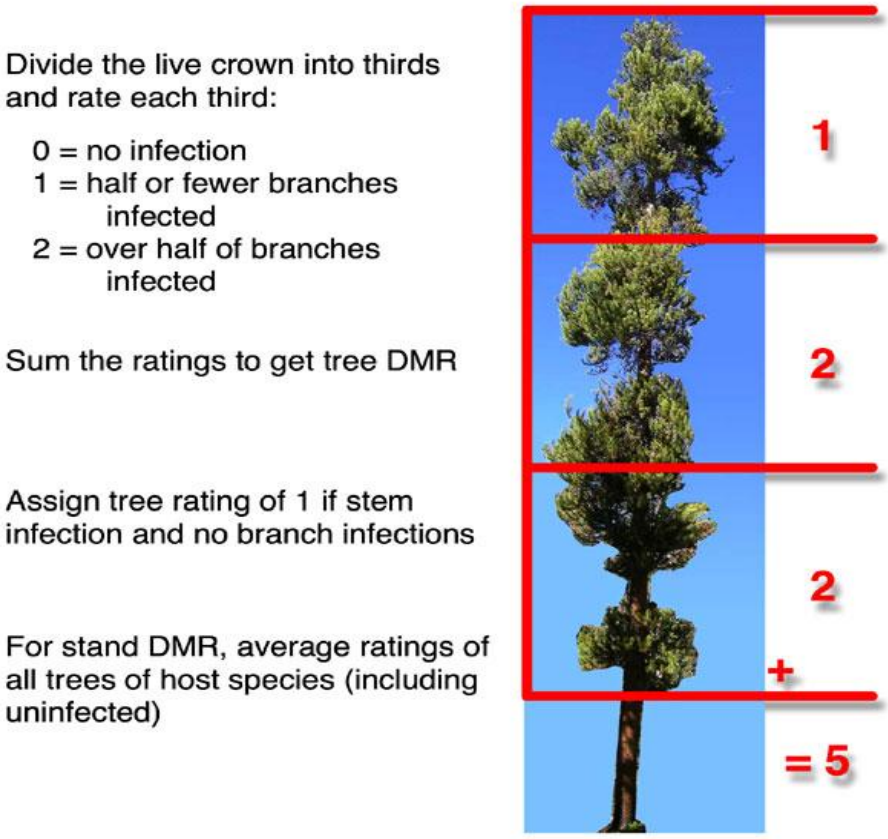
Do not mark hardwoods >8 inches dbh for cut. Leave large hardwoods for stand diversity. Never mark a conifer with its crown entangled in a hardwood tree.

Thin around large (>20” dbh) or old-growth pine, oak and cedar trees. Protect these tree species by increasing growing space and decreasing competition around these trees. Mark all competing conifers around the leave or center tree twice the distance of the trees dripline (distance from tree bole to dripline). Leave all trees in a group if they exhibit old-growth characteristics. Trees that exhibit old-growth characteristics should be preferred over tree size when selecting an individual or group to protect. Trees that are associated with old-growth trees and create a unique type of stand structure or wildlife habitat shall not be marked.

Where root disease is encountered, infection centers should be marked to favor resistant species. When infection centers are identified, mark all symptomatic trees within the infection area if prescribed canopy cover is not compromised at the stand level. Mark white fir trees found within infection centers and Douglas-fir trees found only in laminated root rot areas. Douglas-fir and white fir trees within these disease centers would be retained for wildlife habitat if they meet the description of old-growth trees. Identify all marked root disease infection centers on map for inventory and tree planting opportunities. Leave all non-symptomatic incense cedar, sugar pine, and ponderosa pine trees within infection centers.

Where mistletoe is encountered, target heavily infected trees for removal first, then, focus on leaving resistant species (sugar pine, ponderosa pine, incense cedar, and white fir), followed by uninfected or the least infected Douglas-fir trees with infections confined to the lower third of the tree (Douglas-fir Mistletoe Rating [DMR] Ratings 1-2, Figure 2-2). Dwarf mistletoe infected trees may be marked for treatment if prescribed canopy cover retention for the stand is not compromised.

Figure 2-2. Douglas-fir Dwarf Mistletoe Rating (DMR) System



Source: The American Phytopathological Society, 2006

2. Commercial Harvest Methods

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

(a) **Tractor Skidding:** utilizes tractors to drag trees to landing locations. This method requires narrow skid trails (about 9 to 12 feet wide). Skid trail locations are approximately 150 feet apart, and vary depending on the site-specific terrain, and are pre-designated by the purchaser and approved by the BLM sale administrator. Pre-located skid trails minimize the area of ground a tractor operates on, thus, minimizing soil disturbance. Existing skid trails would be used whenever feasible. Trees posing safety hazards would be removed, and trees in skid trails and landing areas may be removed when operationally required.

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

3. Fuels Reduction Treatments

Post-harvest fuels reduction would occur in commercial harvest units, as identified in Table 2-2, to treat small diameter fuels generated from harvest activities. Small diameter slash (generally 3 inches diameter and less) created from forest thinning (activity fuels) would be cut, handpiled, and covered with plastic following completion of timber harvest operations. Pile burning is usually completed within 6 months to 2 years of timber harvesting depending on the time of year the harvest occurred; slash needs a period of time to cure before burning can take place. 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 5 years of initial treatments. Prescribed maintenance 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 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.

4. Project Design Features

Project Design Features **(**PDFs) are an integral part of the Proposed Action (Alternative 2). PDFs include seasonal restrictions on many activities in order to minimize erosion and reduce disturbance to wildlife. PDFs also outline protective buffers for sensitive species, mandate the retention of snags, and delineate many measures for protecting Riparian Reserves throughout the project. 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. A review of forest management impacts on water quality concluded that the use of BMPs in forest operations was generally effective in avoiding significant water quality problems, however the report noted that proper implementation of BMPs was essential to minimizing non-point source pollution (Kattelmann, 1996). BMPs would be monitored and, where necessary, modified to ensure compliance with Oregon Water Quality Standards.

a. Riparian Reserves

Northwest Forest Plan (NWFP) Riparian Reserves, as incorporated by the Medford District RMP, are located on federal lands throughout the planning area. A BLM stream survey crew conducted surveys within the Cottonwood planning area in order to ensure that all areas needing Riparian Reserve protection were identified. The survey crew assessed stream conditions, documented the location of wetland and unstable areas, and determined whether stream channels were perennial, intermittent, or dry draws (USDA and USDI 1994:C30-C31).

Stream maps were updated with the new information. Riparian Reserves are excluded from commercial treatment units by clearly marking unit boundaries on the ground. Riparian Reserve widths were determined site-specifically using the NWFP Standards and Guidelines (USDA and USDI 1994: C-30-31) and the *Jenny Creek Watershed Analysis* (USDI and USDA 1995:90-93). See Maps 2-1 to 2-4 for Riparian Reserve locations for the Cottonwood project area. Site specific widths for each Riparian Reserve have been mapped in GIS and would be implemented under the Proposed Action Alternative. Riparian Reserve widths in the Cottonwood project area are as follows:

(1) Fish streams: 340 distance on each side of the stream.
(2) Perennial nonfish-bearing streams: 170 feet slope distance on each side of the stream.
(3) Intermittent nonfish-bearing streams: 170 slope distance on each side of the stream. Intermittent streams have a defined channel, annual scour and deposition, and are further described as short duration or long duration:
    Short Duration Intermittent: A stream that flows only during storm or heavy precipitation events. These streams can also be described as ephemeral streams.
    Long-duration intermittent stream: A stream that flows seasonally, usually drying up during the summer.
(4) Unstable and potentially unstable ground: the extent of the unstable and potentially unstable ground.
(5) Springs, seeps and other non-stream wetlands less than one acre in size, the wetland and the area from the edges of the wetland to the outer edges of the riparian vegetation. For this project, a buffer of 100 feet is being implemented to meet this requirement.
(6) Constructed ponds and reservoirs, wetlands greater than one acre in size – Riparian Reserves consist of the body of water or wetland and: the area to the outer edges of the riparian vegetation, or the extent of the seasonally saturated soil, or the extent of unstable or potentially unstable areas, or to a distance equal to the height of one site potential tree, or 150 feet slope distance from the edge of the wetland greater than 1 acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is the greatest. For this project, a buffer of 170 feet is being implemented to meet this requirement.

b. Harvest and Yarding

Objective 1: Protect Riparian Reserves

(1) No commercial harvest or pre-commercial thinning in Riparian Reserves. *
(2) Trees would be directionally felled away from Riparian Reserves. *
(3) No logging slash would be piled within Riparian Reserves.
(4) Springs, seeps and other non-stream wetlands less than one acre in size, the wetland and the area from the edges of the wetland to the outer edges of the riparian vegetation. For this project, a buffer of 100' is being implemented to meet this requirement.

Objective 2: Prevent Offsite Soil Erosion and Soil Productivity Loss

(1) When operationally feasible, all units would be yarded in such a way that the coarse woody material remaining after logging would be maintained at or greater than current levels in order to protect the soil surface and maintain soil productivity. *
(2) Wherever trees are cut to be removed, directional felling away from dry draws and irrigation ditches would be practiced. Trees would be felled to the lead in relation to skid trails. Irrigation ditches in the project area would be protected from damage and kept free 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% of the harvest unit. Existing skid trails would be utilized when possible. Tractors would be equipped with integral arches to obtain one end log suspension during log skidding. Skid trail locations would avoid ground with slopes over 35 percent and areas with high water tables, although tractor operations on short pitches exceeding 35% would be permitted. The intent is to minimize areas affected by tractors and other mechanical equipment (disturbance, particle displacement, deflection, and compaction) and thus minimize soil productivity loss. *

(4) All skid trails would be waterbarred according to BLM standards. Main tractor skid trails where they intersect haul roads and at landings would be blocked with an approved barricade and/or slash scattered to preclude OHV use. The intent is to minimize erosion and routing of overland flow to streams by decreasing disturbance (e.g., unauthorized use by OHVs). *
(5) Tractor yarding on designated skid trails would occur between June 15 to October 15 or on approval by the Contract Administrator. Some variations in these dates would be permitted dependent upon weather and soil moisture conditions. Operations using a harvester-forwarder would not be limited to 12% designated yarding trails and would be limited to soil moisture conditions less than 15% by weight at a three inch depth or on a snow pack. Units 32-2, 5-1,5-4, 17-5, 21-1 would have main skid trails designated to facilitate yarding during all types of harvesting except during snow conditions. In most cases, the skid trail designation would facilitate adverse skidding across the contour of the slope. The intent is to minimize compaction and off-site erosion and sedimentation to local waterways.
(6) Tractor yarding or harvester-forwarder operations would be allowed on snow only when the snowpack is sufficient to protect the soil. Tractor yarding or harvester-forwarder operations would be allowed to start when there is a minimum of twenty-four (24) inches of snow. No logging would be allowed once the snow depth deteriorates below eighteen inches of snow to protect soil from compaction (RMP p. 166)*. Skid trail spacing and soil moisture requirements would be waived if tractor yarding on snow occurs.
(7) The BLM would immediately shut down all timber harvest and yarding operations if excessive soil damage would occur due to weather or soil moisture conditions.
(8) Where skidding is proposed on existing roads within Riparian Reserves (along powerline), following use the road would be sufficiently waterbarred and native seed and weed free mulch applied to attain a minimum of 80 percent ground cover.

c. Fuels & Prescribed Fire

Objective1: Prevent Offsite 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 (USDI 1995:167).
(4) Piles would be dispersed across treatment areas. Piles would be burned when soil and duff moisture are high.
(5) Any containment lines constructed for fuels projects shall be sufficiently blocked along their entire length to preclude use by OHVs. This would include such measures as placing logs and slash, falling trees less than 8” dbh (excluding Riparian Reserves) or other actions as necessary.
(6) Vegetation would be thinned using manual techniques. Slash created by the project would be hand piled or lopped and scattered.
(7) 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. *
(8) Old skid roads would not be treated near the intersections with system roads in order to provide a visual screen and discourage vehicular access.
(9) Crossings through dry draws would be limited and approved by authorized officer; vehicles or equipment would not drive up the draw bottoms. *

Objective 3: Protecting Riparian Reserves

(1) No Mechanical piling allowed off of roads or landing areas. No mechanical piling would occur within Riparian Reserves. *

d. Roads and Landings

Objective 1: Protect Riparian Reserves

(1) No construction of new landings or expansion of old landings would be allowed in Riparian Reserves. *
(2) Landings within riparian reserves used during project implementation would be treated to reduce soil erosion. Treatment of the running surface would be dependent on site conditions and may include subsoiling, which would lift and fracture the compacted surface in place to a depth of 18 inches. Mulch and seed with native grasses or other approved material is required. If practical, the landings shall then be blocked sufficiently to preclude vehicles.
(3) Where new road construction occurs within Riparian Reserves, consider fords versus culverts. Appropriate sized fractured rock shall be used within the channel for fords. Approaches on either side of fords shall be rocked for a minimum of 150 feet (per RMP pg. 162) for both new construction and ford construction on existing roads.
(4) Dewatering would be required for any in-channel construction where surface water is present. Generally, this would require conveying clean water around the site and capturing and pumping any turbid water generated at the construction site.

Objective 2: Prevent Offsite Soil Erosion

(1) Road and landing construction, decommissioning and road maintenance would not occur during the wet season (October 15th to June 15th) when the potential for soil erosion and water quality degradation exists. This restriction could be waived under dry conditions and a specific erosion control plan (e.g., rocking, waterbarring, seeding, mulching, barricading). All construction activities would be stopped during a rain event of 0.2 inches or more within a 24-hour period or if determined by the administrative officer that resource damage would occur if construction is not halted. If on-site information is inadequate, measurements from the nearest Remote Automated Weather Station would be used. Construction activities would not occur for at least 48 hours after rainfall has stopped and on approval by the Contract Administrator. *
(2) Bare soil due to road and landing construction/renovation would be protected and stabilized prior to fall rains to reduce soil erosion and sediment potential. Methods used would be dependent on site conditions and may include: mulch and seed with native grasses or other approved seed; surface with durable rock material; or leave "as is" where natural rock occurs or where vegetation/topography prevents movement of sediment. *
(3) Fill slopes on all new roads and landings would be seeded with native or approved seed, fertilized, and mulched, except where rock occurs. *
(4) Slash would be windrowed at the base of newly-constructed fill slopes to catch sediment. *
(5) Temporary routes, also referred to as short operator spurs (50 to 500 feet) and roads identified for decommissioning would be closed by placing logs, slash, boulders, earthen berms, and other material at the entrance and throughout its length sufficient to preclude vehicle use, and waterbars would be constructed. Mulch and seed with native grasses or other approved material is required within Riparian Reserves. Roads used during the timber sale shall be treated at the completion of log haul and within the same season as constructed/opened. Work would be done between June 15th to October 15th. *
(6) All natural surface roads would be closed during the wet season (October 15th to June 15th) to protect roads from damage and to decrease the potential for off-site sediment movement. Some variations in these dates would be permitted dependent on weather and soil moisture conditions on roads. *
(7) Previously closed roads that have been identified and analyzed for use and all newly constructed native surface roads shall be adequately blocked at the entrance and if applicable along its length to preclude vehicle use.

Objective 3: Protect Natural Discharge Patterns

(1) Where possible, rolling grades and outsloping would be used on road grades that are less than 8%. These design features would be used to reduce concentration of flows and minimize accumulation of water from road drainage.
(2) Cross drain structures (culverts, water dips, waterbars) would be installed at intervals not greater than the spacing distances identified in the RMP (USDI 1995:177) 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.
(4) 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. *

e. Applicable Culvert Installation/Replacement and Ford Installation

Objective 1: Reducing or Eliminating Surface Soil Erosion

(1) Fill material over stream crossing structures would be stabilized as soon as possible after construction/decommissioning has been completed, before October 15. Exposed soils would be seeded and mulched with native materials or weed free straw. Work would be temporarily suspended if rain saturates soils to the extent that there is potential for environmental damage, including movement of sediment from the road to the stream. *
(2) Waste stockpile and borrow sites would not be located within Riparian Reserves. *
(3) Where surface water is present, sediment and erosion controls would be used during construction to minimize stream sedimentation. Sediment control techniques may include, but are not limited to, settling ponds, silt fences, straw wattles, straw bales, or geotextile fabric or coconut fiber bales. Sediment and erosion controls would be placed immediately (within 10 feet) downstream of the instream work to reduce sediment movement downstream from the project site. *

f. Hauling

Objective 1: Prevent Offsite Soil Erosion

(1) No hauling would occur on natural surfaced roads during the wet season (October 15th to June 15th). This would protect the road from damage and decrease the potential for off-site sediment movement. Some variations in these dates would be permitted dependent upon weather and soil moisture conditions of the roads.
(2) Hauling would be allowed between May 15th and November 15th on roads surfaced with at least 6 inches of pit-run rock or 8 inches of crushed rock.
(3) Winter hauling would be allowed on paved roads or any road when at least 4 inches of packed frozen snow is present on hauling roads. Snow plowing would maintain at least 4 inches of packed snow on hauling roads.
(4) Dust abatement would include water or lignin.

g. Quarries

Objective 1: Protect Riparian Reserves

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

Objective 2: Prevent Offsite Soil Erosion

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

h. Oil and Hazardous Materials & Emergency Response

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

i. Silviculture

Objective 1: Protect Residual Leave Trees

(1) In forest stands with a pine component, logging slash should be handpiled outside of the driplines of individual pine trees and burned.
(2) Prescribed burns should be performed when moisture conditions are high enough and prescription windows are at a level so that no more than 50% of the mound depth/duff layer around pine trees is consumed during burning.
(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.
(5) White fir is extremely susceptible to fungal attacks and root rots. To reduce the probability of mechanical damage to white fir leave trees, avoid leaving white fir along haul routes, planned skid roads, or adjacent to major landings where heavy mechanical injury can occur during harvest operations.

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

(1) In forest stands with a pine component, 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) Demonstrates good form and vigor.
    (b) Generally free of visible disease and defect.
    (c) Exhibits a minimum of 30% crown ratio.
    (d) Leave conifers in the following species preference order: sugar pine, ponderosa pine, incense cedar, Douglas-fir, and white fir, respectively.
    (e) Conifers should be pre-commercially-thinned to no more than 20-foot spacing. Allow ±25% to accommodate for stand variability (e.g., portions of a stand with a dense mat of small diameters should be thinned to -25% of 20 feet, whereas areas of larger sub-merchantable trees should see +25% of 20 feet).
    (f) 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.

(g) To meet hardwood spacing criteria, leave all oaks > 6 inches dbh; leave all other hardwoods >8 inches dbh; cut multistem clumps >8 inches dbh to 2-3 of the largest stems per clump. Hardwoods should be spaced no more than 40 feet apart (+/- 25% to allow for stand variation). Slash excess hardwoods preferring leave species in following species preference order: white oak, black oak, and Pacific madrone, respectively. Slash only these species, leaving all other hardwoods.

(h) In the absence of conifer trees, hardwoods would be considered acceptable crop trees. The order of preference would 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) sized trees should be slashed within the dripline of the old-growth trees.

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

j. Terrestrial Wildlife

Objective 1: Protect Northern Spotted Owl Nest Reserves

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

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

(1) Work activities that produce loud noises above ambient levels would not occur within specified distances (Table 2-6) of any documented or generated owl site during the critical early nesting period, March 1 and June 30, or until two weeks after the fledging period. This seasonal restriction may be waived if protocol surveys have determined the activity center is not occupied, owls are non-nesting, or owls failed in their nesting attempt. The distances listed in Table 2-6 may be shortened with Level 1 concurrence if substantial topographical breaks or blast blankets (or other devices) would muffle sound between the work location and nest sites.

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

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

Table 2-6. Mandatory Spotted Owl Restriction Distances

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

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

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

Objective 4: Protect Special Status Wildlife Species

(1) Northern Goshawks are known to inhabit forested habitat of the type found within the Cottonwood project area. Any nest sites located prior to or during harvest activity would be protected with a 30-acre buffer.
(2) The Mardon skipper butterfly, a Federal Candidate for listing and a Bureau Sensitive species occurs in meadow areas within the planning area but outside of any treatment areas. Natural meadows are identified as special habitats and receive protection from disturbance as directed in the RMP (pg. 45).
(3) Golden Eagles are known to inhabit forested habitat within the Cottonwood analysis area. Known nest locations would be protected with a 30-acre buffer.
(4) Bald Eagle nest sites would be protected with a 30-acre buffer. Disturbance within ½ mile would be avoided from 1 Feb. through 15 August.

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

(1) Known great gray owl nests would be protected with a ¼ mile protection buffer (approx. 100 acres).
(2) Known locations of Survey and Manage snails, *Monadenia chaceana and Helminthoglypta hertleini*, would be protected through the application of a no treatment buffer.
(3) Suitable habitat for *Pristiloma arcticumcrateris* snail species would be protected through no-treatment in Riparian Reserves (which includes suitable habitat within 30 feet on each side of the channel).

k. Botanical Resources

Objective 1: Minimize the spread of noxious weeds

(1) Vehicle and equipment use off existing roads in the project area would be limited to the dry or snow-covered season.
(2) Mechanical equipment (e.g., skidders, yarders, etc.) would be power washed and cleaned of all soil and vegetative material before entering the project area. Equipment moving from a weed infested work site to or through a non-infested area would be field washed before moving. Field washing station would include a system to contain all weed waste for subsequent landfill disposal.
(3) Seeding of native grasses and/or an approved seed mix on highly disturbed soil (e.g., landings, temporary spur roads, etc.) would occur as prescribed by BLM watershed specialists.
(4) Roadside noxious weed populations along haul routes and work areas would be treated prior to timber sale activity with subsequent treatments as necessary and as funding is available.
(5) Noxious weed populations in existing quarries or stockpiles used for road rocking would be treated prior to ground disturbance.

Table 2-7. Protection Measures for Special Status and Survey & Manage Plant Species

T_R_S	SPECIES CODE	SITE NO.	PROPOSED TREATMENT	PROTECTION	RATIONALE FOR PROTECTION
T38S R03E S32	ALPE	**13899**	RX: Unit 32-3 (White Fir, Activity Fuel)	**RX:** 50' buffer, no activity within buffer.	RX: Maintain moisture regime, soil filtration, and microhabitat.
T38S R03E S32	PIVU	**N1900**	RX: Unit 32-1 (White Fir, Activity Fuel)	None	Located outside of unit in a meadow. Analyzed as a site in project area.
T38S R03E S33	ALPE	**13906**	RX: Unit 33-3 (White Fir, Activity Fuel)	**RX:** 50' buffer, no activity within buffer.	RX: Maintain moisture regime, soil filtration, and microhabitat.
T38S R03E S33	BOME4	**2088**	RX: Unit 33-3 (White Fir, Activity Fuel)	**RX:** 50' buffer, no activity within buffer.	RX: Maintain moisture regime, canopy cover, and microhabitat.
T38S R03E S33	BOPU4	**N3284**	N/A	None	Protected by distance from unit. Analyzed as a site in the project area.
T38S R03E S33	CODE60	**13907**	RX: Unit 33-3 (White Fir, Activity Fuel)	None	Protected by distance from unit. Analyzed as a site in the project area.
T38S R03E S33	ALPE	**13905**	N/A	None	Protected by distance from unit. Analyzed as a site in the project area.

T_R_S	SPECIES CODE	SITE NO.	PROPOSED TREATMENT	PROTECTION	RATIONALE FOR PROTECTION
T39S R03E S04	ALPE	**13908**	RX: Unit 4-2 (Mixed Conifer Site, Activity Fuel)	**RX:** 50' buffer, no activity within buffer.	RX: Maintain moisture regime, soil filtration, and microhabitat.
T39S R03E S04	BOPU4	N3285	N/A	None	Protected by distance from unit. Analyzed as a site in the project area.
T39S R03E S04	DERI60		RX: Unit 4-2 (Mixed Conifer Site, Activity Fuel)	None	Site protected by the riparian reserve. Species currently not on the Medford District Sensitive Species list, but is undocumented in the area.
T39S R03E S08	HABE	**11459**	N/A	None	Outside of areas of proposed disturbance. Analyzed as a site in the project area.
T39S R03E S08	HABE	**12349**	Road: 39-3E-3	**Road:** Limit dust abatement on road 39-3E-3; no magnesium chloride. Mechanized equipment stays within existing road prism 100’ in any direction of population boundary.	Road: Effects of magnesium chloride unknown on species.
T39S R03E S08	HABE	**12352**	N/A	None	Outside of areas of proposed disturbance. Analyzed as a site in the project area.

T_R_S	SPECIES CODE	SITE NO.	PROPOSED TREATMENT	PROTECTION	RATIONALE FOR PROTECTION
T39S R03E S09	HABE	**10699**	RX: Unit 9-2 (Mixed Conifer Site, Activity Fuel)	**RX:** 50' buffer, no activity within buffer.	RX: Maintain moisture regime, soil filtration, and microhabitat.
T39S R03E S09	HABE	**10705**	RX: Unit 9-2 (Mixed Conifer Site, Activity Fuel)	**RX:** 0' buffer, no activity within buffer.	RX: Large population in area, with numerous individuals. Located primarily outside of unit boundary. Loss of a few individuals would not trend species towards listing.
T39S R03E S09	HABE	**1363**	Road: Rd 39-3E-3	**Road:** Limit dust abatement on road 39-3E-3; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary. Seasonal hauling restrictions apply.	Road: Effects of magnesium chloride unknown on species.
T39S R03E S09	HABE	**1364**	Road: Rd 39-3E-3	**Road:** Limit dust abatement on road 39-3E-3; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary. Seasonal hauling restrictions apply.	Road: Effects of magnesium chloride unknown on species.

T_R_S	SPECIES CODE	SITE NO.	PROPOSED TREATMENT	PROTECTION	RATIONALE FOR PROTECTION
T39S R03E S09	HABE	**8180**	Road: Rd 39-3E-3	**Road:** Limit dust abatement on road 39-3E-3; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary. Seasonal hauling restrictions apply.	Road: Effects of magnesium chloride unknown on species.
T39S R03E S09	HABE	**8181**	Road: Rd 39-3E-3	**Road:** Limit dust abatement on road 39-3E-3; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary. Seasonal hauling restrictions apply.	Road: Effects of magnesium chloride unknown on species.
T39S R03E S09	HABE	**13911**	Road: Rd 39-3E-3	None	Plants are located in area further than 100' from road, and in a unit that has been dropped in the planning process. Analyzed as part of the project area.
T39S R03E S09	HABE	**10701**	Road: Rd 39-3E-9.1	**Road:** Limit dust abatement on road 39-3E-9.1; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary. Seasonal hauling restrictions apply.	Road: Effects of magnesium chloride unknown on species.

T_R_S	SPECIES CODE	SITE NO.	PROPOSED TREATMENT	PROTECTION	RATIONALE FOR PROTECTION
T39S R03E S09	HABE	**10703**	Road: Rd 39-3E-9.1	**Road:** Limit dust abatement on road 39-3E-9.1; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary. Seasonal hauling restrictions apply.	Road: Effects of magnesium chloride unknown on species.
T39S R03E S09	HABE	**13142**	Road: Rd 39-3E-9.1	**Road:** Limit dust abatement on road 39-3E-9.1; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary. Seasonal hauling restrictions apply.	Road: Effects of magnesium chloride unknown on species.
T39S R03E S09	HABE	**13139**	Road: Rd 39-3E-3	**Road:** Limit dust abatement on road 39-3E-3; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary. Seasonal hauling restrictions apply.	Road: Effects of magnesium chloride unknown on species.
T39S R03E S09	HABE	**10700**	Road: Unnamed spur (maintenance followed by decommissioning)	**Road:** Limit dust abatement on private spur road; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary.	Site exists in area where existing road bed is present; decommissioning will improve long-term habitat conditions for population. Loss of a few individuals will not trend the species towards further listing.

T_R_S	SPECIES CODE	SITE NO.	PROPOSED TREATMENT	PROTECTION	RATIONALE FOR PROTECTION
T39S R03E S09	HABE	**8182**	N/A	None	Outside of areas of proposed disturbance. Analyzed as a site in the project area.
T39S R03E S09	HABE	**10698**	N/A	None	Site located within the riparian reserve.
T39S R03E S09	HABE	**10706**	N/A	None	Outside of areas of proposed disturbance. Analyzed as a site in the project area.
T39S R03E S09	HABE	**10707**	N/A	None	Site located within the riparian reserve.
T39S R03E S17	ALPE	**13912**	RX: Unit 17-6 (Mixed Conifer Site, Activity Fuel)	**RX:** None	Unit has been modified to exclude 3 populations and habitat. Primary population is protected by the riparian reserve.
T39S R03E S17	ALPE	**13914**	N/A	None	Outside of areas of proposed disturbance and in the riparian reserve. Analyzed as a site in the project area.
T39S R03E S17	DERI60	**13913**	N/A	None	Outside of areas of proposed disturbance and in the riparian reserve. Analyzed as a site in the project area.

T_R_S	SPECIES CODE	SITE NO.	PROPOSED TREATMENT	PROTECTION	RATIONALE FOR PROTECTION
T39S R03E S17	DERI60	**339W**	Road: Rd 39-3E-21	**Road:** Limit dust abatement on roads 39-3E-21; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary. Seasonal hauling restrictions apply.	Road: Effects of magnesium chloride unknown on species. Site located within the riparian reserve.
T39S R03E S17	HABE	**13916**	Road: Rd 39-3E-21	**Road:** Limit dust abatement on roads 39-3E-21; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary. Seasonal hauling restrictions apply.	Road: Effects of magnesium chloride unknown on species.
T39S R03E S17	HABE	**8176** **8177** **8178**	Road: Rd 39-3E-21	**Road:** Limit dust abatement on roads 39-3E-21; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary. Seasonal hauling restrictions apply.	Road: Effects of magnesium chloride unknown on species.

T_R_S	SPECIES CODE	SITE NO.	PROPOSED TREATMENT	PROTECTION	RATIONALE FOR PROTECTION
T39S R03E S17	HABE	**13914**	Road: Rd 39-3E-21	**Road:** Limit dust abatement on roads 39-3E-21; no magnesium chloride. Mechanized equipment stays within existing road prism 100' in any direction of population boundary. Seasonal hauling restrictions apply.	Road: Effects of magnesium chloride unknown on species.
T39S R03E S17	HABE	**13915**	RX: Unit 17-3 (Mixed Conifer, Activity Fuel)	**RX:** 50' buffer, no activity within buffer.	
T39S R03E S20	ALPE	**13917**	RX: Units 20-1 and 20-2 (Mixed Conifer Site, Activity Fuel)	**RX:** None	Site located within the riparian reserve.
T39S R03E S20	DERI60	**SCL5760**	RX: Unit 20-3 (Mixed Conifer Site, Activity Fuel)	**RX:** None	Site located within the riparian reserve.
T39S R03E S20	OREU	**SCL5759**	RX: Unit 20-3 (Mixed Conifer Site, Activity Fuel)	**RX:** None	Site located within the riparian reserve.
T39S R03E S20	SCCI	**SCL5758**	RX: Unit 20-3 (Mixed Conifer Site, Activity Fuel)	**RX:** None	Site located within the riparian reserve.

T_R_S	SPECIES CODE	SITE NO.	PROPOSED TREATMENT	PROTECTION	RATIONALE FOR PROTECTION
T39S R03E S21	HABE	**8090**	Road: 1066 (Hyatt Prairie Road)	**Road:** Mechanized equipment stays within existing road prism 100' in any direction of the population boundary.	Located adjacent to a paved road; no dust abatement mitigation necessary.
T39S R03E S27	BOPU4	**N3283**	N/A	None	Protected by distance from units or roads. Analyzed as a site in the analysis area.
T39S R03E S29	CYFA	**13612**	N/A	None	Outside of areas of proposed disturbance. Analyzed as a site in the analysis area.
T39S R03E S32	CYMO2	**12389**	N/A	None	Outside of areas of proposed disturbance. Analyzed as a site in the project area. Site located across the road from a proposed unit, and along an old road that will not be used for this project. Buffered previously as part of the Sampson Cove Forest Management Project.

l. Recreation

Objective 1. Maintain heavily used multiple use and Nordic trails for winter recreation

(1) Do not snowplow roads 38-3E-19 and 38-3E-29.3 to provide for Nordic trail use.

Objective 2. Protect trail tread for the Pacific Crest National Scenic Trail (PCNST)

(1) Designate skid trail crossings perpendicular to the trail to minimize disturbance to the trail tread in Units 32-5A and 32-5B.
(2) Rehabilitate trail tread at designated skid trail crossings on PCNST by matching trail tread width and appearance as closely as possible to that of trail tread immediately on either side of the designated crossing.
(3) Do not cross PCNST outside of power line corridor to access Unit 21-2B from Unit 21-3 or 21-2A, or from Unit 21-3 to 21-2B or 21-2A. Use East Hyatt Lake road, Howard Prairie road, power line corridor, or other existing routes for equipment access to units.

Objective 3. Minimize impact to the recreation experience

(1) Mark trees for cutting (rather than leave tree marking) in units visible from the PCNST.
(2) Cut stumps of trees visible from the PCNST as close to the ground as possible given site specific conditions and safety concerns in order to minimize the visual impact to the recreation experience.

Objective 4. Maintain public safety for visitors to the PCNST

(1) Designated skid trail crossing on the PCNST should be well marked and signed to alert PCNST users of logging operation.
(2) Place signs on haul routes where the PCNST crosses these routes alerting drivers to the presence of the trail crossing, and that hikers may be crossing the road.
(3) Fall trees away from the PCNST.

Objective 5.Maintain public safety for visitors to the Table Mountain Sledding Hill

(1) If winter logging or hauling activity is to occur, place sign(s) on road 39-3E-3 at intersection with Hyatt Prairie road alerting the public of possible interactions with logging trucks and associated equipment.
(2) If winter logging or hauling activity is to occur, place sign(s) on road 39-3E-3 near yellow gate just southwest of Table Mountain Sledding Hill. Sign(s) should instruct drivers to slow down and be alert to the possibility of there being foot traffic across the road.
(3) If winter hauling is occurring on weekends or holidays (including designated holiday breaks for the local Rogue Valley public schools) the purchaser would be required to post a flagger near the Table Mountain Snow Play parking area on road 39-3E-3 to provide for pedestrian safety.

Objective 6.Maintain public safety for visitors to the Hyatt Lake Recreation Complex

(1) No logging activity in Unit 21-5 from three days prior to the last Monday in May until after the first Monday in September due to safety concerns of campground visitors
(2) Signs alerting campground visitors of the logging operation would be posted in Hyatt Lake Recreation Complex prior to any logging activity in Unit 21-5.

m. Rangeland Resources/Grazing

Objective 1. Protect Rangeland Improvements

(1) During logging operations use of techniques such as directional falling would be used to prevent damage to fences, cattle guards, livestock watering troughs and other improvements.
(2) If damage to range improvements does occur the BLM shall be notified and proper repair or replacement would occur within 2 weeks of the completion of logging activities. *Proper repair of fences and gates includes keeping wire properly attached to posts, splicing or replacing broken wire in kind, repairing structures such as corners or gates, and any other work necessary to keep

improvements functional. Repair of structures such as stress or corner panels and gates requires pre-approval by BLM staff.

Objective 2. Prevent Livestock Trespass

(1) During logging activities operators would keep all gates closed and all livestock containment systems functional to keep livestock in authorized areas.

5. Implementation Monitoring

The majority of actions described under the alternatives are implemented through a timber sale, service, or stewardship contract. Implementation monitoring is accomplished through BLMs contract administration process. Project design features included in the project description are carried forward into contracts as required contract specifications. BLM contract administrators and inspectors monitor the daily operations of contractors to ensure that contract specifications are implemented as designed. If work is not being implemented according to contract specifications, contractors are ordered to correct any deficiencies. Timber sale contract work could be shut down if infractions of the contract are severe. The contract violations would need to be corrected before the contractor would be able to continue work or timber harvest. If contract violations are blatant, restitution could be of a monetary value of up to triple the amount of damage.

6. Recreation/Social Mitigation Measures

BLMs Recreation Planner and Layout Forester met with a representative of the Pacific Crest Trail Association to discuss visual impacts to Pacific Crest National Scenic Trail (PCNST) resulting from Cottonwood Forest Management Project and developed buffer distances and possible mitigation measures to ensure protection of the Pacific Crest National Scenic Trail (PCT) and maintenance of a quality recreational experience by PCT users.

Units visible from the PCNST were visited by the group. The group looked at various components of the landscape such as topography, canopy cover, tree density, species composition, tree health, and vegetation screening that affected the view of the trail user. Specifically the group worked in a collaborative fashion to determine based on the above mentioned factors, the adequate “no cut” buffer distance needed to minimize or eliminate the visual effects of the forest management project on the trail user. The groups also worked to identify solutions to minimize impacts to the trail tread itself.

The following recommended mitigation measures were developed by the group; these measures have been adopted by the deciding official and would be required part of the implementation of the Cottonwood Forest Management Project:

Unit 21-2A
Recommendation: 1) 170’ no cut buffer from either side of the centerline of the PCT

Rationale: 1) 170’ buffer provides adequate vegetative screening to prevent the effects of the project to be seen by trail users.

Unit 21-2B
Recommendation: 1) 170’ no cut buffer from either side of the centerline of the PCT

Rationale: 1) 170’ buffer provides adequate vegetative screening to prevent the effects of the project to be seen by trail users.

Unit 21-2B
Recommendation: 1) Current existing flagged unit boundary was adequate no cut buffer from the PCT. No buffer is needed; power line corridor serves as buffer.

Rationale: 1) The current power line corridor is the major disturbance in the area affecting the experience of the PCT user and the corridor itself serves as a buffer and is cleared and currently devoid of trees. An additional buffer on the unit south of the power line is not needed and would not improve the experience of the user if it required.

Unit 21-4C
Recommendation: 1) 170' no cut buffer from either side of the centerline of the PCT

Rationale: 1) 170' buffer provides adequate vegetative screening to prevent the effects of the project to be seen by trail users

Unit 21-4A
Recommendation: 1) 170' no cut buffer from either side of the centerline of the PCT

Rationale: 1) 170' buffer provides adequate vegetative screening to prevent the effects of the project to be seen by trail users

Unit 32-5B
Recommendation: 1)50' no cut buffer from either side of the centerline of the PCT, 2) designate skid trail crossing close to private land in southern portion of the unit if existing roads cannot be used, and 3) exclude machinery inside 170' buffer from the PCT in this unit except at designated skid trail crossing.

Rationale: 1) Thinning the unnaturally highly stocked unit, mostly pines w/ many in poor health would better serve the long term protection of the trail experience by being thinned. Thinning would prevent massive die off and promote larger trees that would be visually appealing to trail users in the long term. 2) Designating a skid trail crossing the PCT close to the southern portion of the unit would minimize damage to the trail tread in an area were the trail is the driest and has stable soil. 3) Excluding machinery would reduce visual impact to landscape and unit can be bull-lined away from trail.

Unit 32-5A
Recommendation: 1)50' no cut buffer from either side of the centerline of the PCT and 2) exclude machinery inside 170' buffer from the PCT in this unit except at designated skid trail crossing.

Rationale: 1) Thinning the unnaturally highly stocked unit, mostly pines w/ many in poor health would better serve the long term protection of the trail experience by being thinned. Thinning would prevent massive die off and promote larger trees that would be visually appealing to trail users in the long term. 2) Excluding machinery would reduce visual impact to landscape and unit can be bull-lined away from trail.

Unit 32-4B
Recommendation: 1) 170' no cut buffer from either side of the centerline of the PCT

Rationale: 1) 170' buffer provides adequate vegetative screening to prevent the effects of the project to be seen by trail users.

Unit 32-4A
Recommendation: 1) Drop unit from project

Rationale: 1) The proximity of this unit to the road and trail would mean that after thinning trail would be susceptible to damage and impacts from OHVs. This area has had problems with OHV damage in the past and after the project increased "openings" would possibly allow easier OHV use that would impact the PCT.

Unit 30-3
Recommendation: 1) Current Road Boundary is sufficient buffer, no additional buffer needed.

Rationale: 1) The road has the largest visual impact on PCT users in this area and the unit due to topography won't have a large visual impact on trail users.

Unit 30-1
Recommendation: 1) Current Road Boundary (39-3E-30) is sufficient buffer, no additional buffer needed in the southwest portion of this unit. 2) 170' no cut buffer from either side of the centerline of the PCT on the north boundary of this unit.

Rationale: 1) The road has the largest visual impact on PCT users in the southwestern portion of this unit. 2) 170' buffer provides adequate vegetative screening to prevent the effects of the project to be seen by trail users.

Additional PDFs Recommended:

- Cut stumps as close to ground as possible
- Mark trees to remove as opposed to keep
- Mark side of tree away from the PCT
- Post signs warning hikers of machinery crossing trail at possible skid trail crossing between Units 32-5A and 32-5B where skid trail crosses PCT

D. ACTIONS AND ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

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

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

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

No New Road Construction
This alternative would have eliminated all 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 elimination of any new road construction would have required units to be helicopter yarded which would have made it uneconomical to manage units otherwise accessed by proposed new road construction. This would have resulted in dropping units from proposed harvesting and would not have been consistent with RMP direction for managing units for sustained timber production.

Diameter Limitation

Imposing a upper diameter limit for harvesting trees was suggested by the public. This alternative would have imposed an upper diameter limit on timber harvesting trees greater than 20 inches diameter breast height (dbh). This would mean no trees would be cut and removed if they were larger than the specified diameter limit.

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. 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 20+ inches is necessary:

- ✓ 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 necessary 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 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 meet silvicultural objectives for desired species composition.
- ✓ 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. Arbitrarily imposing a diameter limit could affect BLMs ability to meet treatment objectives designed to control, reduce, or inhibit the adverse impacts of 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.

An arbitrary diameter limit would sacrifice the effectiveness of the treatment in achieving these objectives. That being said, the Cottonwood Forest Management Project, does primarily focus on the removal of small diameter trees to retain the larger healthier trees within a stand, although some larger trees may be removed as stated above to meet desired stand densities, species composition, and disease management objectives (see Silvicultural Objectives and Prescriptions, above).

***Manage the Project Area Consistent with the Cascade Siskiyou National Monument and Wilderness*:**
Comments were received requesting that the Cottonwood Project be managed consistent with the Cascade Siskiyou National Monument and/or South Cascades Wilderness Proposal so as not to disqualify the area for future inclusion in monument or wilderness designation.

Rationale for Elimination: While there is a citizen's movement underway working to expand the boundaries of the CSNM, the project area is currently located on lands allocated by the Medford District RMP as Matrix lands with the primary objective of providing for long-term timber production. The BLM is obligated to managing the project area consistent with its current land use plan. Additionally, portions of the project area that have been proposed as the Greensprings Mountain portion of the South Cascades Wilderness proposal have been previously analyzed for wilderness character by the BLM (Public Wilderness Proposal – Evaluation Form on file at Medford District BLM) and it has been determined that the area does not possess wilderness character. Also see Chapter 1, Issues Considered but not Further Analyzed.

CHAPTER 3 - AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

A. INTRODUCTION

This chapter describes the present conditions of each affected resource, followed by a comparison of the estimated environmental effects of implementing the No-Action Alternative and the Proposed Action Alternative. The Environmental Effects portion of this chapter provides the analytical basis for the comparisons of the alternatives (40 CFR § 1502.16) and the reasonably foreseeable environmental consequences to the human environment that each alternative would have on the relevant resources. Impacts can be beneficial, neutral or detrimental. The affected environment is described to the level of detail needed to determine the significance of impacts to the environment of implementing the Proposed Action. The analysis of the direct, indirect, and cumulative effects are organized by resource and the analysis areas for actions proposed under this EA vary by resource. For all resources it includes the project area, which encompasses the areas where actions are proposed for the Cottonwood Forest Management Project.

1. Project Area and Analysis Area

The terms **Project Area** and **analysis areas** are used throughout this chapter. The following defines each term:

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

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

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

Instead of incurring these exorbitant costs in terms of time and money, it is possible to implement easier, more accurate, and less costly ways to obtain the information concerning the effects past actions, which is necessary for an analysis of the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions."(See definition of "cumulative impact" in 40 CFR § 1508.7.)

Under 43 CFR § 46.115 it states that when considering cumulative effects analysis, it must analyze the effects in accordance with relevant guidance issued by the Council on Environmental Quality (CEQ). As the CEQ, in guidance issued on June 24, 2005, points out, the "environmental analysis required under NEPA is forward-looking," and review of past actions is required only "to the extent that this review informs agency decision-making regarding the proposed action." Use of information on the effects on past action may be useful in two ways according to the CEQ guidance. One is for consideration of the proposed action's cumulative effects, and secondly as a basis for identifying the proposed action's direct and indirect effects.

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

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

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

The Sampson Cove Forest Management Project proposed on BLM lands neighbors the Cottonwood Forest Management Project, with approximately 6 acres overlapping into the Cottonwood analysis area, along the drainage divide from the Bear Creek Watershed into the Keene Creek subwatershed. These units are located near the ridge top, do not include any stream channels or Riparian Reserves, and would leave a minimum of between 40 to 60% canopy cover following harvest. Because they do not have any hydrological connectivity with aquatic habitat in the Keene Creek subwatershed, and because they would retain sufficient canopy cover to negate the possibility of altering peak or base flows, these units would have no causal mechanism to affect aquatic habitat in Keene Creek. As such, harvest of these units would not have any direct or indirect effects, would not contribute to an increased risk for cumulative effects within the analysis area.

B. SOIL RESOURCES

1. Affected Environment

The proposed Cottonwood Forest Management Project units are located in the Burnt Creek, Cottonwood Creek, Hyatt Reservoir, and Keene Creek Reservoir drainages (approximately 12,882 acres) of the Jenny Creek Watershed. The dominant soils series identified in the project units are Bybee, Farva, Pinehurst, Snowlin, Tatouche, and Woodseye.

The topography in the project area consists of slopes between 8 and 60 percent slope at elevation between 4,500 and 6,000 feet above mean sea level. The mean annual precipitation is 30 to 55 inches, the mean annual temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

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

Table 3-1. Soil Series and Characteristics

Map Unit #	Soil Series Name	Depth (in.)	Soil Texture	Soil Sensitivity Category
18, 19, 20	Bybee	60+	Loam, clay loam, clay	3
56, 57, 58	Farva	20 - 40	Very cobbly loam, cobbly loam	2
144	Pinehurst	60+	Loam, clay loam	3
159, 160	Rustlerpeak	20 - 40	Gravelly loam, stony loam, very cobbly clay	2
177, 178	Snowlin	60+	Gravelly loam, very gravelly clay loam	3
19, 190	Tatouche	60+	Gravelly loam, gravelly clay loam, clay	2
207	Woodseye	> 20	Very cobbly loam	1

a. Description of Soils Series

Bybee Series

The Bybee soil is very deep and somewhat poorly drained. It formed in colluvium derived dominantly from andesite, tuff, and breccia. Typically, the surface is covered with a layer of needles and twigs about ½ inch thick. The surface layer is very dark grayish brown loam about 4 inches thick. The next layer is very dark grayish brown clay loam about 6 inches thick. The upper 4 inches of the subsoil is brown clay. The lower 24 inches is light yellowish brown clay. The substratum is light yellowish brown clay about 22 inches thick. The depth to bedrock is 60 inches or more. Permeability is very slow in the Bybee soil. Available water capacity is about 9 inches. The effective rooting depth is limited by a dense layer of clay at a depth of 10 to20 inches. Runoff is medium, and the hazard of water erosion is moderate. The water table, which is perched above the layer of clay, is at a depth of 1 to 3 feet from December through May.

Farva Series

The Farva soil series is moderately deep, well-drained soil on hillslopes. It formed in colluvium derived from andesite, basalt, and volcanic ash. Typically, the surface is covered with a layer of needles, leaves, and twigs about ½ inch thick. The surface layer is dark brown very cobbly loam about 12 inches thick. The subsoil is brown extremely cobbly loam about 15 inches thick. The substratum also is brown extremely cobbly loam. It is about 8 inches thick. Weathered bedrock is at a depth of about 35 inches. The depth to bedrock ranges from 20 to40 inches. In some areas the surface layer is stony. Permeability is moderately rapid in the Farva soil. Available water capacity is about 3 inches. The effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

Pinehurst Series

This very deep, well-drained soil is on plateaus. It formed in colluvium derived from basalt and andesite. Typically, the surface is covered with a layer of needles and twigs about one (1) inch thick. The surface layer is dark reddish brown loam about 15 inches thick. The subsoil to a depth of 60 inches is dark reddish brown clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony. Permeability is moderately slow in the Pinehurst soil. Available water capacity is about 10 inches. The effective rooting depth is 60 inches or more. Runoff is low, and the hazard of water erosion is slight.

Rustler Peak Series

This moderately deep, well-drained soil is on plateaus. It formed in colluvium derived from andesite and volcanic ash. Typically, the surface is covered with a layer of needles, leaves, and twigs about one (1) inch thick. The surface layer is dark reddish brown gravelly loam about 12 inches thick. The subsoil is dark reddish brown very cobbly clay loam about 11 inches thick. Weathered bedrock is at a depth of about 23 inches.

The depth to bedrock ranges from 20 to40 inches. In some areas the surface layer is stony. Permeability is moderately slow in the Rustler peak soil. Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight.

Snowlin Series

This very deep, well-drained soil is on plateaus. It formed in colluvium derived from andesite and volcanic ash. The mean annual precipitation is 40 to 50 inches, the mean annual temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days. Typically, the surface is covered with a layer of needles and twigs about two (2) inches thick. The surface layer is dark reddish brown gravelly loam about 20 inches thick. The upper 14 inches of the subsoil is dark reddish brown gravelly clay loam. The lower 26 inches is dark reddish brown very gravelly clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony. Permeability is moderately slow in this soil and available water capacity is about 8 inches. Runoff is slow and the hazard of water erosion is slight.

Tatouche Series

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

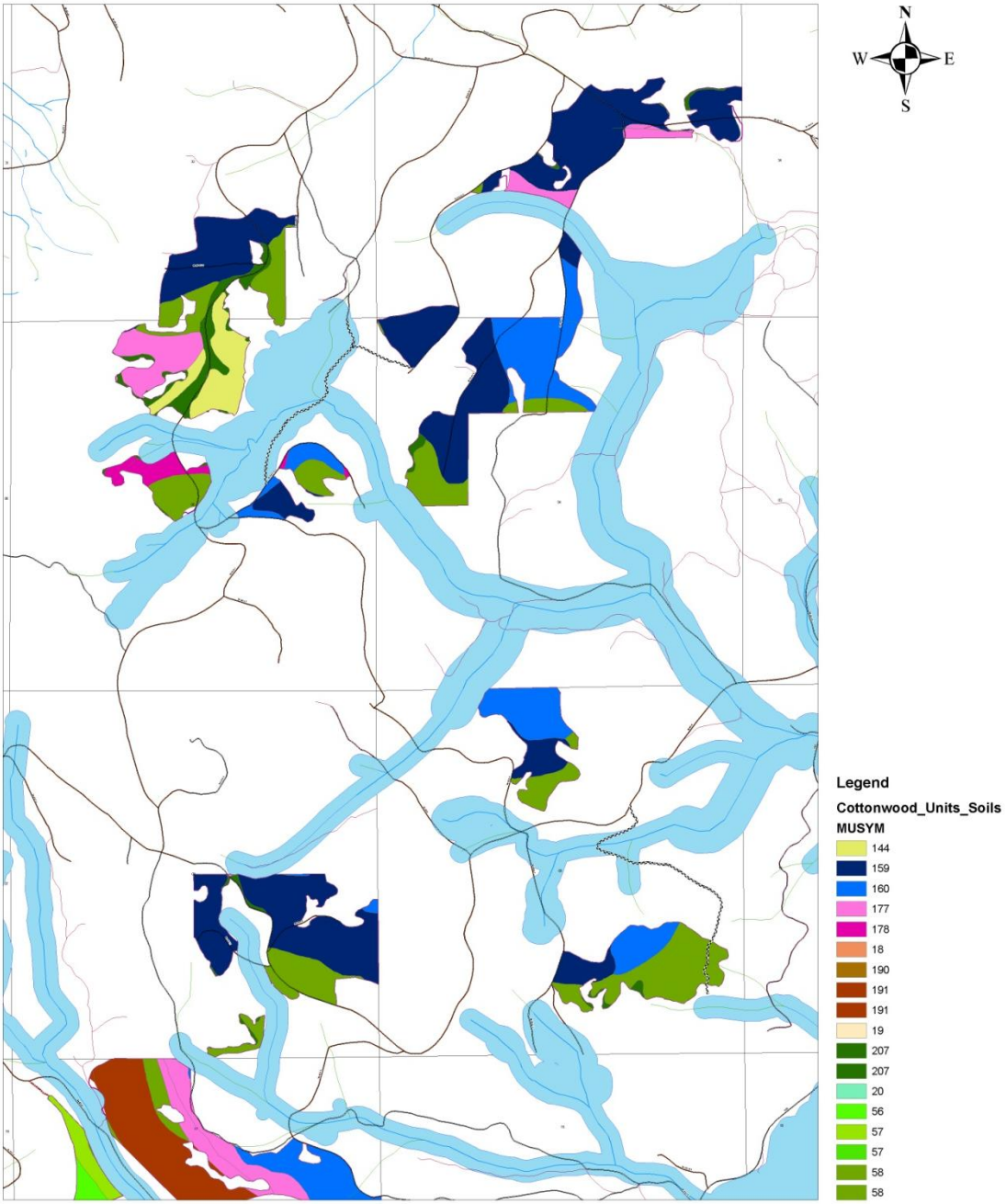
Woodseye Series

The Woodseye soil is shallow and somewhat excessively drained. It formed in colluviums derived dominantly from andesite. Typically, the surface layer is dark brown very stony loam about two (2) inches thick. The next layer is dark brown very cobbly loam about six (6) inches thick. The subsoil also is dark brown very cobbly loam. It is about 10 inches thick. Bedrock is at a depth of about 18 inches. The depth to bedrock ranges from 10 to 20 inches. Permeability is moderate in the Woodseye soil. Available water capacity is about 1 inch. The effective rooting depth is 10 to 20 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

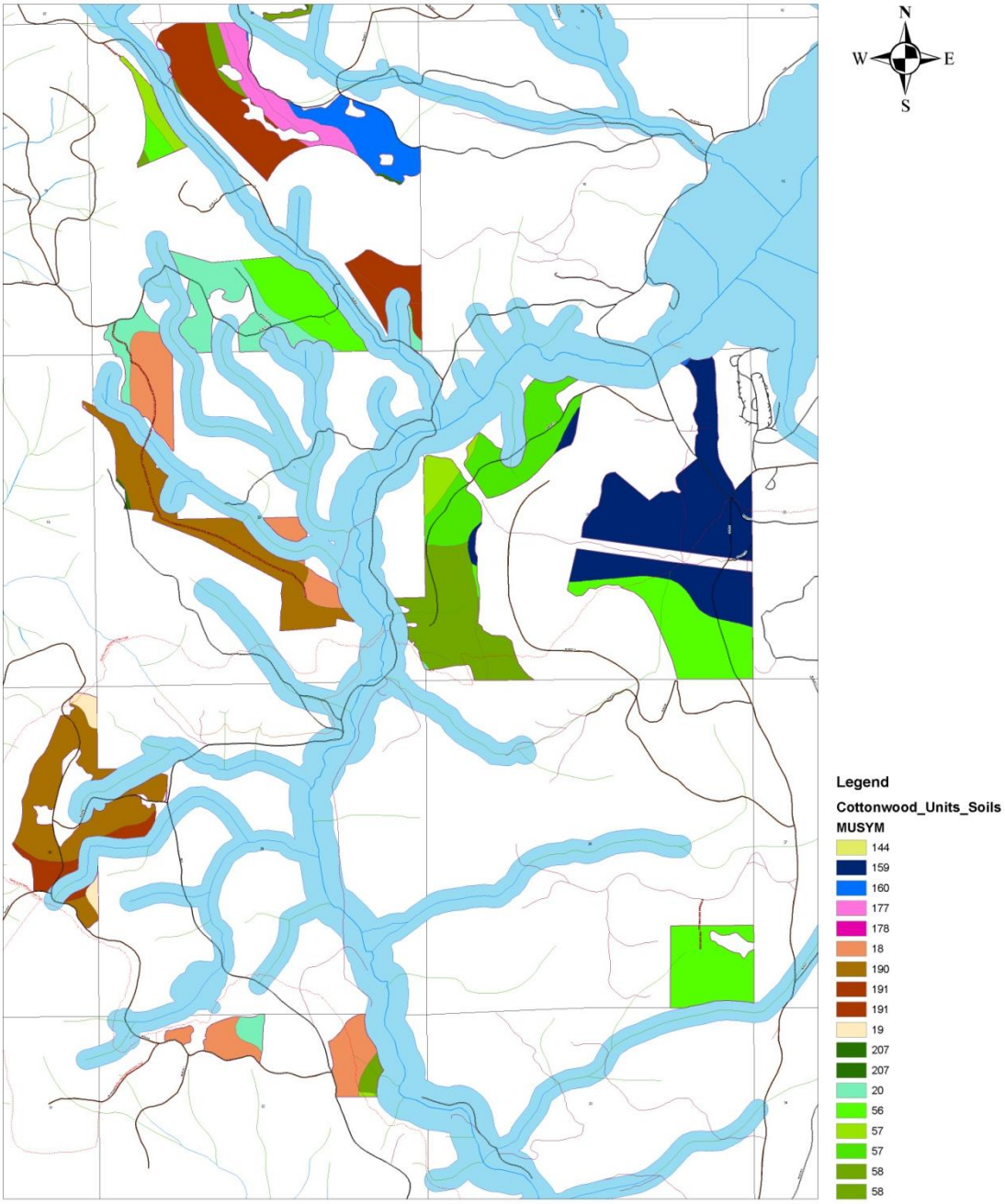
Swanson and Dyrness (1975) estimated the natural erosion rates for soils in the Western Cascade Range to be about 0.19 yd^3/ac/year and erosion rates increased in harvest areas to 0.7 yd^3/ac/yr (in Amaranthus, 1985, p.233). Erosion rates are highly dependent on the intensity and amount of rainfall that a particular site receives in a given time period. Other factors that affect erosion rates are steepness of slope, ground cover, soil particle cohesion and amount/degree of disturbance. The project planning area consists of slopes up to 40 percent with a very slight potential for landslides. For this reason, it is anticipated that erosion rates in the project area to be much less than those reported by Swanson and should not be of concern.

A map showing the location of the soils in the proposed project units is displayed below.

Map 3-1. Cottonwood Project Soils



Map 3-2. Cottonwood Project Soils



b. Roads

There are about 108 miles of road in the 12,882 acre analysis area. Approximately 42 miles of the existing roads are confirmed paved or adequately surfaced with rock on public lands in the analysis area. The remaining roads are either natural surface, a jeep road, or information on the surface type is unknown (un-inventoried roads on private land). This area gets substantial snow fall amounts in the winter and many of the roads are closed due to snowpack. Due to the gentle topography, most of the roads appear to have been built over ten years ago and are in stable condition, but surfacing is below optimum to minimize road related erosion particularly during wet season use.

Soil loss from a lightly graveled roadbed is about equivalent to loss from an un-graveled 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.

c. Soil Productivity

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

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

In the project area, organic matter is abundant on all sites that are proposed for treatment. Most of the organic matter is in the form of down wood, leaf litter and needle cast and was produced from trees, shrubs, grasses, and moss. Soil organic matter appears typical for the region with most of the sites having about ½ inch or less of litter (leaf and needles). Some sites with a mature forest canopy, in sections 17 and 24, have a litter layer about 1 inch thick. Except for areas disturbed by roads and trails and sites with gravels and cobbles surfaces, the most of the soil in the proposed project area had at least a thin ground cover of organic material. On most sites, soil organic matter consumption appears normal with a very thin layer of decomposing matter at the soil and litter layer interface.

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

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

d. Past Actions

An inventory of past actions with harvest dates and units of treatments was made for the analysis area using past harvest records and photo interpretation. Timber harvest records in combination with the operations inventory data were used on land managed by the BLM. A nearly complete harvest data record was available from about 1975 to present. An inventory of harvest activities prior to 1975 on BLM-administered land was estimated using operation inventory records and aerial photo interpretation. The inventory of past harvest activities on private land was estimated using aerial photo interpretation. The aerial photos used were from 1966, 1975, 1980, 1985, 1991, 1996, 2001, and 2005. The past actions were digitized in Geographic Information Systems (GIS) layer and a corresponding database established.

The relevant part of analyzing past actions is determining what events or actions previously occurred, whether current proposals repeat those actions or events, and whether current proposals have similar or different anticipated effects. In addition, past events are manifested in current conditions, the starting point for the addition of cumulative effects. The lessons learned from past actions are that roads were historically poorly designed and located without regard to erosion and stream sedimentation impacts. Many of the roads have been poorly maintained and have been degraded as a result of use during the wet season. Clearcutting and broadcast burning in the 1980s created highly erosive conditions especially when ground-based yarding systems were used without much regard for the location and number of skid trails, and/or tractor-piling of slash was incorporated. These sites have been re-established with vegetation and, except for roads, erosion rates are near natural levels.

It is estimated that about 185 acres of the 1,108 acres proposed for harvest have had some type of timber harvest in the past. All past timber harvest in the proposed units were accomplished using tracked equipment. It is estimated that 35 acres was completed around 1996 on designated skid roads and the rest before 1970, and not on designated skid roads. Most of the harvesting before the 1970s (150 acres) was in the form of single tree selection or group selection taking out the biggest and most valuable trees. During the 1970s through the 1980s, clearcutting was implemented which was often followed by broadcast burning of the logging slash on the site. During the 1980s on BLM managed land, tractor harvesting was restricted to designated skid trails that would impact about twelve percent of the harvest area. It is estimated that unrestricted tractor logging resulted in about twenty-five percent of the area being compacted. There have been approximately 831 acres harvested on BLM-administered land within the planning area since 1983 and approximately 2,183 acres on private land during that time period. Overall, it is estimated that approximately 40 percent of the land has had some sort of harvest entry in the past with most (about 5,000 acres) being partial cutting or single tree selection.

In the analysis area, it is estimated that approximately 725 acres of land have been compacted to some extent as a result of timber harvesting since 1970. Of these acres, about 100 acres have been compacted on BLM-administered land and about 625 on private land. It is difficult to predict compaction's effects on soil productivity because of all the variables, but McNabb and Froelich (1983) estimate that stand growth losses can range from 5 to 13 percent and compaction's effects can last 30 years. Lucklow and Gullen, in a compaction study of Arkansas forest, found evidence that old disturbance areas have partially self-mitigated since the previous harvest entry. The old disturbance compaction observed in this study was caused from harvest equipment activities that occurred at least 15-20 years earlier. Old disturbance areas are composed of secondary or primary skid trails and areas that received 1-2 equipment passes. They estimate it would take from 50-80 years for skid trail soil density levels to recover to near natural density levels. This estimated recovery period is in line with other findings. Perry (1964) estimated a 40-year recovery period for reduced infiltration rates on old compacted woods roads to approach natural rates on a southern Arkansas soil.

2. Environmental Consequences

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

Discussions for Alternative 2 (Proposed Action) reflect the direct and indirect impacts of these alternatives. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable. The environmental consequences on the soil resource will be described in terms of the effect that a particular action would have on the soil characteristics or soil erosion processes. It would be futile to try to predict specific quantitative values for erosion as there are too many variables to consider such as rainfall amount, duration and intensity during storm events. The effects of the proposed activities will be compared to natural rates.

The appropriate scale for measuring soil productivity criteria (compaction, erosion, etc.) is site specific or on a unit by unit basis. The appropriate scale for measuring erosion or compaction that may affect water resources would be the designated analysis area (see Water Resource section for analysis areas). Short-term impacts (or effects) are those being ten years or less and long-term more than ten years. Although studies (Rice et al., 1972) and local observations by BLM soil scientist reveal that vegetation recovery and erosion rates return to near normal levels within approximately 5 years, short-term effects of 10 years were used because broadcast burning within 5 years after harvest could occur.

a. Alternative 1

The effect of the No-Action Alternative on the soil resource would be the continuance of existing erosion rates coming from the current conditions throughout the analysis area. Erosion rates are near natural levels throughout the project area except for areas where roads and trails exists. The units that were harvested in the past have stabilized with vegetation and erosion rates back to near natural levels. There is no way to be certain that possible future actions will occur on private land but it is presumed that all private lands having timber of commercial value would be harvested in the near future (10 years). These actions would increase the amount of compacted acres in the drainages possibly affecting peak flows. A discussion of the effects that future harvest, compacted acres and roads has on sedimentation in local waterways 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" fire conditions no longer exist. Fuel loadings in some areas are 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. Following wildfire, erosion susceptibility is increased in response to increased soil moisture from decreased evapotranspiration (Silva et al., 2006), increased displacement of soil particles from decreased vegetative interception of rain (Anderson and Brooks, 1975), and formation of a hydrophobic soil layer in some instances that decreases water infiltration into soil (Brady 2001). When compared to the Proposed Action, there would be no increase in erosion rates short-term but long-term erosion from roads would increase due to lack of sufficient road maintenance and the risk of a catastrophic wildfire would increase as a result of the no action alternative.

b. Alternative 2

There is about 1.5 miles of permanent road construction and 0.6 miles of temporary road construction proposed under this alternative. Road construction would have the greatest impact on the soil resource as approximately 4 acres of land are disturbed and taken out of vegetation production for every one mile of road construction proposed. There would be a noticeable increase in soil erosion the first few substantial rain events after construction. Erosion rates from roads and landings on the Cascade geomorphological unit (similar to that of the analysis area) were reported to be about 9.36 $yd^3/ac/yr$ (Swanson and Dyrness [1975] in Amaranthus et al., 1985; p. 233). This total includes mass slope failures from roads and landings on unstable slopes in calculating the number. Because most of the newly proposed road construction would be located on gentle topography it is anticipated that, under average rainfall conditions, the erosion rates would be less than one-half of those reported by Swanson (<4 $yd^3/ac/yr$) the first few substantial storm events after construction and decrease down to about 3 times natural rates after 3 years. Typically, newly constructed roads lose the most soil primarily during the short period before grass becomes established and the roadbed is graveled or compacted. Soil loss from fully graveled roadbeds was only 3 to 8 percent of that from the bare soil roadbed of otherwise similar construction (Swift, 1988; p.321).

New roads would have an impact on the soil productivity. Approximately four (4) acres of land is disturbed and taken out of vegetation production for every one mile of road proposed. The 2.1 miles of new construction would take out of production approximately 8.4 acres.

The effects of 2.1 miles of new road construction would be partially balanced by decommissioning 1.9 miles of existing unsurfaced roads. The road decommissioning would consist of mechanical decommissioning. As mechanically decommissioning involves ripping the road surface and digging up existing culverts, there would be a moderate short-term increase in soil erosion the first several rain events after road decommissioning is completed. A long-term decrease in sediment production associated with existing roads would result as erosion rates on decommissioned roads lower to near natural levels in five to ten years. Mechanically decommissioning roads should decrease erosion rates to near natural levels within ten years.

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

There is about 1,108 acres of land proposed for land management activities with some type of timber removal. Soil disturbance from timber harvesting may not be avoidable, but can be minimized. Preventative measures are more effective in minimizing impacts on soils than remedial mitigation because of the remedial expenses, loss of productivity until mitigation occurs, and the possibility that the original soil conditions may never be restored (Miller et al., 2004). The commercial timber harvest activities proposed in this alternative would disturb, on average, about 15 percent of the ground in the proposed harvest units. As a result of implementing designated skid trails, the units tractor logged (550 acres) 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 on partially cutting using designated skid trails conducted by Oregon State University (Bradshaw, 1979), designated skid trails occupied only four percent of the area compared to 22 percent for conventional logging. In a study of thinning and partial cutting by yarding systems, skidding logs caused soil disturbance on about 21 percent of the site resulting in 13 percent displacement and 8 percent compaction (Landsberg, 2003; p.29).

Observations of the units proposed for harvest reveal very few old skid trails still apparent across the landscape. Tree and brush vegetation has re-established in most of the skid trails that were previously compaction from past harvesting.

The proposal to use a harvester/forwarder system is proposed in some units instead of tractor yarding using designated skid roads. Implementing such equipment would occur only during very dry soil conditions or on a minimum of 18 inches of snow pack and would result in minimal amount of detrimental compaction. Harvested trees would be processed in front of the harvester, so that the harvester trails are covered with slash. Slash is placed in front of the harvester to produce a slash mat for the harvester and forwarder to walk over. The forwarder, that carries the logs to the landing, should remain on trails approximately 150 ft. apart to avoid impacting more than 12 percent of the harvest area.

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

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 alternative as such sites were screened through the Timber Productivity Capability Classification process (USDI, 1994; page 3-85) and taken out of the timber harvest base. It is estimated that there are approximately 357 miles of road that exist in the 98,228 acre analysis area resulting in an average road density of 5.8 miles of road per square mile and about 700 acres of compacted area.

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

The increase in erosion rates over present levels would be less than 15 percent as a result of burning handpiles because the piles would be spaced throughout and occupy approximately 3 to 5 percent of the total area. The increased potential of soil particles reaching the local waterways as a result of the prescribed burning would be low because of prescribed riparian buffers, and handpiling of slash would not occur near waterways. High soil temperatures generated by burning piles would severely and adversely affect soil properties in 3 to 5 percent of the unit by physically changing soil structure and reducing nutrient content. In most pile burning operations, the duff and woody debris is completely consumed.

Duff and woody debris represent a storehouse of minerals and protection for the soil surface. Since Nitrogen losses are roughly proportional to the amount of duff consumed, burn prescriptions that allow greater retention of woody debris benefit long-term site productivity. Burning volatizes organic Nitrogen or changes it into a readily available form (for plant use). Large proportions of the total Nitrogen budget can be lost through volatilization in the sites where pile burning occurs. Total foliar Nitrogen content also is reduced (14% in moderate burns, 33% in intense burns), and the effects last at least 4 years (Atzet, 1987; p.193). Overall, soil productivity would experience slight (<15%), adverse short-term effects but potential long-term beneficial effects would be realized from the proposed actions as the risk of catastrophic fire is diminished.

In summary, there would be a net increase in compacted area in the tractor harvest units averaging about 12 percent which would slightly decrease soil productivity long-term. Based on research and past monitoring of operational activities, it is assumed there would be a 5 percent loss of productivity on all lands that would be tractor harvested using designated skid trails. The loss is accounted for in the (Medford District) non-declining timber harvest calculations (PRMP/EIS 1994. p.4-13). Soil productivity would experience a slight (<15%), adverse short-term effect but potential long-term beneficial effects would be realized by thinning and prescribed fire. There would be a slight to moderate (15-50%) increase in erosion rates as a result of the combination of harvesting timber and fuel reduction activities (i.e., slashing, prescribed burning) which would last about three to five years. A slight cumulative long-term increase in erosion rates would occur as a result of road building.

Cumulatively, there is currently little direct evidence to indicate that harvest removals in themselves lead to soil depletion over several succeeding rotations (Beschta, n.d.). A crucial aspect that affects soil productivity is cutting intensity. Cutting intensity means the proportion of standing trees harvested, i.e., clearcutting vs. shelterwood vs. selection cutting. 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 Cottonwood Project as soil disturbance would not result in a significant amount of soil leaving the site and erosion rates would return to near normal within about five years. Most past harvest that had a substantial effect on soil erosion rates was over twenty years ago and the most sites has recovered from those events. Therefore, cumulative effects to the soil resource as a result of the timber harvest would be minimal if the soil resource is allowed enough time to recover from the disturbance of this project.

C. WATER RESOURCES

1. Affected Environment

A watershed analysis provides general water resources background information for the project area. This document is titled the *Jenny Creek Watershed Analysis* (USDI 1995).

a. Analysis Area Description

The Cottonwood project area is located in the western portion of the Jenny Creek watershed, which is a tributary to the Klamath River. Jenny Creek is designated as a Tier 1 Key Watershed in the Resource Management Plan for the Medford District (RMP, 1995). Key Watersheds serve as refugia and are crucial for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species. They also have a high potential of being restored as part of a watershed restoration program.

The planning/project area is smaller than the analysis area and for purposes of analyzing the affected environment and the proposed project, specifically cumulative effects, the analysis area for water resources will consider those portions of Keene Creek where treatments are proposed.

Keene Creek is referred to as a sub-watershed and represents a 6th field hydrologic unit code or HUC. The total size of the analysis area is 12,892 acres or 20.1 square miles. This sub-watershed is further subdivided into 7th field HUC's called drainages which range in size from 1,833 to 4,808 acres (Table 3-2). This size of drainage is large enough to assess the cumulative effect of actions that, taken individually (site scale) may not be significant, but when combined with effects from everything else going on in the drainage, may have a potential impact ("cumulative effect"). The drainage areas are small enough to avoid "drowning out" evidence of adverse effects. As the size of the analysis area increases, there is an increasing possibility of the analysis indicating that there is "no problem" when in fact individual drainages may have issues of concern.

There is one 7thfield HUC where portions of two harvest units cross drainage boundaries. This drainage is located within Dead Indian Creek (0509). There are approximately 12 acres proposed within Dead Indian Creek, which is a tributary to South Fork Little Butte Creek and eventually the Rogue River. Harvest within this drainage is on relatively flat ridgetop topography, would not reduce canopy cover below 30 percent, and no new road construction or reconstruction is proposed. Therefore, this analysis does not include this drainage.

The analysis area is within Jackson County and is a mix of public and private land (Table 3-2 and Map 3-3). BLM managed lands make up a small majority (61 percent) of the analysis area. BLM parcels are scattered throughout the analysis area which resembles a plateau that defines the boundary between the Rogue and Klamath basins in the southern Cascade Range. The sub-watershed where treatments are proposed is Keene Creek. The affected drainages either flow into Hyatt Reservoir, Little Hyatt Reservoir or Keene Creek Reservoir. A portion of the flow is then diverted from Keene Creek, which is a tributary of Jenny Creek and the Klamath River, to Bear Creek, which is a tributary of the Rogue River. Essentially all the water draining the affected drainages within the analysis area is impounded and a portion diverted from the Klamath Basin to the Rogue Basin. It is important to note that the drainages where treatments are to occur represent an area that currently has little direct effect on the main stream system and Jenny Creek due to diversion from Keene Creek Reservoir. Keene Creek flows in a southerly direction towards it's confluence with Jenny Creek. Elevations range between approximately 3,200 feet to 6,105 feet at Chinquapin Mountain. The headwater areas of these drainages range from moderately steep to gentle and is largely forested with numerous meadow complexes.

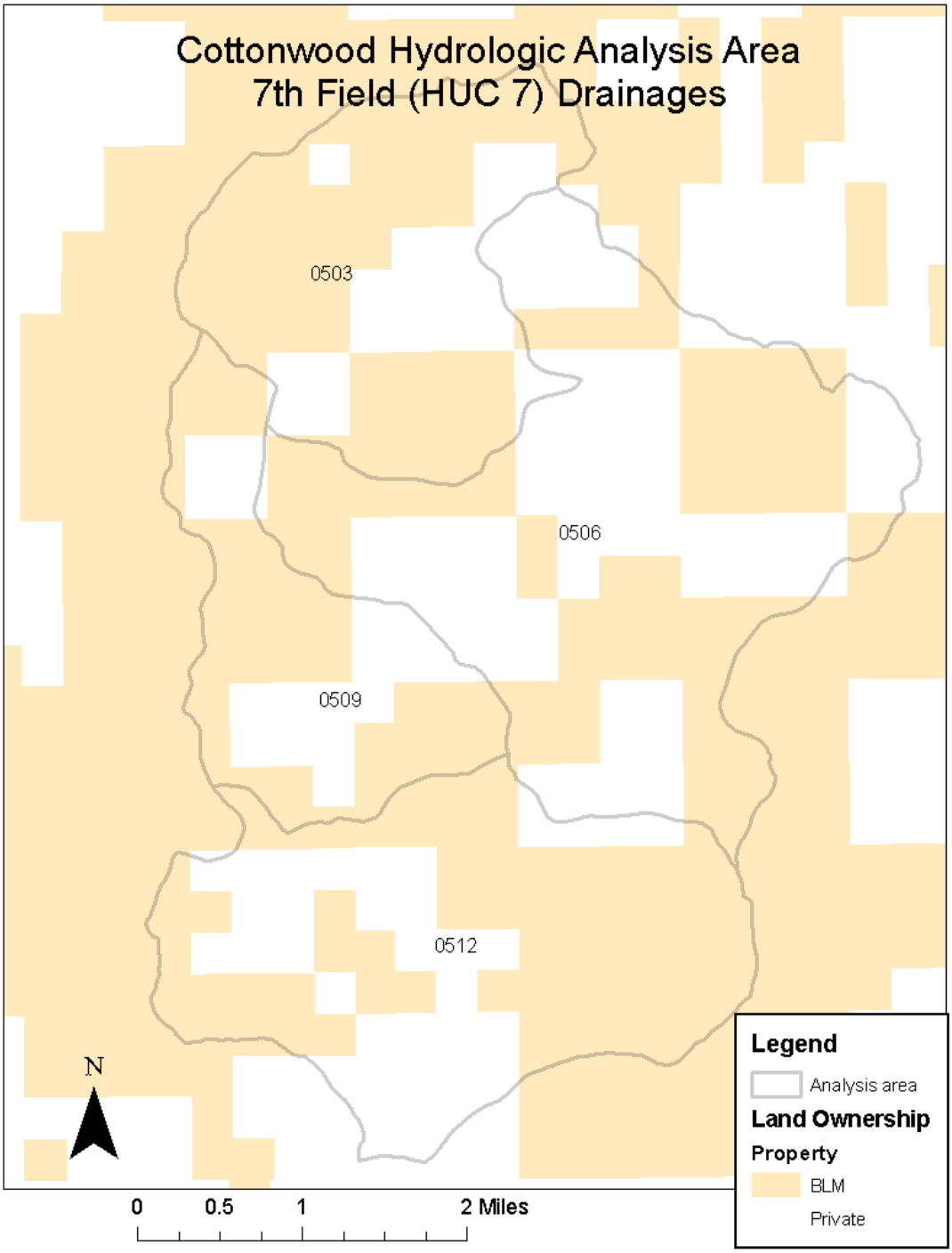
The climate is characterized by mild wet winters and hot dry summers. Average annual precipitation is approximately 33 inches. Winter precipitation in the higher elevations usually occurs as snow, which ordinarily melts during the spring runoff season from April through June. Rain predominates in the lower elevations with a mixture of rain and snow occurring between approximately 3,000 feet and 4,000 feet in what is referred to as the transient snow zone (TSZ). Rain on snow runoff events originate in this zone and when they occur can trigger landscape altering responses such as floods, debris torrents and landslides. The analysis area is almost entirely located within the snow zone, which is above the TSZ. Summer rainstorms occur occasionally and are usually of short duration and high intensity. These types of events are usually limited in coverage but can result in increased erosion and sediment deposition.

Private lands within the analysis area are generally used for ranching, commercial timber harvest, and recreational residences. Public lands are almost entirely managed by the BLM and are primarily used for timber harvest as well as summer and winter recreation, which is a substantial use on public lands in the analysis area. Regional public issues reflect the dominant uses of the analysis area and include concerns with recreational activities such as use of the Pacific Crest Trail (PCT) and off-highway vehicle (OHV) use; concerns with timber harvest and grazing on private and public lands; concerns about fish and water quality; and concerns over general degradation of the natural environment.

Table 3-2. Analysis Areas and Ownership Associated with the Cottonwood Project Area

Sub-Watershed	HUC 7 (drainage)	Acres	BLM (percent)	Private (percent)
Keene Creek	0503	2,602	70	30
	0506	4,808	47	52
	0509	1,833	64	36
	0512	3,649	63	37
Total		**12,892**	**61**	**39**

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



As a result, the hydrology of the analysis area has been altered through irrigation withdrawals, roads, grazing, stream alteration, and other actions. Streams in this area are primarily considered transport channels, whereas sediment is routed through these reaches only to be deposited in lower gradient depositional reaches. The BLM has not surveyed all of Keene Creek or tributaries to determine proper functioning condition (PFC), however it is likely that Keene Creek itself will never reach proper functioning condition because of the large amount of water diverted to the Rogue Basin.

The major factors currently influencing both water quantity and quality within the analysis area where harvest is to occur include canopy cover, roads, and riparian grazing impacts. Reduced canopy cover within the forested portion of the drainages that are less than historical can alter the amount and timing of streamflows. This may result in increased channel erosion and morphological changes to the stream channels. Roads, trails, and clearcut logging, can accelerate erosional processes and result in increased turbidity and sedimentation. This too can result in adverse impacts to aquatic habitat and organisms, including fish. Grazing along streams and within meadows can elevate stream temperatures and accelerate erosion by reducing streamside shade and altering channel form and process.

b. Roads and Road Density

Recent research (Reid and Dunne, 1984: Luce and Black, 1999) supported by local and regional field evaluations have consistently found roads to be the primary source of accelerated erosion in wildland watersheds. Roads impact aquatic systems through both chronic and episodic erosion. Chronic erosion is where material is detached and transported to streams via the road surface and drainage structures such as cross drains and inboard ditches. This occurs in response to precipitation events throughout the year. Episodic erosion usually occurs as a result of intense rainfall and rain-on-snow events within the transitional snow zone. Large failures often occur as a result of culvert plugging, stream diversion and fillslope landslides. In addition, where road densities are high, concentration and routing of stormwater may result in increased peak flows. Both road density and the number of stream crossings are gross indicators of the level of road impacts in watersheds. High road densities, greater than 4.0 miles per square mile (USDI and U.S. Dept. of Commerce, 2004), are found in all of the drainages within the analysis area (Table 3-3).

Although road density is a useful indicator, it should be noted that not all roads impart similar effects. For instance, the magnitude of impacts from roads on steep slopes is different than those from roads located on flat terrain. Roads located near streams and road stream crossings are responsible for the majority of sediment delivered to channels. Within the analysis area, many roads are unsurfaced and located within Riparian Reserves. In addition, some native surface roads are open during the wet season. This type of use can render drainage features ineffective and result in concentrated flow and increased erosion. Although all road densities are considered high, the drainage (0506) with the highest road densities correspondingly has the highest percentage of private ownership.

Currently, in the analysis area, roads, timber harvest, and grazing have been the largest source of sediment delivery to streams and subsequent adverse impacts to aquatic habitat. Although some road work has been accomplished, many crossings are susceptible to failure through culvert plugging and stream diversion. Other road segments are unsurfaced, steep, lack adequate drainage, or are located within close proximity to streams. Lack of road maintenance or improper road maintenance by all jurisdictions within the analysis area has increased sediment production or the potential for sediment production. There is also an expanding network of OHV trails. These features often utilize old road beds or are established through repeated off-road travel, or illegally constructed by proponents. They exist on the landscape irrespective of sensitive soils, adequate drainage, or proximity to watercourses and are also responsible for increased sediment production.

Table 3-3. 7th Field Road Densities for all Roads within the Analysis Area

Catchments	HUC 7 (drainage)	Road Density (miles/square mile) [1]	Riparian Reserve Road Density (miles/square mile) [1]
Keene Creek	0503	5.4	6.2
	0506	5.9	10.4
	0509	4.8	5.5
	0512	5.0	7.0

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

The major tributaries in the Keene Creek sub-watersheds, which comprise the 7th field HUCs analyzed, have steep gradients, usually greater than three percent. These channels are entrenched with steep sideslopes. Material is quickly moved through these reaches and deposited within the lower reaches as the gradient flattens. In the case of Keene Creek, what is not deposited along its limited lower gradient stream reaches ends up in Hyatt, Little Hyatt, or Keene Creek Reservoirs. Overall, stream condition/stability is good to fair in the lower part of the sub-watershed, however visual observations indicate relatively high levels of sediment in some reaches of Keene Creek below the project area. This is likely the result of the lack of flood flows which scour the channel and periodically redistribute sediment in a natural cycle. Dams and water diversions have interrupted this process. Not all streams have been surveyed for all parameters and based on recent field observations, conditions are highly variable and site specific throughout the analysis area.

c. Canopy Cover and Transient Snow Zone

Historically, geomorphic processes that shape landscape and channel geometry are triggered by large, infrequent storm events. In recent times, these events can be characterized by warm moist storms that result in high intensity, long duration rainfall. The results can be intensified when rainfall occurs on an established snowpack. The percent of a watershed in the transient snow zone (TSZ), for Jenny Creek roughly an elevation band between 3,000 and 4,000 feet, can indicate elevated risk of adverse impacts. These impacts can be accelerated by modifications to forest canopy cover and as discussed, roads and other disturbance features. Drainages where TSZ compromises greater than 25% of the drainage area are of hydrologic concern, particularly where large openings such as clearcuts exist. Large areas of vegetation removal in the transient snow zone are of particular concern due to alterations of the streamflow regime and resultant increased peak flow magnitudes (Christner and Harr, 1982). The analysis area is located almost entirely within the snow zone, which is above the transient snow zone. Recent research (Grant, et al., 2008) is inconclusive in determining accurate response to intensity of harvest within the snow zone; however it is recognized that drainages located outside the TSZ are generally less susceptible to increased peak flows.

Table 3-4. 7th Field HUCs Less Than 30% Canopy Cover and Percent within the TSZ

Subwatershed	HUC 7 (drainage)	Percent Forested Area Less Than 30% Canopy Cover [1]
Keene Creek	0503	45
	0506	52
	0509	21
	0512	26
	Total	

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

Modifications of canopy cover that result in less than historical conditions either through fire or timber harvest, also may affect the timing and volume of streamflow. An assessment of percent canopy cover is also useful in determining potential cumulative effects of the proposed activities. In the analysis area, the Ecoregion Description (WPN 1999: Appendix A) lists historical canopy closure as greater than 30 percent, with the exception of the oak woodland/ lowest elevations which historically had less than 30 percent canopy closure. An analysis of percent canopy cover of forested land at the 7th field HUC was conducted. This scale is where detectable changes in peak flows would likely occur. The previous table summarizes percent of the drainages that are below 30 percent canopy cover.

Different levels of harvest in watersheds have demonstrated variable effects on peak flows (Jones and Grant, 1996; Harr 1979). When less than 25% of a watershed is harvested, no detectible change in peak flows have been observed (Stednick, 1996). It should be noted the majority of literature available regarding the relationship between harvest and flow have focused on clear cut harvesting, many in areas that removed close to 100% of the overstory canopy. For this analysis, any area that is less than the historical 30 percent canopy cover is assumed to be hydrologically altered and responds similar to a clearcut. In contrast, any drainage that is above 25 percent harvested may be at an elevated risk of increased peak flows. This is particularly true if a large percentage of the drainage is located within the TSZ. For this analysis, two drainages (0503, 0506) exceed the 25 percent harvested threshold by a wide margin, while another (0512) barely exceeds it. Fortunately all the drainages are located outside the TSZ, so although a relatively large percentage of two drainages exceed harvest criteria, the synergism that may result in altered timing and increases in peak flows does not exist.

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

d. Surface Water

Surface water in the Cottonwood analysis area includes streams, ditches, springs, wetlands, and reservoirs. Streams in the project area are classified as perennial, intermittent with seasonal flow (long duration intermittent), intermittent with ephemeral flow (short duration intermittent), and dry draws with ephemeral flow. Streams categorized as perennial or intermittent on federal lands are required to have Riparian Reserves as defined in the Northwest Forest Plan (USDA and USDI 1994). Dry draws do not meet requirements for streams needing Riparian Reserves because they lack the combination of a defined channel and annual scour and deposition (USDI 1995:27). Streams on private forest lands are managed according to the Oregon Forest Practices Act. Stream types on BLM-managed lands were identified through site visits; USFS and non-federal land stream types were estimated using aerial photo interpretation and extrapolation from information on adjacent BLM-managed lands. Table 4 summarizes stream miles within each HUC. Mileages include perennial, intermittent, and ephemeral (short duration intermittent).

Stream channels in the analysis area have been influenced since the arrival of Euro-American settlers. This is particularly true where dams and water transfers have altered flow regimes. The most significant change which occurred downstream of the analysis area was the construction of Hyatt, Little Hyatt and Keene Creek Reservoirs. Within the analysis area, the inter-basin transfer of water from the Klamath Basin to the Rogue Basin directly impacts both Keene and Jenny Creeks.

Table 3-5. 7th Field HUC Stream Miles, BLM and Other

Subwatershed	HUC 7 (drainage)	Stream Miles		Total Miles
		BLM	Private	
Keene Creek	0503	7.2	4.1	11.3
	0506	9.3	13.5	22.8
	0509	5.9	6.3	12.2
	0512	9.2	10.7	19.9
	Total			

Cattle and sheep use on the Dead Indian Plateau become prominent in the late1800s and heavy livestock use continued until the mid 1900s. They tended to concentrate along stream courses and likely caused streambank deterioration as they moved in and out of channels. Livestock grazing is currently occurring on both public and private lands in the analysis area. In some reaches, there continues to be an apparent lack of large wood available today. As a result, peak flows can be more destructive without sufficient instream structure to reduce stream energy. As more streambank erosion occurs and streams downcut, the channels become more entrenched. This also reduces channel diversity necessary for sustaining aquatic species.

Within the upper watersheds where harvest is proposed, the primary concerns are lack of riparian shade and large wood recruitment from grazing and past harvest activities. Also, elevated sediment and turbidity levels are occurring as a result of an extensive road network and other disturbances such as OHV use. Summer water temperatures for Keene Creek exceed the State temperature criteria and it is currently designated as water quality limited and on the 1998Oregon 303(d) list.

Most of the warming can be attributed to flow alterations and loss of riparian shade. Stream temperatures on Federal lands not affected by water withdrawals are expected to improve as Riparian Reserves and improved grazing practices promote the maintenance and improvement of streamside vegetation on BLM administered lands.

e. Fuel Loading

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

f. Groundwater

Groundwater supplies in the analysis area are primarily found in limited areas containing valley bottom alluvium or shallow aquifers where springs and seeps are present. Increasing demand from rural population density increases and years with below-normal precipitation have been identified as factors affecting ground water supplies in Jackson County (USDI 1994:3-13). The Medford District PRMP/EIS identified that an increase in rural population density has been accompanied by an increase in ground water diversion, and this trend is expected to continue (USDI 1994:3-13). None of the proposed Cottonwood project area has been identified as a critical groundwater area by the Oregon Water Resources Department (OWRD 1989).

2. Environmental Consequences

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

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

Future timber harvest on private lands would likely occur within the planning area and assumes that it will continue at a similar rate as has occurred in the past. Private lands are governed under state forestry regulations, and as such receive a different level of protection than Federal lands. Analysis of effects from private timber harvest generally considers the worst case scenario (i.e., all suitable forested lands would be logged at ~ 60 year tree-growing rotations) with regeneration harvest and road building as the predominate effects. Currently, approximately 488 acres of private timberland within the analysis area is predominantly 60 years old or older and available for harvest. The drainages with the highest number of those acres are 0509 and 0512 which contain 232 and 240 acres respectively. One drainage (0503), contains no stands over 60 years old on private land. These numbers reflect small acreages available for private harvest relative to the overall size of the drainages and may partially explain why two drainages have high percentages of reduced canopy cover. A small amount of timber harvest on Federal land (BLM) is planned within these drainages. The Sampson Cove Timber sale proposed on BLM lands includes 6 acres of commercial units along the drainage divide from the Bear Creek Watershed into the Keene Creek subwatershed. These units are located near the ridge top, do not include any stream channels or Riparian Reserves, and would leave a minimum of between 40 to 60% canopy cover following harvest. Because they would retain sufficient canopy cover to negate the possibility of altering peak or base flows, these units would not contribute to an increased risk for cumulative effects within the analysis area.

a. Alternative 1

Direct and Indirect Effects

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

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

In the long term, a high intensity wildfire over part or all of the area may occur. Should this happen, it could drastically alter the surface water and groundwater regime. Immediately after a severe fire, the loss of vegetation would make more groundwater available for streamflow and low summer flows would likely increase. However, the absence of vegetation may also result in an increased risk of higher peak flows and increased erosion.

b. Alternative 2

Direct and Indirect Effects

This alternative proposes various prescriptions of commercial tractor and cable timber harvest totaling 1,108 acres, 1.5 miles of new road construction, 0.6 miles of temporary road construction, and1.9 miles of road decommissioning, road maintenance and improvements, and the use of existing landings. In addition, depending on post-harvest conditions, activities may be followed up by fuels treatments that would entail hand thinning, piling and burning. An evaluation of fuel conditions five years post-harvest may occur, and if needed underburning within treated units would be implemented to maintain desirable characteristics.

All vegetation treatments would maintain an overstory and mosaic of understory vegetation. At least 40-60 percent canopy cover would be maintained in harvest units. There would be no increase of percent canopy cover less than 30 percent within the analysis area, which may result in an increase in peak flows. Base flows would likely remain unaffected as the magnitude of vegetation removal would not significantly reduce transpiration. Since there is no harvest proposed within Riparian Reserves, stream temperatures would not be affected and the proposal would allow attainment of the Aquatic Conservation Strategy (ACS) and the project would be in compliance with the Upper Klamath and Lost River Subbasins Total Maximum Daily Load (TMDL) and Water Quality Management Plan (2010).

Where commercial harvest occurs, treatment of activity generated fuels would include hand piling and burning. This would retain a mix of hardwoods and conifers, organic duff layer, leaf litter, and coarse wood debris. Collectively these forest components provide nutrients, bacteria and fungi decomposers, and mycorrhizae to maintain long term site productivity. Additionally, activity fuel treatments would occur within 6 months to two years following harvest activities while follow-up maintenance underburning would occur over a period of about 5 years, distributing activity over time. These activities would not appreciably decrease canopy cover as only small diameter vegetation would be cut and piled.

As described in the affected environment section, sediment levels due to roads, past harvest, grazing and other disturbances is the primary focus of concern. In addition to road construction and renovation, this proposal includes log hauling and associated road maintenance. This includes ditch cleaning, road blading, and maintenance of drainage features. Log truck traffic, especially on unsurfaced roads, loosens the road surface and makes that material available for transport to channels. When road maintenance is performed improperly or best management practices (BMPs) are not implemented the potential for sediment delivery to streams increases dramatically. Examples include sidecasting material, undercutting cutslopes, improper disposal of material, and unnecessary disturbance within Riparian Reserves. Luce and Black (1999) found no significant increase in erosion when only the road surface was treated; however statistically significant erosion occurred when road ditches were bladed. Luce and Black (2001) observed an 87% decrease in erosion and sediment transport from roads in years one and two following road maintenance activities. With this proposal, hauling and road maintenance activities are expected to result in a short term increases in sediment and turbidity. If BMP's are implemented and maintenance activities are properly conducted, these increases are expected to be minor. If transport occurs during high flows, which is likely, the introduced sediment would become an immeasurable fraction of the total sediment load and would not be detectable at downstream locations.

Road construction has the potential to increase both short and long term sediment production as well. Also, decommissioning if not properly implemented can lead to short term increases in sediment. Compared to the existing road system, this proposal would result in a net decrease of road miles within the analysis area by 0.3 miles. This is consistent with management direction (ACS) to reduce, or not increase road densities within Key Watersheds. The newly constructed temporary roads would be decommissioned using various techniques to preclude vehicle use. All new road construction would be designed and constructed using techniques that disperse water; therefore no connectivity with stream channels would occur.

Within the Jenny Creek watershed, the BLM decommissioned 10.1 miles of road between 1995 and 1996. An indirect affect that is difficult to quantify is OHV use following harvest. In areas not already closed by gates or other measures, OHV use of skid trails and other features such as previously closed roads has been observed. The result is a potential increase of unmanaged OHV trails leading to elevated sediment rates and adverse impacts to soils and other resources. These effects may persist over time. Within the analysis area, light to moderate use is occurring and may increase if project design features (PDFs) specific to road closures are not adhered to.

Actions included in this proposal that have a higher probability of sediment delivery include road use and maintenance, cable and tractor yarding, and road construction. If project design features (PDFs) and BMPs contained in Chapter 2 are implemented properly, there would be small increases of sediment routed to stream channels. Also, given the small amount of compacted area and no increases in canopy cover less than 30 percent (Table 3-4) beyond existing, there is little probability the proposal would modify the magnitude or timing of peak or base flows.

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

Given the uncertainty in climate models and the predicted effects of climate change on a site specific scale, it is difficult estimate the combined effects of this site-specific project with those anticipated effects of climate change with any certainty. Therefore, the best way to address this issue is to discuss the effects of this project on maintaining watershed resiliency. Under this alternative, vegetation and fuels treatments may decrease the likelihood a high intensity wildfire over part or all of the area may occur. This would maintain or slightly improve watershed resiliency. Alternately, roads and road construction can decrease watershed resiliency.

Cumulative Effects

As described in the affected environment, impacts from roads, recreation, grazing, OHVs, clearcut logging and water diversions has altered watershed processes and is responsible for localized degraded aquatic processes and conditions. This mix of impacts is typical of many of the drainages that are tributary to Keene and ultimately Jenny Creeks.

It is expected that reasonably foreseeable future actions including rotational harvest on commercial timberlands that maintain forest conditions in an early to mid seral condition (USDI 1995) and land disturbance attributed to development of private lands will continue. Activities on BLM lands will likely continue to focus on commercial thinning for forest health and fuels reduction projects. Some recovery is expected to occur as previously harvested areas within Riparian Reserves improve shade and large wood recruitment.

Grazing impacts on private lands will likely continue to occur at near present levels. On BLM managed lands, only a small portion (67 acres) of the project area is within the Buck Point grazing allotment. Overall, livestock numbers have been greatly reduced in the project area since the Keene Creek grazing allotment was retired in 2008. This has likely resulted in improved conditions within riparian areas and this trend is expected to continue.

Overall, Alternative 2 does not reduce canopy cover below critical thresholds or result in appreciable increases in ground disturbance. These would be the primary catalysts that may trigger synergistic responses. The proposal is located almost entirely outside the TSZ and does not decrease canopy cover that may result in peak flow increases.

Road densities however are considered high in all drainages, including within Riparian Reserves. One drainage in particular (0506) has both high road densities and a relatively high percentage of forested acres that is less than 30 percent canopy cover. This drainage may be at an increased risk of cumulative impacts. However, this proposal would decommission 0.3 miles of existing road, build no new roads, and the canopy cover would be maintained. Therefore, this proposal would not increase risk within this drainage.

The drainages with proposed new road construction under this alternative are 0509, and 0512. Total mileages of new construction are 1.2 and 0.2 miles respectively. Within these, one drainage (0509) would have 0.1 miles of new construction within Riparian Reserves. All of the temporary new construction occurs within 0509. A total of 0.8 miles of existing roads within Riparian Reserves would be decommissioned. These are all located within 0503. The table below summarizes the changes in road density between Alternative 1(No-Action) and Alternative 2.

Table 3-6. Comparison of Road Density in Miles/Square Mile for Drainages with New Construction

Subwatershed	HUC 7 (Drainage)	Alternative 1 (No-Action)		Alternative 2	
		Total	Riparian	Total	Riparian
Keene Creek	0503	5.4	6.2	5.0	5.2
	0506	5.9	10.4	5.8	10.4
	0509	4.8	5.5	5.2	5.5
	0512	5.0	7.0	5.0	7.0

Increased road density, particularly with Riparian Reserves, can increase the potential for sediment delivery to stream channels. Overall, road densities would decrease in drainages 0503 and 0506, increase (8%) in drainage 0509, and remain the same in 0512. Within Riparian Reserves, road density would decrease substantially (16%) within drainage 0503, and remain the same within the others. New road construction would be outsloped to eliminate connectivity with stream channels. Also, all new construction occurs on relatively gentle terrain. No perennial channels would be affected. Since canopy cover would not be reduced below 30 percent, synergistic cumulative effects would likely be minimal. Sediment production resulting from road use and construction may increase in the short term. In many cases, riparian vegetation vigor would improve over time, thus potentially decreasing stream temperatures. Although due to past harvest and high road densities two of these drainages are at a moderate elevated risk of cumulative effects, this alternative does nothing to increase that risk within those drainages, or the larger subwatersheds. It is also expected that sediment delivery from new road construction would be short term and minor. Since canopy cover would not be reduced below 30 percent, synergistic cumulative effects would likely be minimal. Sediment production resulting from road use and construction may increase in the short term.

D. FISHERIES & AQUATIC HABITAT

The proposed Cottonwood Forest Management Project would be located in the western-most portion of the Jenny Creek Watershed, in the Klamath River Basin, specifically in the upper portion of the Keene Creek subwatershed. For the fisheries analysis, areas will be discussed by major catchment, defined by areas that drain to distinct fish bearing streams. In the Cottonwood Project, these catchments consist of Keene Creek and its tributaries above Keene Creek Reservoir, including Cottonwood Creek, which flows into Hyatt Lake, and Burnt Creek, a Keene Creek tributary above Little Hyatt Lake. Henceforth, this area will be referred to as the analysis area.

Keene Creek is itself a large fish bearing tributary to Jenny Creek. Note that all project elements of the Cottonwood Project would occur upstream of Keene Creek Reservoir, which diverts a substantial portion of water from Keene and Jenny Creeks out of the Klamath Basin and into the Rogue Basin via a system of water works which terminate in Emigrant Creek, in the Bear Creek Watershed. Keene Creek Reservoir acts as an efficient sediment trap, as evident by the deposited sediment delta observable at the head of the reservoir when it is drawn down. Effects to aquatic habitat as a result of the Cottonwood Project would not be discernable downstream of Keene Creek Reservoir.

At the top of the Cottonwood Creek catchment, there are 12 acres of harvest units which slop over the drainage divide into the Dead Indian Creek catchment, which is in the Little Butte Creek Watershed. These units are located on top of a flat table land, far from any waterways. Harvest prescriptions would leave 40% or greater canopy cover. Because these units would not reduce canopy cover to a threshold which would allow for discernable effects to peak or base flows to occur, and because they would have no hydrological connectivity, and hence no causal mechanism to affect aquatic environments in the Dead Indian Creek catchment, they will not be discussed further in this analysis.

The mainstems of Keene Creek and its tributaries below Keene Creek Reservoir and Jenny Creek and its other tributaries are not included within the analysis area, but the Jenny Creek Watershed as a whole will be briefly discussed in this analysis, as the Northwest Forest Plan requires that Aquatic Conservation Strategy objectives (see section F, below) be analyzed at the site, drainage, and fifth field watershed scales. However, the primary focus of this analysis will be on the afore mentioned analysis catchments (the site and drainage scales), as it is in these particular streams that potential effects to fisheries resources from this project would be discernable.

1. Key Fisheries and Aquatic Resources Issues

Scoping (external and internal) generated the following key issues for fish and fish habitat both existing and anticipated under implementation of the Proposed Action.

Riparian areas and instream aquatic habitats in the watershed are currently degraded from a host of past and ongoing activities within the watershed, particularly but not limited to: 1) Demands for water use have led to: construction of dams which obstruct fish passage; diversions and transfer of water out of the watershed; and altered stream flow regimes. 2) High road densities which has increased the potential for sediment inputs to aquatic habitat. This trend is improving on federal lands in the watershed, as roads have been and continue to be decommissioned, especially in the vicinity of the Cascade Siskiyou National Monument (CSNM), and newly designated Soda Mt Wilderness area. 3) Historical and ongoing grazing has resulted in increased erosion and sediment transport to many stream reaches, including those within the analysis catchments. Riparian adjacent vegetation has been reduced in some areas by grazing. This trend has been improving for the last decade due to the retirement of allotments on federal lands in the vicinity of the CSNM, the use of riparian exclosures, and restoration efforts undertaken in the last 15 or so years on many BLM lands. 4) The Jenny Creek Watershed Assessment assumed that only 0.5 mile of 76.5 miles of perennial streams in the Jenny Creek Watershed were in Proper Functioning Condition in 1995. At the time the WA was written, on the ground surveys had not been conducted on many stream reaches within the watershed. Perennial reaches within the analysis catchments were found to be PFC after on the ground surveys were conducted in 1999.

Based on recent sampling efforts, populations of native redband trout in the Jenny Creek Watershed appear to be depressed relative to past observed population numbers. It is unknown what factors, either natural or anthropogenic in nature, may have contributed to this apparent decline.

Sediment loading in stream reaches in the analysis catchments has generally not been found to be adversely impacting instream habitats, due in part to the filtering effect of the three large impoundments which effectively capture any sediment transported to downstream reaches. However, other stream reaches in the larger watershed area, including Jenny Creek, do suffer from elevated sediment levels.

In addition, the lack of flushing flows in some years due to water storage operations at Hyatt and Howard Prairie reservoirs may be impacting habitat, particularly in mainstem reaches of Jenny Creek, which is home to the endemic Jenny Creek sucker. Flushing flows have the ability to mobilize and transport stored sediment out of affected habitats. The Oregon Department of Fish and Wildlife (ODFW) considers fine sediment levels of greater than 20% to be "undesirable" for salmonids. Sedimentation from use of roads, and other ground disturbing activities associated with timber harvest has potential to increase sediment levels in stream channels, which could further degrade habitat, as a result of implementing the Proposed Action.

2. Fish and Designated Habitat

There are no federally designated threatened or endangered species in the Jenny Creek Watershed. As such, there is no designated critical habitat. Before construction of Iron Gate Dam on the mainstem Klamath River, it is likely that listed Southern Oregon/Northern California Coast coho salmon were historically present in the lower ~ 2 miles of Jenny Creek, which is below a large natural barrier falls. All anadromous fish populations in Jenny Creek were extirpated by the dam. As there are no anadromous salmonids in the watershed, there is no designated Essential Fish Habitat. The Jenny Creek sucker, found in Jenny Creek and several of its tributaries, and the redband trout, found throughout the watershed are designated special status species, but are not protected under the Endangered Species Act.

Riparian Reserves

Under the Northwest Forest Plan, Riparian Reserves (RRs) were 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-fishbearing 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 170' on BLM lands in the Jenny Creek Watershed; therefore 170 feet will be used for non-fishbearing Riparian Reserves and 340 feet will be used for the fishbearing Riparian Reserves. 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 fish habitat, help filter fine particulates which may be mobilized from upland areas, 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 and watersheds. These objectives are examined at the site (e.g., a single pool or stream reach), HUC 7 (drainage) and HUC 5 (large watershed) scale. The 9 objectives and effects from implementation of the Proposed Action are presented in section F (below) of this document.

In addition, the ACS identifies Key Watersheds, which contribute directly to conservation of at-risk anadromous salmonids, bull trout, and resident fish species. They also have a high potential of being restored as part of a watershed restoration program. The Jenny Creek Watershed is a designated Key Watershed, due to the presence of the endemic Jenny Creek sucker and native redband trout. Of note and pertinent to this project, Key Watersheds include a special management mandate that no net gain in roads occur as a result of any Federal management action.

3. 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 Cottonwood Project, within the analysis area. Anticipated direct and indirect affects to fisheries resources will be described from each action. For any foreseeable future action determined to have any anticipated effects to aquatic habitat, the cumulative effect of the action coupled with effects from the Cottonwood Project will be discussed at the end of this analysis.

Federal Timber Harvest

The Sampson Cove Project proposed on BLM lands includes 6 acres of units which slop over the drainage divide from the Bear Creek Watershed into the Keene Creek subwatershed. These units are located near the ridge top, do not include any stream channels or Riparian Reserves, and would leave a minimum of between 40 to 60% canopy cover following harvest. Because they do not have any hydrological connectivity with aquatic habitat in the Keene Creek subwatershed, and because they would retain sufficient canopy cover to negate the possibility of altering peak or base flows, these units would have no causal mechanism to affect aquatic habitat in Keene Creek. As such, harvest of these units would not have any direct or indirect effects, and hence would not add a cumulative effect to aquatic habitat.

Other Federal forest management projects are planned within the larger Jenny Creek Watershed, but not within the analysis area. These include the Swinning Timber sale, which is proposed in areas upstream of Howard Prairie Reservoir, and the Cold Onion Timber Sale, proposed in upper potions of the Johnson Creek catchment on the Klamath Falls Resource area of the Lakeview BLM. Environmental analyses have been conducted for both of these sales; the Swinning timber sale was analyzed under the Plateau Thin EA (EA M060-2010-0034), while Cold Onion Forest Health Treatments EA (EA OR 014-08-11) was prepared for the Cold Onion Timber sale. Both analyses determined that potential adverse effects to aquatic environments from proposed activities would be limited to small site level, short term inputs of sediment and/or turbidity. These inputs were determined to have no potential to adversely impact water quality, and therefore no potential for these projects to contribute to significant adverse cumulative effects to water quality or aquatic habitat in the Jenny Creek Watershed.

Private Timber Harvest

Future timber harvest on private lands would likely occur within the analysis area. The Water Resources analysis of this EA addresses future timber harvest on private lands, and assumes that it will continue to occur at a similar rate as has occurred in the past, with similar affects to aquatic habitats. Private lands are governed under state forestry regulations, and as such receive a different level of protection than Federal lands. Analysis of effects from private timber harvest generally considers the worst case scenario (i.e., all suitable forested lands would be logged at ~ 60 year tree-growing rotations). At this time, it is not known when or where private timber harvest will occur in the area. This analysis will assume that all suitable private lands will continue to be subject to timber harvest, and that the amount of disturbance to aquatic systems as a result of this harvest will continue similar to present rates, helping to maintain degraded aquatic habitats.

Grazing

Cattle grazing is widespread throughout the planning area catchments, both on private and BLM managed lands. Several allotments on BLM managed lands are up for renewal. The lease renewal process utilizes standards and guidelines which consider effects to aquatic habitat, so at a minimum it is anticipated that no additional degradation to aquatic habitat would result from renewal of the allotments which overlap with the Cottonwood analysis catchments. A more likely result of the renewal process would be a reduction of impacts, which could be accomplished by such measures as reducing the number or duration of livestock grazing, riparian exclusion, providing off site water, etc. Specific management plans for area allotments have not been fully developed at this time, so this analysis will assume that cattle grazing will continue across all ownerships as at present.

Cattle grazing in sensitive riparian areas will continue to impact water quality, with chronic episodic inputs of sediment and turbidity occurring to stream reaches adjacent to destabilized and trampled banks. Small springs and seeps are particularly vulnerable to degradation, as these areas often contain suitable browse along with a reliable water source, which both attracts and concentrates cattle to these areas. In areas lacking a large overstory component, cattle browse of riparian vegetation could also add to stream temperature warming.

Little Hyatt Dam

Little Hyatt Dam has weathered to the point that its integrity has been compromised. Recent emergency stabilization measures undertaken by the BLM have alleviated short term concerns of a dam failure, but its long term future remains in doubt. The BLM is considering several alternatives for dealing with the dam, including restoration, full removal, and partial removal. At this time, no decision has been made as to the fate of the dam. If the dam is restored, existing conditions would remain; no additional impacts to aquatic habitat would occur as a result of this decision. If it is decided to fully remove the dam, it is anticipated that effects to fish and fish habitat would occur. The primary impact would likely be a large input of sediment and turbidity to Keene Creek immediately following dam removal. The sediment would migrate downstream overtime to Keene Creek reservoir, where it would settle out and be stored. Turbidity pulses would periodically occur as high water events flushed deposited fine sediment downstream, potentially resulting in short term impacts to feeding behavior.

Removal of the dam would restore upstream passage to migratory fish, though this would be of limited benefit to aquatic species, as other large dams exist both up and downstream of Little Hyatt dam. Should the BLM choose to partially decommission the dam, fish passage facilities could be a requirement of the action, again restoring access to the limited amount of stream between Little Hyatt and Hyatt Lake Dam. This alternative would not release the volume of sediment associated with full dam removal, as the majority of deposited sediment behind Little Hyatt Dam would remain behind the partial structure left. It is probable that as Keene Creek carved through newly exposed mud flats as the reservoir level was dropped that turbidity levels would spike for short periods, impacting downstream habitats for a short durations.

The turbidity pulses could potentially disrupt feeding behavior of aquatic organisms in downstream reaches of Keene Creek for short periods. The native fauna of the Jenny Creek Watershed have evolved in a dynamic system that historically was naturally subject to periods of increased turbidity, such as would occur during a rain on snow event, or a particularly rapid snow melt. As such, short periods of increased turbidity resulting in either a full or partial dam removal would not be expected to have long term detrimental impacts to aquatic species. A significant release of fine sediment (in the case of the full removal option) on the other hand, could potentially have more severe impacts; these include reduction in spawning habitat, reduced substrate availability for macroinvertebrates and hence reduced food source for other aquatic organisms, both of which could lead to decreased growth, survival, and reproduction rates of fish and other aquatic fauna. Impacts of this nature would persist for some time, as the mobilized sediment made its way ~ 2.1 downstream to Keene Creek reservoir, but would be limited to this reach, as the reservoir would effectively capture and hold the sediment.

4. Affected Environment - Fish and Designated Habitat

This section and the following sections present baseline conditions in the Little Butte Creek Watershed and within the analysis 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 Cottonwood Forest Management Project, coupled with foreseeable effects from future projects as described above, are the cumulative effects of this project to fisheries resources in the watersheds and specific analysis catchments.

a. Fish Distribution

Jenny Creek Watershed

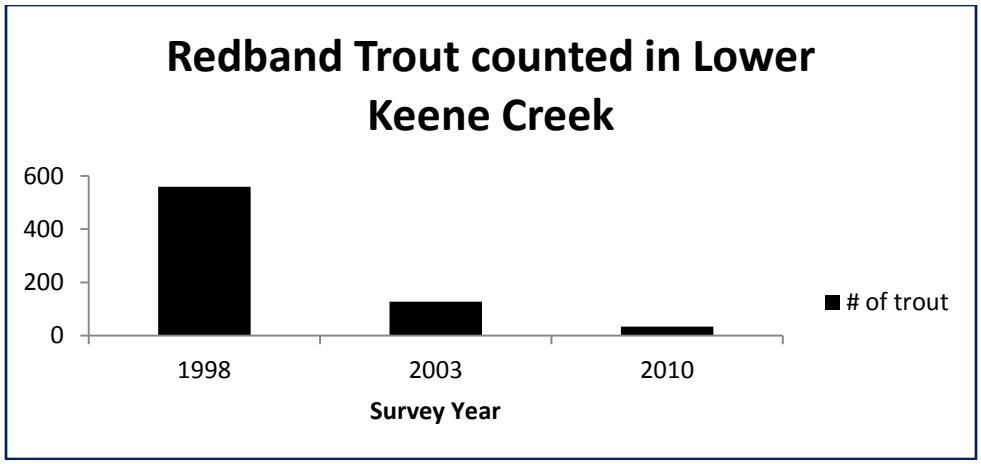
The Jenny Creek Watershed supports only three native fish species for most of its length; the endemic Jenny Creek sucker (*Catastomus rimiculussp*), a subspecies of rainbow trout known as the redband trout (*Onchorynchus mykiss sp.*), and a minnow, the speckled dace (*Rhinichthys osculus*). Redband trout are uniquely adapted to survive in warmer waters than most other salmonids, and can tolerate water temperatures as high as 84°F (Rodnick et al., 2003). This adaptation suits them well in systems like Jenny Creek which are subject to warmer water temperatures than most salmonids prefer. A large barrier falls located a couple of miles upstream of the mouth of Jenny Creek precludes migratory fish from most of the watershed. It is likely that before the construction of Iron Gate dam on the mainstem Klamath River that other native fish species, such as summer run steelhead (*Onchorynchus mykiss)* and coho salmon (*Onchorynchus kisutch*) would have utilized this lower reach. These runs were extirpated by the construction of the dam, which does not have any fish passage facilities. Non-native species in the watershed include largemouth bass (*Micopterus salmoides*), bluegill (*Lepomis macrochirus*), black bullhead (*Ameiurus melas*), and golden shiner (*Notemigonus crysoleucas*). These fish have been introduced to provide sport fishing opportunities, and their distribution is primarily limited to the reservoirs, though they are from time to time found in the free flowing reaches in limited numbers.

Keene Creek

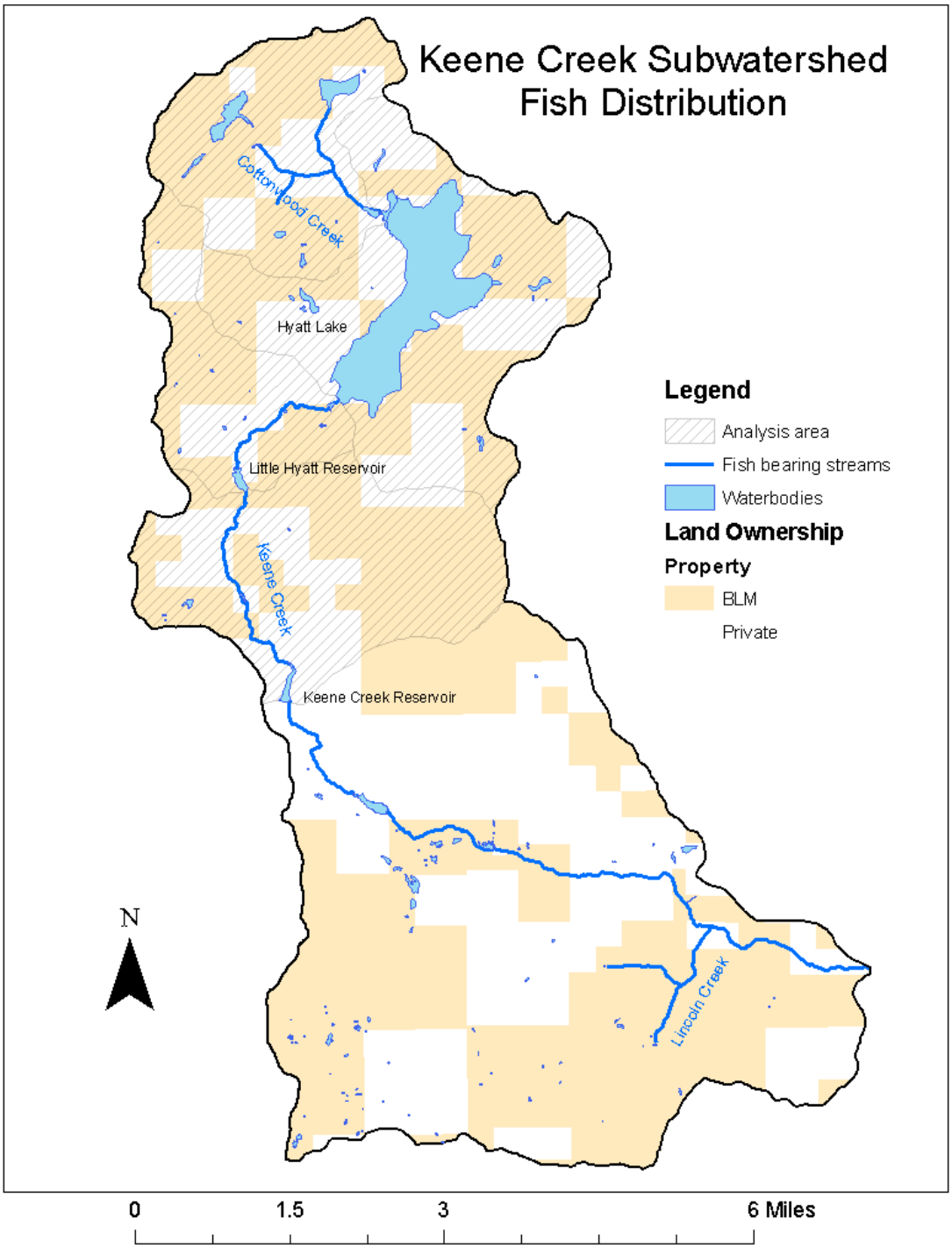
Within the analysis area, rainbow trout and speckled dace are present throughout Keene Creek (Map 3-4). The rainbows found in upper portions of Keene Creek (upstream of Keene Creek Reservoir) appear to be of hatchery origin rather than native redband trout, descendants of fish intentionally stocked into the reservoirs. Dace are also widely spread throughout Keene Creek. Jenny Creek suckers have not been observed in Keene Creek above Keene Creek Reservoir. Rainbow trout have also been described in Cottonwood Creek and two of its larger tributaries; their distribution in the drainage is limited almost exclusively to private lands. Fish have not been found in Burnt Creek, probably due to its relatively small size and steep gradient at its mouth.

Repeated snorkel surveys of Keene Creek in 2010 documented a reduction in the number of redband trout as compared to observations made in past years (Figure 3-1 below). In addition, two pass electrofishing depletion surveys conducted on three separate reaches of Keene Creek in 2010 documented densities of trout that were much lower than anticipated. Repeat snorkel surveys conducted on Jenny Creek showed this same trend, as redbands were encountered 40% less in 2010 than in 2003, while interestingly, numbers of Jenny Creek sucker encountered in 2010 were much higher than in previous year's surveys. It is unknown at this time why trout populations appear to have declined throughout this period in the watershed, while sucker populations appear to have increased.

Figure 3-1. Number of Redband Trout Counted in Lower Keene Creek During Summer Snorkel Surveys



Map 3-4. Fish Distribution in Keene Creek



5. Affected Environment - Aquatic Habitat

Jenny Creek Watershed

Aquatic habitat in the watershed includes free flowing stream reaches, natural ponds such as the parsnips lakes, and dam regulated impoundments, ranging in size from less than 10 surface acres (Little Hyatt reservoir), to the over 1,700 surface acre Howard Prairie Reservoir. Natural stream reaches display a wide degree of diversity, largely driven by variances in local topography, and range from low gradient meandering meadow reaches, to old growth dominated step pool reaches, to moderately high gradient reaches constrained by steep canyon walls which contain plunges and large scour pools.

Many reaches support habitat and browse suitable for beavers, and beaver dams and their associated pools are abundant, particularly on upper portions of Jenny Creek. This diversity of habitat provides for a good balance of spawning, rearing, holding, and overwinter habitat for native aquatic species.

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

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

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

Keene Creek

At over 26,500 acres in size and composed of eleven 7th field drainages, the Keene Creek subwatershed is the largest tributary to Jenny Creek. BLM managed lands account for 58% of the drainage, and 36% (6.2 miles) of the fish bearing channels. The upper subwatershed (from Keene Creek Reservoir upstream) is typified by lower gradient stream reaches which are interrupted by three large reservoirs. There is one very high gradient reach between Little Hyatt and Hyatt Lakes, as the stream flows down a steep basalt flow composed of large boulders. Stream adjacent meadows are common in this portion of the subwatershed. Keene Creek Reservoir diverts substantial quantities of water from the upper subwatershed into the adjacent Bear Creek (Rogue River Basin) Watershed. The lower subwatershed is typified by higher gradient stream reaches, with numerous cascades and step pools formed by rocks or debris jams. Most mainstem reaches of Keene Creek in this section are surrounded by forest stands which provide both shade and a source of large wood inputs to the stream. Water temperatures have been observed to be as much as 12 degrees F cooler in reaches of the lower subwatershed than those observed in the upper subwatershed, likely a result of the impoundments which allow for increased heating of water. (USDI, 2010).

Quantitative data regarding instream habitat conditions have been assessed by BLM aquatic inventories which were conducted on every mile of stream in the subwatershed on BLM lands. Inventories placed perennial and intermittent stream reaches into a qualitative category based on streamside indicators. These categories are Proper Functioning Condition (PFC), Functioning at Risk (FAR) and Non Functioning (NF). The PFC Assessment refers to a consistent approach for considering hydrology, vegetation, and erosion/deposition (soils) attributes and processes to assess the condition of riparian areas.

Reaches are rated PFC when streamside indicators point to a stream that functions in its natural capacity to dissipate energy associated with high flow events, is capable of sorting and storing substrates in a natural matter, and has sufficient structure and adjacent riparian vegetation to stabilize streambanks. Instream habitat in surveyed reaches of Keene Creek was found to be in PFC, with substrate composition, channel conditions, bank stability, and riparian cover indicators occurring in ranges beneficial to aquatic organisms. Within other analysis area drainages, the perennial reaches of Burnt Creek and Cottonwood Creeks were also found to be PFC (USDI, 1999). Aquatic inventories conducted along the entire length of Keene Creek by the ODFW assessed substrate composition. These surveys found that average levels of fine sediment were in the desirable range, below the 20% benchmark indicator (ODFW 1993). They also documented that large wood levels in most reaches were very low, though numerous debris jams were tallied, and that streamside banks were stable and not actively eroding.

6. Environmental Consequences - Aquatic Habitat

a. Alternative 1

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 altered state. As no new road construction or decommissioning would occur, road densities would remain at the current level within the analysis area. Fish habitat would continue to be impacted as a result of past and ongoing activities, as described in the current condition section.

b. Alternative 2

This alternative proposes various prescriptions of commercial timber harvest, follow up activity fuels treatments, new road construction, road decommissioning, and log haul, as described in Chapter 2 of this document. All harvest prescriptions would leave at least 40% canopy cover remaining after harvest. No harvest would occur within Riparian Reserves, or have direct hydrological connectivity with aquatic environments. Disturbances proposed in the Cottonwood Forest Management Project with proximity and/or connectivity to aquatic habitats include construction of approximately 330’ of riparian road, which would include one crossing over an intermittent stream channel, decommissioning over ¾ of a mile of riparian roads, involving four perennial stream crossings, and an estimated 30 miles of log haul over non-paved routes, which would include multiple stream crossings.

Ground disturbing activities in or near stream channels and roads have the greatest potential to impact fish habitat; it is these activities that could increase erosion and sediment transport to, and storage in, stream channels. The new road construction, road decommissioning and log haul are the project elements proposed under this alternative which have been identified as having the greatest potential to contribute sediment to streams.

Commercial Timber Harvest

There are three primary mechanisms by which timber harvest may influence aquatic habitat: 1) Removal of stream side vegetation reduces shade, which can increase water temperature, and reduce recruitment potential of large wood, a key habitat feature of aquatic systems. 2) Reduction of canopy (particularly in the transient snow and snow zones) if applied to large areas of watersheds has been shown to alter hydrological processes, such as increasing peak and base flows, or altering the timing of these flows, which in turn may impact channel and habitat features. 3) Ground disturbance and compaction from yarding corridors or skid trails can bare soils, reduce infiltration, channel overland flow, and route eroded particulates (fine sediment) to downslope stream channels.

In the Cottonwood Project, all harvest would occur outside of Riparian Reserves, at a minimum distance of one site potential tree height from the edge of the stream channel. Because existing large wood densities and shade would be maintained within the Riparian Reserves, harvest and yarding operations would have no impact to stream temperatures, or future large wood recruitment potential.

The Water Resources analysis of the Cottonwood Project documented that harvest operations would not reduce canopy cover within any of the analysis area catchments below a threshold to measurably affect or alter the timing of peak or base flows. Because harvest and yarding operations would not take place in Riparian Reserves, no hydrological connectivity would exist between harvest units and stream channels. Fine sediment mobilized from units or skid trails would be filtered by remaining vegetation within the Riparian Reserves, and deposited on the forest floor before reaching aquatic habitat. In sum, no connectivity, and hence no causal mechanism, would exist for commercial timber harvest to input sediment through the RR buffers and into stream channels.

Because harvest and yarding operations would not decrease stream shade, reduce future wood inputs, increase peak flows, negatively modify summer base flows or input sediment into aquatic habitats, they would not directly or indirectly affect the aquatic environment, and hence would not impact fisheries resources, and would not add a cumulative effect.

Fuels Treatments

Follow up activity fuel treatments are planned in the commercial harvest units. These treatments would occur to clean up slash and debris left after harvest and yarding operations. Treatments would not occur in Riparian Reserves, would add little additional ground disturbance, and would not treat remaining live vegetation. Because treatments would not occur in Riparian Reserves, they would have no mechanism to affect water temperature or input sediment to channels. Canopy levels would not be reduced by treatments, nor would ground compaction increase; hence peak flows would not be affected. For these reasons, activity fuels treatments are not expected to impact fisheries resources, and hence they would not contribute to cumulative impacts.

New Roads

The primary mechanism by which new road construction may impact water quality is the potential to intercept, concentrate, and route flow down the road prism, which disrupts natural flow paths, while at the same time increasing erosion of the road surface and subsequent transport of sediment downslope. Connectivity exists between roads and the aquatic system at any point where roads and streams intersect. Runoff which is not diverted off the road via drainage control devices before these intersect points can be input directly into the aquatic system. Runoff over erodible surfaces mobilizes and transports sediment with it. For these reasons, natural surfaced (or broken down rocked surfaced) roads with a high degree of hydrological connectivity are particularly problematic to aquatic habitat.

In the Cottonwood Project, 2.1 miles of new road construction is proposed, consisting of permanent and temporary spur roads. Of the proposed new roads, only two would be permanent; the 39-3E-17.04 road (hereafter referred to as new road “A”) would be 1.3 miles in length and cross a long duration intermittent stream and its associated Riparian Reserve, a tributary to Keene Creek which flows directly into Little Hyatt Lake. This road would include the installation and removal of a temporary culvert over the channel. New road “B” (39-3E-28.02; 0.2 miles long) would be permanent, and located on flat ground to the south east of Little Hyatt Lake, and would not cross any channels. Four short (<500’ in length) additional temporary spur roads may be utilized to provide access to timber units (see Chapter 2). These potential spurs would be located on stable ground away from channels or RRs and would be decommissioned after use at the end of the dry season in which they were constructed.

Five of the proposed new segments (permanent new road “B” and the four potential temporary spur roads) would not have hydrological connectivity with any channels, would be located on flat and stable ground, and would not have any causal mechanism to input sediment into aquatic habitats. However, new road “A” would have hydrological connectivity with aquatic habitat, and would necessitate disturbances both within the stream channel, and within a Riparian Reserve. As such, construction of this road would likely result in small inputs of sediment to the intermittent stream channel. Stream temperatures would not be adversely affected, as the stream in the project area is intermittent and dry during the summer months.

The roads would be constructed (and, in the case of the temporary spur roads deconstructed) during the dry season, when the intermittent stream would be dry. This would ensure that construction of new road "A" and installation of the culvert would not immediately contribute sediment to wetted aquatic habitats. PDFs for new road construction include seeding and mulching of disturbed ground. These stabilization measures would minimize the amount of sediment available for mobilization during wet weather resulting from installing and removing the temporary culvert. In spite of this, it is anticipated that small amounts of disturbed soil would remain in and adjacent to the channel in the vicinity of the crossing. Estimates based on observations of similar projects suggest that direct sediment contributions to the channel resulting from the culvert work would be less than 1 cubic foot of sediment at the crossing (USDI, 2010).

Indirectly, intercepted water could potentially be transported down the road causing erosion and rutting. However, the potential for rutting would be slight, as the road would be low gradient, and drainage features would be incorporated into its design, allowing the road to shed intercepted water off the surface and into downslope vegetation. As such, it is anticipated that indirect inputs of sediment and/or turbidity resulting from new road "A" would not be discernable above background levels.

In any event, sediment contributed to aquatic habitat as a result of the proposed new road construction would not meaningfully impact fish habitat in Little Hyatt Lake; the small contributions from the road would eventually find its way into the reservoir, where it would be stored and assimilated into the existing mud substrate bottom.

Although the construction of the new roads would increase road densities in a catchment and watershed that already has high road densities, given the location, grade, and the limited amount of hydrological connectivity between the roads and aquatic systems, construction of these roads is not anticipated to adversely impact fisheries or aquatic resources.

Road Decommissioning

Decommissioning of riparian roads which have direct connectivity with aquatic habitats has the potential to impact aquatic habitat in the short term primarily through the pulling of culverts, as this necessitates a disturbance directly within the channel. Fill material and disturbed soil left after the culverts are removed may be mobilized during precipitation or high flow events, and transported downstream. Adherence to PDFs can greatly reduce the magnitude of sediment available for transport. Examples include dewatering perennial stream channels before conducting instream work, installing sediment fences, removing as much fill as possible before pulling the culverts, and stabilizing disturbed ground with seed and mulch afterwards.

Executed properly, removing culverts on small streams should directly input only a small amount (less than one cubic foot) of sediment to the channel (personal observation by BLM fisheries biologist). This input is limited to the area immediately downstream of the project sites, and is short duration in nature. Transport flows which occur during the wet season following decommissioning mobilize the deposited sediment, which is transported and sorted in natural deposition areas in downstream areas, where it becomes assimilated into background conditions. These near term small inputs must be weighed against the long term benefits resulting from decommissioning; elimination of annual chronic sources of sediment input to channels, and restoration of natural bottom configurations in the channels at the culvert locations.

Road segments proposed for decommission under the Cottonwood Project total ~ 1.9 miles, 0.84 miles of which is located within Riparian Reserves. One road proposed for decommission would be within a Riparian Reserve of Cottonwood Creek and an adjacent large wetland area, and would include a perennial crossing over Cottonwood Creek itself, located ~ 1,800' upstream of the end of fish use in Cottonwood Creek. The other would include a Riparian Reserve of an unnamed fishless perennial tributary to Hyatt Lake, and would include one perennial and one intermittent stream crossing.

The anticipated effect to aquatic habitat as a result of the road decommissioning would be the addition of less than 1 cubic foot of unconsolidated fill material (sediment) to Cottonwood Creek, and less than 2 cubic feet to the unnamed tributary to Hyatt Lake. This material would be transported downstream over subsequent high flow events, either as small undetectable pulses during periods of high flow, or in the event of a large flood would be transported down in a single pulse of increased turbidity, undetectable beyond background levels which would occur during such an event. The one-time pulses following the decommissioning would be less than the amount of sediment contributed annually to the intermittent channels by these roads each year. Eventually the sediment would settle out in the ponded water of Hyatt Lake, where it would be assimilated into the mud substrate found in the reservoir. Given the magnitude and the nature by which the sediment would work its way through fish habitat, it is not anticipated to adversely impact fish populations in Cottonwood Creek.

In sum, sediment would be released to the aquatic systems as short duration pulses (short term adverse 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 prisms 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.

Haul Routes

Repeated use of the unpaved haul roads may both directly and indirectly contribute fine sediment to streams as rocked surfaces become pulverized rock (i.e., dust, a form of fine sediment) surfaces after repeated heavy truck traffic. Direct contributions of fine sediment could occur if dust mobilized by haul should settle out in stream channels crossing or adjacent to the haul route. Indirectly, the fine sediment that remains on the road prism would be available to be transported off of the road during the first substantial rain event following a season of haul. Properly engineered roads are capable of shedding the majority of mobilized sediment off of the road (or road ditch) downslope and into vegetation. However, the road/ditch distance from the last cross drain located on either side of a channel crossing would directly contribute captured water and mobilized sediment into the stream channel. Therefore, use of the roads for haul would increase the risk of road derived sediment transport to stream channels, particularly in the vicinity of road/stream crossings.

Log hauling would occur on an estimated (from GIS) 30 miles of non-paved roads within the analysis catchments. Of this, 15.3 miles would be gravel or rocked roads, and 12.7 miles would be natural surfaced roads. The non-paved routes would terminate at the paved Buck Prairie and Hyatt Prairie roads. Roughly 1.2 miles of the haul routes would parallel fish habitat; the natural surfaced Little Hyatt Prairie Road, which is adjacent to Keene Creek in the vicinity of Little Hyatt Reservoir. Though this road does parallel the stream, it is well removed (more than 200' distant) from the channel in most areas. This route does include 2 crossings (culverts) over Keene Creek. One other non-paved route would cross fish habitat in Cottonwood Creek; the rocked surfaced Table Mt. Road, which crosses the stream (culvert) just upstream of where Cottonwood Creek enters Hyatt Lake.

Non paved haul routes in riparian areas include 4.4 miles in Riparian Reserves on BLM lands, and 1.8 in riparian areas on private lands. These routes would include an estimated (from GIS) 41 crossings over active stream channels, of which 17 would be over perennial streams. Six of the perennial crossings would be on natural surfaced roads, while 18 of the 24 intermittent crossings would be natural surfaced.

Potential sediment sources from log hauling are surface erosion from truck traffic and dust. Surface erosion would be minimized because PDFs would limit log hauling to during dry or frozen conditions and it would be restricted whenever soil moisture conditions or rainstorms could result in the transport of sediment to ditch lines and nearby stream channels. Dust abatement measures would help to reduce the probability of dust migrating from the road to the streams during dry season haul, but it is possible that some small amount would settle out into stream channels below the rocked and natural surface crossings.

The magnitude of the dust/sediment inputs would be small because dry/frozen season haul restrictions would reduce impacts to the road surfaces, and haul routes would be spread over a relatively large spatial scale. It is not anticipated that the amount of sediment input into aquatic habitats resulting from use of the haul routes would be discernable above contributions which occur chronically. As such, the amount of dust (sediment) to reach and settle out in any one pool would be insufficient to adversely modify aquatic habitats.

Aquatic Habitat Effects Summary

Short term (one to three years) there would likely be small inputs of sediment to channel crossings and reaches adjacent to some rocked and natural surfaced roads used for haul, particularly in the Keene Creek catchment, as two routes would closely parallel both Keene and Burnt Creeks for short distances. Any sediment increases would be minor relative to existing sediment levels. The construction of new road "A" would likely indirectly contribute small amounts of fine sediment to an intermittent channel above Little Hyatt Lake, where the contributed sediment would eventually settle out. Decommissioning the riparian roads would also likely input fine sediment to aquatic habitat above Hyatt Lake, primarily as a result of pulling the culverts. Over time, chronic sediment sources to aquatic habitat would be reduced as a result of the decommissioning. Upland work, including timber harvest, and follow up fuels treatments would have no effect on fine sediment levels, due to the filtering action of Riparian Reserve buffers, extensive PDFs designed to prevent overland sediment movement, and normal BMPs. Stream temperatures would not be affected, as no riparian vegetation adjacent to perennial streams would be removed (see Riparian Reserves discussion, below).

Future private timber harvest is assumed to continue at present levels, and cumulative effects to water resources have been assessed (see Water Resources section). Future private harvest coupled with ongoing erosion issues stemming from high road densities and grazing, is expected to continue the declining trends in streambank stability, sedimentation potential, and health of riparian areas currently present in the planning area. To sum, The Cottonwood Forest Management Project would, in the short term contribute a small amount of sediment to channels in the Keene Creek catchment, on top of the large amounts contributed annually from all other sources. These inputs would eventually settle out into the reservoirs, where it would be assimilated into existing substrate and undetectable. Direct and indirect inputs of fine sediment resulting from haul would be of insufficient magnitude to meaningfully affect fish or fish habitat. In the long term, decommissioning the riparian roads would yield a slight reduction in sediment inputs.

7. Affected Environment- Riparian Reserves

Riparian corridors along fish bearing stream reaches in the Jenny Creek Watershed display a wide range of diversity, as streams flow through a mix of meadow and wetland habitats, conifer stands, and hardwood dominated stands which include aspen, willow, and alder. In the meadow and wetland areas, there may be little or no overstory. This is in many instances a natural condition, though in some areas willow and other shrubby species have been reduced by browse, both by cattle and by native species, including beaver and elk. Reaches flowing through forested stands are generally well shaded, while reaches flowing through the open meadows and wetlands are generally subject to increased solar penetration. Stream adjacent roads have reduced riparian cover in some areas, though relatively few roads closely parallel any of the major channels for extended lengths.

Portions of both Jenny and Keene creeks are listed as water quality limited for exceeding summer stream temperature criteria by the Oregon Dept. of Environmental Quality (DEQ). Elevated water temperatures can affect spawning and incubation time, feeding, growth, and survival of salmonids (Meehan, 1991), though as mentioned, redbands are adapted to tolerate higher water temperatures than most other salmonids. The reservoirs likely have a large part to do with these listings, as they allow for substantial heating of water to occur behind the dams.

Non canopied stream reaches, such as those which flow through meadows also intercept solar radiation and are subject to increased heating of water, and also likely play a part in the listing status. For streams which flow through the forested landscapes, the 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 analysis area specifically, there are 1,069 acres of Riparian Reserves on BLM lands. These reserves include areas adjacent to streams, springs, wetlands, and lakes. Of these acres, 343 are in open, meadow like areas, while the remainder are in more forested landscapes. There are many more acres of riparian areas located on private lands that do not receive the same level of protection as that provided by RRs. Overlaying the vegetation condition (GIS) layer with Riparian Reserve boundary layer is a useful way to display current vegetative states of the reserves over the large area encompassed within the analysis area. Note, however, that the vegetative condition layer was generated primarily to reflect upland conditions, and only estimates the conditions in riparian areas, especially those areas adjacent to stream channels (the primary shade and large wood producing zone). A summary of existing vegetative states in RRs on BLM managed lands within the Cottonwood analysis area is presented in Table 3-7 below.

Table 3-7. Seral State of Riparian Reserves in Cottonwood Analysis Area

Riparian Reserve Acres by Vegetation Type						
Grass (meadows)	Hardwoods	Early Seral (seedlings/saplings)	Poles (5-11" DBH)	Mid Seral (11-21" DBH)	Mature (>21" DBH)	Total Acres of R.R.'s
343	101	24	2	261	338	1,069

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 3-8 below displays the percent of all forested reserves that are in mid seral or greater stage (capable of providing high levels of shade), and in a mature stage (capable of providing large wood to channels). Non forested Riparian Reserves (meadows) were excluded from this analysis, as the meadows are natural landscape features in this environment. Obviously, meadows do not contain an overstory that would provide a source of large wood input to streams. They do provide some shade, as overhanging vegetation such as willows and other brushy species and tall grasses and forbs do intercept some sunlight.

Table 3-8. Percent of All Reserves in Forested Landscapes in Mid Seral or Greater, and Mature Seral Stages in Planning Area

% of Reserves in Mid Seral Stage or Greater (Trees >11" DBH)[1]	% of Reserves in Mature Stage (Trees >21" DBH)[1]
83%	47%

[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 Cottonwood analysis area, Riparian Reserves in forested landscapes capable of providing a high level of shade are relatively intact, but that Reserves which historically would have served as a source of large wood input to the stream system are somewhat lacking.

8. Environmental Consequences- Riparian Reserves

a. Alternative 1

The No-Action Alternative would have no direct or indirect effects to RRs within the planning area, or within the Jenny Creek Watershed. The reserves would remain as they are currently, slowly recovering as stands mature. It is anticipated that levels of shade and large wood input will slowly increase over time. Benefits will be limited in RRs impacted by roads, as barring major road decommissioning, the existing road system will likely remain in use, perpetuating canopy openings adjacent to the fish bearing stream reaches. As this alternative would not contribute any direct or indirect affects to the reserves, no cumulative effects would result from implementation of the No-Action Alternative.

b. Alternative 2

Activities proposed in Riparian Reserves under this project include new road construction, road decommissioning, and log hauling. All other activities would occur outside of riparian areas. Only new road construction would necessitate the removal of riparian vegetation. Disturbances associated with decommissioning the riparian roads would be limited to the existing road prism, and haul would also be limited to existing roads. Hence these project elements would not affect shade or rates of large wood input to the aquatic system, and would not contribute adverse effects to Riparian Reserves. The road decommissioning would, over time, yield a positive benefit, as approximately 3.0 acres of riparian vegetation reestablishes along the decommissioned road prism. Much of this area closely parallels stream channels. As such, this road work would lead to future increases in both shade and large wood recruitment potential to the perennial channels.

The new road construction (new road segment “A”) would necessitate the removal of riparian vegetation from approximately 330 feet of Riparian Reserves surrounding an intermittent stream. This would impact roughly 0.2 acres of Riparian Reserves. However, as the stream is intermittent, any reduction of stream side shade would not adversely impact water temperatures. Future wood recruitment potential would be diminished slightly in the vicinity of the new channel crossing. As the new road is proposed to be built bisecting the Reserve and channel perpendicularly, rather than parallel, this reduction would affect only an estimated 30’ of the stream channel.

Cumulatively, project elements proposed in the Cottonwood Forest Management Project would, over time, net beneficial effects to 2.8 acres of Riparian Reserves, as the amount of riparian road decommissioning would be greater than the amount of riparian road construction, and much of it would occur adjacent to perennial channels. Across other federally managed lands, both in the analysis area and in the larger Jenny Creek Watershed, Riparian Reserves would continue to slowly recover from past disturbances, particularly as riparian roads continue to be decommissioned and/or permanently closed in the Soda Mt. Wilderness and Cascade Siskiyou National Monument.

E. CONSISTENCY WITH AQUATIC CONSERVATION STRATEGY

1. Introduction

The Northwest Forest Plan’s (NWFP) Aquatic Conservation Strategy (ACS) has four components: Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration. It is guided by nine objectives which are meant to focus agency actions to protect ecological processes at the 5th-field hydrologic scale, or watershed, at the 6th and or 7th fields (subwatershed and or drainage), and at the site level.

In this case, Keene Creek is a sixth field subwatershed and is composed of 11 smaller 7th field drainages. These 7th field drainages combine to form the tributaries to Keene Creek, such as Cottonwood and Burnt Creeks. The Keene Creek subwatershed is within the larger Jenny Creek 5th field watershed. How the four components of ACS relate to the Cottonwood Forest Management Project is explained below:

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

2. Key Watersheds: Tier 1 Key Watersheds contribute directly to conservation of at-risk anadromous salmonids, bull trout, and resident fish species. They also have a high potential of being restored as part of a watershed restoration program. The Jenny Creek Fifth Field Watershed is designated as a Key Watershed, due to the presence of two endemic resident fish species, the Jenny Creek sucker and the redband trout.

3. Watershed Analysis: BLM completed the Jenny Creek Watershed Analysis in1995.

4. Watershed Restoration: Past and ongoing restoration activities in the watershed include land exchanges/acquisitions by the BLM, channel and bank restoration projects, riparian plantings, riparian cattle exclusion, retirement of grazing leases, and closure and decommissioning of problematic roads. The designation of one national monument and a wilderness area has also occurred, preserving lands and aquatic environments in the watershed.

2. Consistency Review

Evaluation of this project's consistency with Northwest Forest Plan Aquatic Conservation Strategy Objectives (ACSOs):

ACSO 1. Maintain and restore the distribution, diversity, and complexity of watershed and ***landscape-scale features*** *to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.*

Topography, slope, forest fire regime, climate, and the distribution of soil types and plant communities are some of the landscape-scale features affecting aquatic systems in the watershed. One of the treatment objectives of the project is to compensate for an altered fire regime and restore certain plant communities. The intent of this objective is to restore the function of landscape-scale processes like wildfire in order to protect the complexity and distribution of plant communities (including riparian areas) across the landscape. This would be noticeable at the site level, but would have only a minor benefit at the watershed scale, as less than 1% of the watershed would be treated.

ACSO 2. Maintain and restore ***spatial and temporal connectivity*** *within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.*

In the Jenny Creek Watershed, reservoirs and diversions have disrupted all of these indicators, particularly in the headwater regions of the watershed. The Cottonwood Project would occur within the area which has suffered the greatest alterations, as it would be within the reach of Keene Creek which includes three large impoundments, and upstream of a large diversion which transports much of its flow out of the Klamath and into the Rogue River Basin. The road decommissioning proposed in the project would help this indicator at the site level and drainage level, as 3 road/stream crossings would be restored.

The new road construction would not affect this indicator in the long term, as the proposed crossing would be temporary, and would be removed after harvest operations were complete. None of the above crossings are over fish habitat. No appreciable benefit would be noticeable at the watershed scale, as this indicator would continue to be significantly impacted by the dams.

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

The only actions proposed in the Cottonwood Project that would impact the physical integrity of the aquatic system are the new road construction and road decommissioning. As mentioned above, the road decommissioning would lead to site level improvements to channels, including the shoreline, bank, and bottom configurations, at the locations of the three stream crossings which would be restored. The installation and removal of the temporary crossing for the proposed new road would have short term adverse impacts at the site level at the temporary crossing. However, these would be short duration in nature, and in the long term would not contribute an adverse effect to this indicator.

*ACSO 4. Maintain and restore **water quality** necessary to support healthy riparian, aquatic and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.*

There would be no effect on water temperature, because shade would not be reduced along any perennial stream channels. Short term (one to three years) there would likely be a small amount of fine sediment entering stream channels above Hyatt and Little Hyatt reservoirs from the proposed new road construction, road decommissioning, and haul. Sediment increases resulting from this activity would be minor relative to existing sediment levels, and detectable behind background levels only at the site level. Inputs would eventually settle out into the reservoirs and be assimilated into the existing substrate, and would be within the current existing range which does maintain the biological, physical, and chemical integrity of the aquatic system. Upland work would have no effect on fine sediment levels, due to the filtering action of Riparian Reserve buffers, extensive PDFs designed to prevent overland sediment movement, and normal BMPs.

*ACSO 5. Maintain and restore the **sediment regime** under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.*

The only elements of this project which could affect the sediment regime are the new road construction, decommissioning, and log haul. At the new crossing site, small amounts of sediment would likely be input into the intermittent stream. Likewise for the road decommissioning, as this would involve the removal of culverts over three streams. Over the long term, decommissioning the roads would have a beneficial effect, as chronic sources of sediment input would be eliminated. Haul would likely input a very small amount of fine sediment to aquatic habitats adjacent to or crossing haul routes. This sediment would affect site level habitats during an uncharacteristic time of year (i.e., during haul, which would likely occur during the summer). Given the small magnitude of sediment anticipated to be input from all of these activities and that it would occur upstream of large reservoirs which would effectively capture and store mobilized sediment, it would be undetectable in downstream habitats. Also see ACSO #4. In general, high road densities, OHV use, and cattle grazing in the analysis area catchments will continue to impact the sediment regime.

*ACSO 6. Maintain and restore **instream flows** sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.*

Peak flows and summer low flows are unlikely to be affected by the Cottonwood Project. See the Water Resources section for details. Any effects on ground water availability from the project would be too small to be noticeable at the site, much less the drainage or watershed scale. Storage dams, water transfers and withdrawals for agriculture and residential use have the most significant impacts to instream flows in the watershed.

ACSO 7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in ***meadows and wetlands****.*

Only harvest would have any mechanism to affect the timing, variability, and duration of floodplain inundation and water table elevation. However, harvest would not occur in Riparian Reserves and across the project area would leave canopy cover within the range of natural variability. Because of this, any extra water input intercepted by the ground as a result of harvest would likely be utilized by remaining vegetation before it reached the floodplain. Therefore, this objective would not be measurably affected at any spatial scale.

ACSO 8. Maintain and restore the species composition and structural diversity of ***plant communities in riparian areas*** *and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of* ***coarse woody debris*** *sufficient to sustain physical complexity and stability.*

The new road construction would disturb riparian vegetation at the site level as an estimated 0.2 acres of Riparian Reserve surrounding an intermittent stream would be impacted. The disturbance near a channel would be limited only to the crossing, and as such would be too small to impact winter thermal regulation. The stream is dry during the summer, so summer thermal regulation would not be affected. As the new road would be constructed perpendicular to the direction of stream flow, the disturbance to filtering vegetation, would again be limited to the site level at the crossing. This disturbance would be coupled with the restoration of 3 acres of riparian vegetation via the riparian road decommissioning. This decommissioning would have site and drainage level benefits, as the roads parallel channels for much of their lengths.

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

See ACSOs # 3, 4, 5, and 8. Site level effects to aquatic and riparian habitat would not be of sufficient magnitude to compromise this objective. The amount of habitat affected would be insignificant and immeasurable at the drainage, subwatershed, and watershed scales compared to the past and ongoing degradation that has impacted habitat in these catchments.

F. TERRESTRIAL WILDLIFE

The Cottonwood Project area falls within the Jenny Creek Watershed Analysis Area. Watershed Analysis was conducted for the Jenny Creek Watershed (1995) using the guidance of BLMs 1995 Record of Decision and Resource Management Plan.

1. Introduction

a. Vegetation Conditions & Terrestrial Wildlife Habitats (General)

The Cottonwood Forest Management Project is located in the western portion of the Jenny Creek watershed, which is a tributary to the Klamath River. The project area is smaller than the analysis area. For the purpose of analyzing the affected environment and the proposed project with regard to terrestrial wildlife, the analysis area considers 4HUC 7s (called sub-watersheds or 7th field hydrologic units). (For a complete listing of drainages included in the analysis area see the Water Resources section) The total size of the analysis area is 12,892 acres or approximately 20 square miles. BLM administered lands comprise approximately 60% of this area.

The vegetation condition classes presented in the table below provide habitat for the terrestrial wildlife species found in the proposed Cottonwood analysis area. Acreage of each vegetation condition class and several wildlife species that are representative of the various habitats are also displayed. Approximately 255 terrestrial wildlife species are known or suspected to occur in the analysis area based on known range and habitat associations. This includes species that migrate through the area.

Table 3-9. Vegetation Communities and Condition Classes - Cottonwood Analysis Area

Vegetation Condition Class	Acres (BLM Administered Lands)	Representative Species (from Brown 1985)
Grassland/ Brushland/Shrubland	896	Gopher snake, California ground squirrel, western meadowlark Western fence lizard, wrentit, dusky-footed woodrat
Hardwood/Woodland	245	Acorn woodpecker, western gray squirrel, ringneck snake
Seedling/Sapling >10 ft height; <60% crown canopy	697	Northwestern garter snake, mountain quail, pocket gopher
Small Conifer >60% canopy; ~40-100 years old	106	Golden-crowned kinglet, porcupine, Southern alligator lizard
Large Conifer >21 " dbh	1,874	Ensatina, Stellar's jay, mountain lion
Mature Conifer Old-growth, >200 years, multiple layers w/decadence	3,749	Northern spotted owl, northern flying squirrel, pileated woodpecker,

b. Threatened, Endangered, Survey and Manage, and Bureau Sensitive Terrestrial Wildlife

Special Status Species are those species that are federally listed as threatened or endangered; proposed or candidates for federal listing as threatened or endangered; or are BLM designated sensitive species. Survey and Manage species are listed for protection under the Northwest Forest Plan. The table below lists the special status and Survey and Manage species that are known or suspected to be present in the analysis area. Only those species that could reasonably be assumed present are included – not species that would be considered as "accidental" in the analysis area.

Table 3-10. Threatened, Endangered, Bureau Sensitive, and Survey and Manage Terrestrial Wildlife

Species	Scientific Name	Status
Bald Eagle	*Haliaeetus leucocephalus*	BS - Known
Chase Sideband Snail	*Monadenia chaceana*	BS and S&M- Known
Fisher	*Martes pennanti*	FC - Known
Foothill Yellow-legged Frog	*Rana boylii*	BS - Suspected
Fringed Myotis	*Myotis thysanodes*	BS - Suspected
Great Gray Owl	*Strix nebulosa*	S&M – Known
Johnson's Hairstreak Butterfly	*Callophrys johnsoni*	BS--Suspected
Mardon Skipper Butterfly	*Polites mardon*	FC - Known
Northern Spotted Owl	*Strix occidentaliscaurina*	FT -Known
Northwestern Pond Turtle	*Actinemys marmorata marmorata*	BS - Suspected
Oregon Shoulderband Snail	*Helmithoglypta hertleini*	BS and S&M – Suspected
Oregon Spotted Frog	*Rana pretiosa*	FC – Suspected
Peregrine Falcon	*Falco peregrinus anatum*	BS - Suspected
Pallid Bat	*Antrozous pallidus*	BS - Suspected
Purple Martin	*Progne subis*	BS - Suspected
Siskiyou Hesperian Snail	*Vespericola sierranus*	BS - Suspected

Species	Scientific Name	Status
Siskiyou Short-horned Grasshopper	*Chloealtis aspasma*	BS – Known
Travelling Sideband Snail	*Monadenia fidelis celeuthia*	BS - Suspected
White-headed Woodpecker	*Picoides albolarvatus*	BS - Known

FT - Federal Threatened
FC – Federal Candidate
BS - Bureau Sensitive
S&M - Northwest Forest Plan Survey and Manage

2. Affected Environment - Northern Spotted Owl (NSO)

The northern spotted owl (*Strix occidentalis caurina*) is a federally listed threatened species. This species is closely associated with older forests for nesting, roosting, and foraging throughout most of their range (Forsman et al., 1984; Carey et al., 1990; and Solis and Gutierrez, 1990). The ideal NSO habitat consists of large trees in the overstory, smaller trees of varying sizes and species in the lower and middle story, large standing and fallen dead trees, and patchy shrub and herb communities (Spies and Franklin, 1991).

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 northern spotted owl. The reviewed reports include the following:

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

Anthony et al. (2004, 2006) is the most recent published meta-analysis of owl demographic data collected in 14 demographic study areas across the range of the northern spotted owl. Four of the study areas are in western Washington, six are in western Oregon, and four are in northwestern California. Although the agencies anticipated a decline of NSO populations under land and resource management plans during the past decade, the Anthony et al. identified greater than expected NSO population declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California.

Summarizing Anthony et al., between 1985-2003:

- The northern spotted owl population declined over its entire range, and varied from the most pronounced decline in Washington (7.3% year per) to the least pronounced in California (2.2%)
- Within Oregon, the northern demographic study areas averaged 4.9% population decline, and in the southern study areas decline averaged less than 1% per year and were statistically stable, with a western Oregon average of 2.8% decline per year.
- Range-wide, adult survival rates declined in 5 of 14 study areas (western Washington and northwestern California) and western Oregon was stable in all six study areas.

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. Even though some risk factors had declined (such as habitat loss due to harvesting) other factors had continued such as habitat loss due to wildfire, potential competition with the barred owl, West Nile virus, and sudden oak death (USFWS 2004, Lint 2005). The barred owl is present throughout the range of the spotted owl, so the likelihood of competitive interactions between the species raises concerns as to the future of the spotted owl (Lint 2005). Lint (2005) also found that between 1994-2003, federal lands in the Klamath Province lost 6.6% of spotted owl nesting habitat to stand-replacement fire, mainly to the Biscuit Fire (almost 500,000 acres).

An updated draft meta-analysis (http://www.reo.gov/monitoring/reports/nso *Population Demography Of Northern Spotted Owls*, Forsman, et al.) is projected to be published in July 2011. The conclusions reached in this draft are similar to those found in Anthony et al. Forsman, et al, 2011 detected a decline but lacked statistical precision to determine if it was real or an artifact of sampling.

There are 5 northern spotted owl sites with some portion of their provincial home range on BLM administered land within the analysis area. A limited number of surveys have been conducted at these sites over the past 10 years. For purposes of this analysis, all sites are assumed to be occupied.

a. Northern Spotted Owl Habitat

Within the Jenny Creek Watershed, wildlife habitat was typed into habitat categories pertinent to the Northern Spotted Owl (NSO). These habitat types are used throughout this document to describe and quantify habitat conditions across the landscape. These habitat categories are:

- Nesting, Roosting and Foraging habitat (NRF),
- Dispersal-only habitat, and
- Unsuitable habitat.

Nesting, roosting and foraging (NRF) habitat is characterized by forested stands with older forest structure with characteristics such as canopy closure of approximately 60 percent or greater, trees with large crowns, multiple canopy layers, snags and down wood. The best quality NRF habitat has forest stands with large old trees with cavities, broken tops, mistletoe platforms, large branches, dead standing and fallen decayed trees, and multiple canopies of shade tolerant hardwoods and conifers that support prey base. NRF habitat also functions as dispersal habitat.

Dispersal-only habitat for spotted owls is defined as stands that typically have a canopy closure of approximately 40 percent or greater, and are open enough for flight and predator avoidance, but do not meet the habitat criteria of NRF habitat. Dispersal-only habitat is used throughout this document to refer to habitat that does not meet the criteria of NRF (nesting, roosting, or foraging) habitat, but has adequate cover to facilitate movement between blocks of suitable NRF habitat. Unsuitable habitat does not currently meet the NRF or dispersal-only habitat criteria.

Approximately 2,752 acres of the BLM lands within the analysis area are classified as NRF (late-successional) habitat, or approximately 35% of the BLM administered lands in the analysis area. Not all lands in the analysis area are capable of becoming NRF habitat due to the natural limitations of some soil types, and agricultural and rural development.

b. Northern Spotted Owl Critical Habitat

Some of the proposed treatment units are located in designated Critical Habitat (2008 designated)(73 Federal Register 157:47326) for the northern spotted owl. A total of 90 acres of NSO NRF habitat and 45 acres of NSO Dispersal habitat would be treated within NSO Critical Habitat. Critical Habitat is designated under the auspices of the Endangered Species Act of 1973.

3. Affected Environment - Pacific Fisher

The Pacific fisher (*Martes pennanti*) was petitioned for listing as endangered or threatened under the Endangered Species Act on December 12, 2000. In 2003 the USFWS released their notice of 90-day petition finding and initiation of status review (68 Federal Register, No. 132, 41169-41174) and in 2004 published their Notice of 12-month petition finding, concluding that listing fishers as threatened was warranted, but was precluded by higher priority listing actions (Federal Register Vol. 69, No. 68, April 8, 2004, 18769-18792).

The species remains a USFWS candidate species (USDI, USFWS 2004, 71 Fed. Reg. 53777, Sept. 12, 2006). In their 2006 update on the status of the Pacific fisher, the USFWS define the reasons for listing as: "Major threats that fragment or remove key elements of fisher habitat include various forest vegetation management practices such as timber harvest and fuels reduction treatments.

Other potential major threats include: Stand-replacing fire, Sudden Oak Death, (*Phytophthora*), urban and rural development, recreation development, and highways." (71 Fed. Reg. 53777 (Sept. 12, 2006)). The USFWS also states that the three remaining fisher populations "appear to be stable or not rapidly declining based on recent survey and monitoring efforts." (Id.)

Fishers are closely associated with low to mid elevation (generally <4,000 feet) forests with a coniferous component, large snags, or decadent live trees and logs for denning and resting, and complex physical structure near the forest floor to support adequate prey populations (Aubry and Lewis, 2003). Powell and Zielinski (1994) and Zielinski et al. (2004) suggest that habitat suitable for denning and resting sites may be more limiting for fishers than foraging habitat. The NRF habitat type described above for the NSO also adequately describes suitable fisher denning and resting habitat because there is a direct correlation of key habitat features used to assess NSO habitat and fisher habitat (high canopy cover, multi-storied stands, large snags, and large down trees on the forest floor). Using northern spotted owl habitat as a surrogate for fisher habitat has been accepted by the courts as a reasonable practice (KS Wild v. US BLM, Case No. 06-3076-PA, Order and Judgment 9/10/2007).

Based on the NSO habitat analysis, approximately 2,752 acres of suitable fisher denning and resting habitat exist on BLM lands within the analysis area and 456 acres within the project area. However, all of these acres may not provide optimal fisher habitat because past harvest practices and land ownership patterns have fragmented this habitat. BLM "checkerboard" ownership may be one of the primary factors limiting the ability of BLM lands to provide optimal habitat for fishers (USDA and USDI 1994). This checkerboard ownership pattern was created by the Congressional acts that provided land grants, and is outside of BLM's control.

Fishers do not appear to occur as frequently in early successional forests as they do in late-successional forests in the Pacific Northwest (Powell and Zielinski, 1994). Buskirk and Powell (1994) hypothesized that the physical structure of the forest and prey associated with forest structures are the critical features that explain fisher habitat use, not specific forest types.

Forest carnivore surveys using bait stations with motion and infrared detection cameras have been conducted in portions of the Ashland Resource Area and have detected fishers within the analysis area in the vicinity of Hyatt Reservoir. The extent (dispersal, foraging, or breeding) to which the Cottonwood project area is used by fisher is not known.

4. Affected Environment - Survey and Manage and Bureau Sensitive Species

a. Red Tree Vole

The red tree vole (RTV) is an arboreal rodent species with very low dispersal capabilities. Red tree voles depend on conifer tree canopies for nesting, foraging, travel routes, escape cover, and moisture (Carey, 1991). Douglas-fir needles provide the primary food and building materials for nests (USDA, USDI 2000). The broad management objective for this species under the Survey and Manage program is to retain sufficient habitat to maintain its potential for reproduction, dispersal, and genetic exchange. The Cottonwood Project is outside the known range of this species. Surveys east of Interstate 5 in the Rogue Valley have never located RTVs. The nearest known location of RTVs is nearly 20 miles to the northwest in the Applegate River Drainage.

b. Great Gray Owl

The great gray owl is a NWFP Survey and Manage species. Great gray owls (*Strix nebulosa*) nest in a varied array of open forests associated with grassy areas suitable for their preferred prey species (e.g., voles, moles, gophers, etc. Broken top trees, abandoned raptor nests, mistletoe clumps, and other platforms provide suitable nest structures (USDA USDI 2004). Suitable nesting habitat is defined in the "Survey Protocol For The Great Gray Owl " (USDI, USDA 2004) as large diameter trees with roosting cover within 200 meters of suitable foraging habitat. Foraging habitat is described as relatively open, grassy habitats, such as bogs, natural meadows, open forests and recent selective/regeneration harvest areas (USDA USDI 2004). Approximately 6,761 acres of habitat suitable for great gray owl reproduction and foraging exist in and around the Cottonwood analysis area. Protocol surveys were conducted for great gray owls in the Cottonwood analysis area in 2010 and 2011. Five (5) reproductive sites were located.

c. Mollusks

Potential habitat exists throughout the project area for four Survey and Manage mollusks, *Helminthoglypta hertleini, Monadenia fidelis celeuthia, Monadenia chaceana,* and *Vespericola sierranus* (USDI USDA 2001 Survey and Manage ROD). *Helminthoglypta hertleini* (Bureau Sensitive species) utilizes down woody debris, rocky areas, including talus deposits and outcrops, which contain stable interstitial spaces large enough for snails to enter. Previous Medford District detections were found in rocky areas associated with damp grassy areas, oak woodlands, and shrub lands, or in conifer forests closely associated with these habitat types. *Monadenia chaceana* (Bureau Sensitive species) is associated with rocky areas, talus deposits, associated riparian areas, and coarse woody material (USDA, USDI, 2003). *Vespericola sierranus* is primarily a riparian associate found in perennially moist habitat, including spring seeps and deep leaf litter along stream banks and under debris and rocks. *Monadenia fidelis celeuthia* is associated with deciduous, mixed or coniferous forests generally, but also sometimes in open woods and grassy places, such as Garry oak **(***Quercus garryana***)** meadows.

Protocol Surveys for terrestrial mollusks (*Helminthoglypta hertleini, Monadenia fidelis celeuthia, Monadenia chaceana,* and *Vespericola sierranus*) were conducted throughout the Cottonwood project area. fall 2010 and spring/summer 2011 These surveys detected some target mollusk species (*Monadenia chaceana*).

d. Golden Eagle

In Oregon, the Golden Eagle inhabits a wide range of habitats, including shrub steppe, grasslands, juniper, open ponderosa pine, and mixed conifer / deciduous habitats. The preferred foraging habitat is generally open areas with a shrub component that provides food and cover for prey (primarily black-tailed jack rabbit). Nests are typically large (3-10' tall and 3' wide), and often built in large live ponderosa pines (>30" dbh) or on ledges along rims and cliffs (Marshall et al., 2003).

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

During the summer of 1990, a Golden Eagle nest was discovered on the western edge of the analysis area by a wildlife surveyor while conducting northern spotted owl surveys. The nest was documented to have fallen from the tree by the late 1990s and has never been reconstructed. Golden Eagles are still observed in the area on a regular basis. No active nest sites have been located since the 1990s. Suitable habitat exists in the analysis area and across the Jenny Creek Watershed.

5. Affected Environment - Land Birds (Neotropical Migrants)

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

Table 3-11. Land Bird Species Known or Likely to be Present – Cottonwood Analysis Area

Species	Status
Band-tailed Pigeon (*Patagioenas fasciata*)	GBBDC
Flammulated Owl (*Otus flammeolus*)	BCC
Mallard (*Anas platyrhynchos*)	GBBDC
Mourning Dove (*Zenaida macroura*)	GBBDC
Olive-sided Flycatcher (*Contopus cooperi*)	BCC
Purple Finch (*Carpodocus purpureus*)	BCC
Rufous Hummingbird (*Selasphorus rufus*)	BCC
Wood Duck (*Aix sponsa*)	GBBDC

***Bird Species of Conservation Concern* (BCC)**
***Game Birds Below Desired Condition* (GBBDC)**

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

Resident birds remain in the same general area or migrate to lower elevations in the winter. Total numbers of late-successional dependent migratory or resident birds within the Cottonwood analysis area are unknown. However, knowledge of specific numbers is not necessary to assess effects of land management activities on migratory or resident birds. Current research indicates the most appropriate scale to study impacts to migratory birds is at the eco-regional scale (California Partners in Flight 2002). Breeding bird surveys in the Southern Pacific Rainforest Physiographic Region (which includes western Oregon) indicate that songbirds are declining. The exact cause of these declines is still unclear, but issues associated with their winter grounds (Central and South America) are suspected to be an important factor (Sauer et al., 2004).

6. Affected Environment - Deer and Elk

Deer Winter Range and Elk Management Area

None of the proposed treatment units and no portion of the analysis are within designated Big Game Management or Winter Range Areas.

Within the analysis area, approximately 1,838 acres on federal ownership serve as foraging areas (grass, brush, woodland, and early seral vegetation condition classes). Generally, brushland/shrubland and mature conifer forest vegetation condition classes also provide hiding cover.

Management for deer and elk in these areas is focused primarily on improving forage and cover conditions and decreasing the density of roads that are open to vehicular traffic, particularly in the winter.

Deer and Elk are not anticipated to be affected by this project and will not be addressed in detail in the following sections.

Note: In the sections that follow regarding environmental consequences, only those wildlife species that are present within the analysis area and/or are anticipated to be affected by the Cottonwood Proposed Action are discussed.

7. Environmental Consequences - Northern Spotted Owl

a. Alternative 1

The current habitat conditions within the Cottonwood analysis area are a result of the complex interactions of the historic vegetative patterns and the changes to that historic vegetation from human activities and disturbance events.

Under Alternative 1, the No-Action Alternative, none of the proposed BLM activities would occur. Forest stand conditions would continue to develop along the general current trends toward higher density stand conditions, especially in the understory, than what was historically present in the area. It is likely that many of the stands within the analysis area would eventually contain tree densities two to three times that of historical levels (Hardy and Arno, 1996). The majority of the lower elevation stand conditions reflect past fire exclusion efforts. As discussed in further detail in the Silviculture and Fire and Fuels sections, high stocking levels, competition mortality, fuel loading and ladder fuel conditions work to increase the susceptibility of the existing late-successional and NRF habitat to high severity fire.

The No-Action Alternative would not alter the current habitat conditions across the analysis area, and the NSOs that inhabit and utilize the analysis area would not be impacted from any loss of habitat or project related disturbance. NSOs would be expected to behave and utilize the habitat within the project area in the same fashion as they have in the past.

Under the No-Action Alternative, no loss of NRF or dispersal habitat would be expected across the analysis area from active forest management on Federal lands. It is difficult to estimate the potential loss of NRF or dispersal habitat due to wildfire or other disturbance events and when such loss might occur. Recent trends in Southwest Oregon illustrate that fire has been converting mature forest structure into earlier seral stages at a higher rate than harvest. For this reason, the retention of mature forest habitat is problematic in dry forested ecosystems (Courtney et al., 2004; Spies et al., 2006).

In general terms, wildfire would remain the most immediate hazard to late-successional forest habitat (NRF) and its associated species (Courtney et al., 2004), including the NSO. High severity fires could be expected to remove or downgrade habitat randomly across the landscape, setting back forest succession and development, and likely resulting in the loss of large tree structure critical to late-successional forest habitat dependent species. High severity fires resulting from these dense stand conditions would cause more severe impacts to soils, which may prolong the recovery and colonization of mycorizzal organisms, and macroinvertebrate and small mammalian prey food webs important to suitable foraging areas for spotted owls.

Under the No-Action Alternative, the development of future late-successional forest habitat within the project area would be delayed or potentially at risk. This is because current stand conditions are too dense and trees are not developing the diameter to height ratio required to develop late-successional structure (Davis et al., 2007). This late successional structure was historically created through frequent fire events that reduced stem densities and competition that created open grown conditions.

Under the No-Action Alternative, the current stand conditions would likely develop into less complex stand structures and species compositions than that of old-growth stands (Sensenig, 2002), or at the very least, would require a much longer time scale to develop (Tappeiner, et al., 1997). This process is discussed in further detail in the Silviculture section of this EA.

b. Alternative 2

Forest management treatments result in one of the following categories: habitat removal, habitat downgrade, or a maintenance treatment (treat and maintain). Forest management treatments proposed in this alternative include thinning but maintaining NSO nesting, roosting, foraging, and dispersal habitat, pine series thinning, dry Douglas-fir thinning, mixed conifer thinning, downgrading of NSO nesting, roosting, foraging habitat, and removal of NSO dispersal habitat. A description of these silvicultural prescriptions is included in Chapter 2, Silvicultural Objectives and Descriptions.

Harvest Treatments

There are approximately 2,752 acres of suitable spotted owl habitat, and 634 acres of dispersal-only habitat on BLM ownership in the analysis area. Alternative 2 would treat and maintain 456 acres of suitable spotted owl habitat and 652 acres of dispersal habitat.

Within the provincial home range radius (1.2 miles) of 4 historical northern spotted owl sites approximately 416 acres of NRF and 240 acres of Dispersal habitat would be treated. Within the ½ mile core area of two (2) northern spotted owl sites approximately 108 acres of NRF and 114 acres of Dispersal habitat would be treated. All of these treatment areas are expected to continue to function as NRF and Dispersal habitats respectively post-treatment. A total of 90 acres of NSO NRF habitat and 45 acres of NSO Dispersal habitat would be treated within 2008 NSO Critical Habitat. The Cottonwood Forest Management Project would maintain the primary constituent elements of CHU. Across the analysis area, more than 83% of existing suitable northern spotted owl NRF habitat would remain untreated.

When examining the impacts to NSOs from timber harvest, the amount and intensity of harvest are not the only factors to consider. One critical factor to consider is the spatial arrangement of the habitat found across the landscape and where the proposed treatments would occur in relation to known NSO nest sites. Researchers have found that the habitat quality within 300 meters of a nest site (known as the nest patch) is critically important to determining nest site positioning across the landscape (Perkins et al., 2000), and is further recognized as an important area under the Incidental Take Statement Methodology used to estimate the number of NSOs affected by federal actions (USDI, 2008). Therefore, two similar treatments in very similar habitat types could have differing impacts to NSOs depending on if the treatment would occur within 300 meters of NSO nest locations (i.e., the nest patch).

The removal of selected dwarf mistletoe infected trees outside of NSO nest patches would remove some trees with potential nest structure formed by the mistletoe. Suitable nesting structure is retained within units through retention of large dominant trees and most trees infected with mistletoe.

The long term (>10 year) effects of the Proposed Action are anticipated to increase the health and vigor of the residual stands post treatment. It is likely that the treated stands would develop into more complex, structurally diverse forests in the long term in comparison to the No-Action Alternative. In fact, thinning dense stands may be necessary in order to achieve old-growth forest characteristics in the absence of natural disturbance events (Tappeiner et al., 1997). Thinning younger forest stands may provide growing conditions that more closely approximate those historically found in developing old growth stands (Hayes et al., 1997). Thus, the treatments as proposed under Alternative 2 would have long-term beneficial effects to NSOs by increasing growth rates of the residual stand and accelerating the development of late-successional old growth characteristics within the treated areas than would occur if left untreated.

Thinning around pines (by a distance of double the drip line of the pine to be buffered) would aid in recolonization of pines in stands that have seen a conversion from pine dominated forest to Douglas fir and white fir dominated forest due to fire suppression. Pine forest is the historically typical condition of these forest stands. Restoration of these pine forests would enhance habitat for a variety of native wildlife species and improve the fire resiliency of these forest stands. This would in turn reduce the likelihood of landscape scale, stand replacement fires which are a significant threat to NSO habitat throughout this analysis area.

The determination for the proposed project for northern spotted owls would be "*not likely to be adversely affected*" (NLAA); therefore informal consultation with the U.S. Fish and Wildlife Service is required. The consultation took place through a consultation with the Service for timber sales and other projects in July of 2010. The Biological Assessment, July 2010 NLAA, and corresponding letter of concurrence (LOC) from the USFWS are available for review at the Medford District Office**.**

Effects to Spotted Owl Prey

Timber harvest and associated fuels reduction projects may impact foraging by changing habitat conditions for prey. Sakai and Noon (1993) stated that dusky-footed woodrats may benefit from some thinning or harvest which would increase shrub and pole stands. Bushy-tailed woodrat presence is more dependent on cover and food availability than on seral stage. This species often uses areas previously disturbed by fire (Carey 1991). Both of these NSO prey species are likely to be present in the analysis area.

Residual trees, snags, and down wood that are retained in the thinned stands would provide some cover for prey species, and would help minimize harvest impacts to some prey species. Lemkuhl et al. (2006) found that fuels projects in eastern Washington could have impacts on bushy-tailed woodrats, but confirmed the importance of maintaining snags, down wood, and mistletoe.

Some disturbance of habitat may improve forage conditions, provided understory structure and cover are retained. Removal of tree canopy would bring more light and resources into the stand, stimulating forbs, shrubs and other prey food. Once the initial impact of disturbance recovers (6 months to 2 years), the understory habitat conditions for prey forage would improve over the next few years, until shrubs and residual trees respond to again close in the stand.

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

Bingham and Noon (1997) reported that a spotted owl core area is the area that provides the important habitat elements of nest sites, roost sites, and access to prey, benefiting spotted owl survival and reproduction. Rosenberg and McKelvey (1999) reported that spotted owls are "central place" animals with the core area (the area closest to the nest) being the focal area. Several studies (Wagner and Anthony, 1998; Dugger et al., 2005; Zabel et al., 2003; Bingham and Noon, 1997) indicate the core area size for the Klamath and South Cascades provinces is 0.5 miles (or 500 acres) around the nest site. Therefore, effects to prey species are most critical at the nest patch and core areas. Within the Cottonwood Project, there would be no treatment within nest patches and all treatments would be "treat and maintain".

Overall, the spacing, timing and the retention of key habitat features as called for under the Proposed Action and PDFs for this project (EA Chapter 2) are likely to avoid adverse impacts to spotted owls with respect to prey availability, although localized, short-term changes in prey species distribution and abundance are likely to occur within a treated stand.

The dispersed nature of treatment sites over a large area is especially important in maintaining spotted owl prey populations within the project area. Large dominant trees, moderate to high canopy cover residual trees, snags, and down wood retained in the treated stands would continue to provide cover and nest structure for prey species and would help reduce harvest impacts to some prey species, such as dusky-footed woodrats and northern flying squirrels. Treatment implementation would be spread out temporally and spatially within the analysis area, and greater than 83 percent of NSO habitat across the analysis area landscape would remain untreated, providing large, undisturbed areas for spotted owl foraging.

Additionally, research has indicated that thinning treatments are not necessarily detrimental to small mammal communities as a whole. In an experimental study, researchers found of 12 mammal species studied, the number of captures increased for four species and decreased for only one species two years after moderate to heavy thinning occurred in the Oregon coast range (Suzuki and Hayes, 2003). This study also found the total number of small mammal captures was higher in previously thinned vs. unthinned stands. Gomez et al. (2005) noted that commercial thinning in young stands of coastal Oregon Douglas-fir (35-45 yr) did not have a measurable short-term effect on density, survival or body mass of northern flying squirrels, an important prey species for spotted owls.

PDFs and normal operating procedures applied by the Medford BLM reduce the impacts to the extent possible, while still facilitating tree harvest and other projects.

Effects of Disturbance to Northern Spotted Owls

Mandatory PDFs would be incorporated into all Proposed Action activities. Applying the Mandatory PDFs should avoid harm to nesting owls and their young that might occur from noise or activity. Nesting owls are confined to an area close to the nest, but once the young fledge, they can move away from noise and activities that might cause them harm. Since all projects would follow mandatory PDFs, that restrict activities to outside of the breeding season and beyond recommended disturbance distance thresholds, no harm to nesting owls, or their young, is expected from project related noise or activities.

Fuels Reduction Treatments

Alternative 2 proposes to treat slash created from forest thinning. The fuels reduction treatments as proposed in Chapter 2 would not alter the overstory forest structure or remove key habitat components related to spotted owl habitat. In very dense stands, these treatments reduce understory density and improve flight paths within stands, in turn, increasing the accessibility of owls to the forest floor and prey abundance or availability (Sakai and Noon; 1993, 1997). In some instances, mechanical fuels treatments can reduce the habitat quality for owls because these treatments simplify the forest structure, which can in turn have negative effects to prey species. Conversely, results from other studies on small mammals and fuel reduction treatments have demonstrated that the total amount of small mammal biomass increases as a result of mechanical fuel reduction treatments (Converse et al., 2006).

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

Underburning treatments have the greatest potential to impact spotted owl prey because these treatments can fully or partially consume the snags or coarse woody material (CWM) that many prey species are associated with during underburn operations (Stephens and Moghaddas, 2005). However, these effects to prey species are expected to be highly limited and localized because very few acres would be underburned during a given year and not all the existing snags or CWM within an underburn is lost during underburn treatments (Pers. Comm. Mitchell, 2009). In addition, while some prey species may be adversely affected from mechanical and underburn treatments, some of the prey species are primarily arboreal in habit, and would remain largely unaffected by these treatments.

Road Construction
Under Alternative 2, the BLM proposes to maintain about 36 miles of roads (i.e., road grading, rock surfacing, and water drainage improvements). Approximately 2.1 miles of new road (1.5 miles permanent and 0.6 mile temporary) would be constructed under this alternative. Road decommissioning proposed for the Cottonwood Project would include approximately 1.9 miles of existing BLM roads. There are a number of ways roads affect wildlife in addition to habitat removal. Some of the more common ones are vehicular noise disturbance which affects behavior patterns, increased potential for poaching, increased potential for over hunting along roads due to easy access, and microclimatic changes to the habitat adjacent to roads. Road maintenance has the potential to influence wildlife species through noise, but would be of short duration and subject to wildlife seasonal PDFs.

In summary, the Proposed Action would have minimal impacts to the NSOs found within the analysis area given that:

- 17% of the total NRF habitat located within the analysis area would receive treatments
- The treatments would not downgrade or remove any existing NRF or Dispersal habitat.
- None of the proposed treatments would occur within a NSO nest patch
- Negative impacts to NSO prey are anticipated to only occur in the short term (<5 years) and would be spatially separated and well distributed across the owl analysis area.

8. Environmental Consequences – Pacific Fisher

a. Alternative 1

Under Alternative 1, the No-Action Alternative, none of the proposed BLM activities would occur. Forest stand conditions would continue to develop along the general current trends toward higher density stand conditions, especially in the understory, than what was historically present in the area.

The No-Action Alternative would not alter the current habitat conditions across the analysis area. Fishers would be expected to behave and utilize the habitat in the same fashion as they have in the past.

Particularly to fishers, the greatest risk of No-Action is the potential wildfire related loss of large live remnant conifers as well as snags and down wood important to fisher natal and denning habitat.

b. Alternative 2

Harvest Treatments
No known denning sites would be impacted and proposed activities would not be expected to cause direct mortality of any fishers. Disturbance from project activities would likely be the principal effect on any fisher within the analysis area. However, fishers are highly mobile and have large home ranges and would likely move to another part of their home range while the activity is ongoing.

Thinning treatments would have short term adverse effects to habitat for some fisher prey species due to the reduced vegetation. These effects are relatively short term, as understory vegetation typically returns within 5 years. However, these short term effects to fisher prey species would be minimal, because the large amount of untreated areas within the analysis area would continue to provide forage habitat while canopy cover in the treated stands increases. Additionally, these treatments would retain key habitat characteristics such as large snags and coarse woody debris (CWD) to provide existing and future habitat for fishers.

Fishers may avoid roaded areas (Harris and Ogan, 1997) and humans (Douglas and Strickland 1987; Powell, 1993). Disturbance from project activities would be temporally and geographically limited and would occupy a geographic area smaller than the average fisher home range (approximately 36 sq. km. for an adult male and approximately 11 sq. km. for an adult female (Lofroth, et al., 2010).

Seasonal restrictions listed as Project Design Features for other resources would also reduce the likelihood of impact to fishers by restricting project activities until young are approximately six weeks old, approximately the age when fisher move young from natal dens and become more mobile. Fishers have large home ranges and would be able to move away from the action area while the disturbance is occurring, without impacting their ability to forage and disperse within their home range.

Fuels Reduction Treatments

Alternative 2 proposes to treat 1,108 acres for fuels reduction. Approximately 456 acres of fisher habitat would be treated. These proposed treatments would have minimal impacts to the habitat located across the analysis area, as the vast majority of the existing habitat would not be treated.

The fuels reduction treatments as proposed in Chapter 2 do not typically alter the overstory forest structure or remove key habitat components related to fisher habitat. In some instances, mechanical fuels treatments can reduce the habitat quality by simplifying the forest structure. The Project Design Features in Chapter 2 include the retention of snags and CWM, which are important habitat features for fisher. This provision, along with the spatial and temporal staggering of treatments across the landscape would ameliorate the potential negative effects (e.g., removal of cover; disruption of normal feeding, breeding, and sheltering activities) of these fuels treatments on prey species at the landscape level.

Underburning treatments have the greatest potential to impact fisher habitat because these underburning treatments can partially or fully consume the snags or coarse woody material (CWM) that fishers often utilize for denning or rest sites (Stephens and Moghaddas, 2005). However the potential loss of these snags or CWM is expected to be highly limited and localized because not all the existing snags or CWM within an underburn is lost during underburn treatments (Pers. Comm. Mitchell, 2009).

Road Construction

Under Alternative 2, the BLM proposes to maintain about 36 miles of roads (i.e., road grading, rock surfacing, and water drainage improvements). About 2.1 miles of new road would be constructed. Some of this road construction will remove existing forest and contribute to the fragmentation of habitat used by the fisher. Approximately 1.9 miles of existing roads would be decommissioned.

Effects Summary for Fisher Alternative 2

Alternative 2 would not contribute to the need to Federally list the fisher as threatened or endangered because habitat features, such as large snags and coarse wood, would be retained throughout the project area, which would provide habitat for denning and resting. More than 83% of suitable habitat located within the analysis area would not receive any treatments.

9. Environmental Consequences – Great Gray Owl

a. Alternative 1

Under the No-Action Alternative, none of the proposed harvest activities would occur, and the forested stands in the analysis area would continue to develop along their current pathways. Therefore, none of the potential nesting habitat found within the analysis area would be altered. Great gray owls would continue to utilize the analysis area in more or less the same fashion as they have in past years.

Specific to great gray owls, the No-Action Alternative would not affect use of the analysis area for nesting or foraging in the short term. At longer time scales, the open meadow habitats that provide foraging areas would continue to be encroached upon by fire intolerant plant species, thereby reducing the amount of potential foraging opportunities found within the analysis area. Some forest stands would grow too dense over time for great gray owls to fly through, thus further reducing nesting and foraging habitat. Stand replacement fire would remain the greatest risk to the nesting habitat found within the analysis area.

b. Alternative 2

Alternative 2 would treat 1,108 acres of forest habitat. While commercial thinning treatments may remove individual potential nest trees, the thinning treatments are not expected to affect the majority of the stands or individual potential nest trees found throughout the analysis area. Protocol surveys were conducted for great gray owls for the Cottonwood analysis area in 2010 and 2011. Five (5) reproductive sites were located. Each reproductive site would be protected with a ¼ mile radius (or equivalent area polygon) no treatment buffer. Any additional reproductive sites located prior to harvest activities would also receive this protection.

Short term effects would include reduced canopy closure and structural complexity, and the loss of future potential nest trees. However, these habitat changes would also open stands for unobstructed flight and increased foraging opportunities. Long term beneficial effects include accelerated development of late-successional forest habitat suitable for potential great gray owls nesting and improved potential foraging habitat as understories respond from increased light penetrating to the forest floor .

The fuels reduction treatments proposed under Alternative 2 would remove vegetation from the understory or the smaller components of the midstory. This would have minimal effects on great gray owl habitat, as the trees removed by this type of treatment do not provide nesting habitat. These treatments have the potential to improve foraging conditions in treated stands by opening the understory and increasing access to prey species. The road construction associated with Alternative 2 would not occur in suitable great gray owl habitat, and thus would not directly affect any nesting habitat. Each reproductive site would be protected with a ¼ mile radius (or equivalent area polygon) no treatment buffer.

10. Environmental Consequences - Golden Eagle

a. Alternative 1

Under the No-Action Alternative, management activities would not remove or alter suitable habitat within the project area and habitat would continue to develop along current successional pathways. For Golden Eagles, the greatest risk of the No-Action Alternative is the potential wildfire related loss of large live remnant conifers needed to support Golden Eagle nesting structures, and the loss of suitable foraging habitat due to conifer encroachment.

b. Alternative 2

Because of the retention of more than 80% of nesting and foraging habitat suitable for use by Golden Eagles within this analysis area, any impact to the species from the Cottonwood Project is expected to be slight. Most large suitable nest trees would be retained post-harvest. Grasslands suitable for foraging would not be treated and would remain usable by Golden Eagles to their present extent. Some encroachment into these grasslands will continue to occur and thus reduce golden eagle foraging habitat.

11. Environmental Consequences - Bureau Sensitive Species

The Bureau Special Status Species list, updated February 7, 2008, is divided into Sensitive and Strategic species (IM No. OR-2008-038). As mentioned above, only Federally listed or Bureau Sensitive species known or suspected to be present within the analysis area and impacted by the proposed actions are addressed in this EA. Table 3-12 below documents the basic conclusions of this assessment by species. A description of the table's headings and letter codes are located at the bottom of table.

Table 3-12. Special Status Wildlife Species – Cottonwood Analysis Area

SPECIES	7/7/10 STATUS	RANGE (Y/N)	PRESENCE	PROJECT SPECIFIC COMMENTS/ BASIC CONCLUSIONS
Birds Bureau Sensitive & Bureau Strategic				
Peregrine falcon	BSEN	Y	S	No known nest sites within the planning area. Some potential nesting cliffs are present. Suitable habitat would remain suitable post-harvest.
Northern spotted owl	FT	Y	P	Seasonal Restrictions would protect known sites from project activity disturbance. Timber harvest treatments would treat and maintain all NSO habitat.
Amphibians Bureau Sensitive & Bureau Strategic				
Foothill yellow-legged Frog	BSEN	Y	S	A slight increase in sedimentation from road maintenance and construction, and road use for timber harvest, could have negative short term impacts on foothill yellow-legged frog habitat. However, sediment delivery to streams due to project activities would be highly localized, immeasurable, and of short duration. Soil and hydrology PDFs would minimize potential impacts from sedimentation to water quality and no loss of frogs would be expected to occur.
Oregon Spotted frog	FC	Y	U	No known sites within the project area. Habitat would be protected by riparian buffers within the Cottonwood project area.
Reptiles Bureau Sensitive & Bureau Strategic				
Northwestern pond turtle	BSEN	Y	P	Females lay eggs in upland areas up to ½ mile from the nearest water source. Riparian zone buffers would protect aquatic habitats used by this species. Upland sites utilized for nesting are not usually forested and would not likely be impacted by the proposed action. Some individual turtles may overwinter in duff in forested locations and could be subject to incidental impacts.
Mammals Bureau Sensitive & Bureau Strategic				
Fisher	FC	Y	S	Potential habitat exists within and adjacent to the project area. Temporary human disturbance, both temporally and spatially would be inconsequential. No known sites located within project units. Proposed activities impacts have been addressed in detail in subsection 8.
Fringed myotis	BSEN	Y	S	Potential habitat exists within and adjacent to the project area. Project activities would not adversely affect this species at the landscape scale as adequate levels of snags would be retained (PDF Ch. 2) post treatment.
Pacific pallid bat	BSEN	Y	S	Potential habitat exists within and adjacent to the project area. Project activities would not adversely affect this species at the landscape scale as adequate levels of snags would be retained (PDF Ch. 2) post treatment.
Invertebrates Bureau Sensitive & Bureau Strategic				
Chase sideband snail	BSEN	Y	S	Potential habitat exists within and adjacent to the project area. Protocol surveys will be carried out. Known sites would be protected with a one (1) site tree buffer.
Evening fieldslug	BSEN	Y	U	No known sites in project area. Habitat would be protected by riparian buffers within the Cottonwood project area.
Johnson's	BSEN	Y	S	This butterfly species has not been documented in the project area. Surveys for the species have been determined

SPECIES	7/7/10 STATUS	RANGE (Y/N)	PRESENCE	PROJECT SPECIFIC COMMENTS/ BASIC CONCLUSIONS
Hairstreak				to be impractical as it spends the majority of its lifecycle high in the canopy of older conifers with mistletoe infection. This butterfly is likely to be impacted through removal of conifer trees and the mistletoe which they host. As mistletoe would not be eradicated from the project area, this butterfly would likely continue to persist.
Mardon skipper butterfly	FC	Y	S	No known sites within the project area. This species is associated with wet meadows. There would be no treatment of this type of habitat under the provisions of this project.
Oregon shoulderband snail	BSEN	Y	S	Potential habitat exists within and adjacent to the project area. Protocol surveys will be carried out. Known sites would be protected with a one (1) site tree buffer.
Siskiyou hesperian snail	BSEN	Y	S	Potential habitat exists within and adjacent to the project area. Protocol surveys will be carried out. Known sites would be protected with a one (1) site tree buffer.
Siskiyou short-horned grasshopper	BSEN	Y	S	The Siskiyou short-horned grasshopper is associated with open grassland with an elderberry shrub component. No activities are proposed for this habitat type in the Cottonwood project area. They are unlikely to be impacted by the proposed action.
Travelling sideband snail	BSEN	Y	S	Potential habitat exists within and adjacent to the project area. Protocol surveys will be carried out. Known sites would be protected with a one (1) site tree buffer.

Table Headings and Letter Code Definitions

Species: Grouped alphabetically by taxon.
Status: lists the Oregon BLM Program codes as follows:
Oregon BLM Codes:

FT - USFW Threatened - likely to become endangered species within the foreseeable future
FC - USFW Candidate - proposed and being reviewed for listing as threatened or endangered
BSEN - Bureau Sensitive (BLM) - eligible for addition to Federal Notice of Review, and known in advance of official publication. Generally these species are restricted in range and have natural or human caused threats to their survival.
BSTR - Bureau Strategic Species (BLM) - not presently eligible for official federal or state status, but of concern which may at a minimum need protection or mitigation in BLM activities.

Range: indicates yes or no, if the breeding range overlaps with the Ashland Resource Area. If not within the range, both presence and basic conclusion are not applicable (N/A). For invertebrates in which there is inadequate data to determine ranges, 'U' is used for unknown.

Presence: indicates 'P' if a species is known to occur in the project area, 'S' suspected to occur based on known sites adjacent to the project area, or suitable breeding habitat exists, 'U' uncertain that the species occurs within the project area based on insufficient data, 'A' absent from the project area based on no known sites and/or no suitable breeding habitat within the project area, and 'T' possibly transitory species utilizing habitats within the project area during migration.

Basic Conclusion: describes the facts, context and intensity to provide the rationale for the conclusion of the proposed action(s) on the species and its habitat.

12. Environmental Consequences - Land Birds (Neotropical Migrants)

a. Alternative 1

Neotropical birds that favor dense conditions may benefit for a time from the No-Action Alternative because the dense understories would continue to build within the project area. However, the increased chance of stand replacing fires that would eventually be a result of No-Action Alternative would also lead to the loss and decline of a variety of habitat conditions, including the present dense conditions that benefit some species.

b. Alternative 2

Any action that changes or removes vegetation used by one species may benefit another. Species requiring dense cover that have benefited from the dense understories created by the lack of fire could be adversely affected by thinning treatments designed to reduce vegetation density. Due to habitat removal, songbird composition and abundance in treated stands could be reduced in the short term (Janes, 2003; Hagar et al., 2001; and Siegel and DeSante, 2003). Harvest treatments would remove hiding cover and nesting habitat for neotropical birds that use older forests. However, untreated riparian buffers, untreated late-successional forest habitat, and 100-acre spotted owl activity centers would continue to provide hiding cover, foraging, and nesting habitat within the analysis area for birds that use older forests. Additionally, existing large diameter snags and down wood found in older seral stands would be retained in the project area, and would continue to provide nesting, roosting, or foraging opportunities for species dependent on these key habitat structures.

Some individual birds may be displaced and nests could be destroyed during project activities. However, untreated areas adjacent to the treatment areas would provide refuge and nesting habitat. Some nests may be lost from timber harvest and thinning occurring during active nesting periods. However, the failure or loss of a nest during one nesting season would not be expected to reduce the persistence of any bird species in the analysis area. That is because habitat of all types remains to support the wide diversity of bird species in the area. As >86% of BLM administered lands found within the analysis area would remain untreated, impacts to these species are anticipated to be negligible at the landscape scale. The loss would not be measurable at the regional scale; therefore, populations in the region would be unaffected; Partners in Flight support the eco-regional scale, as appropriate, for analyzing bird populations (California Partners in Flight, 2002).

14. Cumulative Effects

Cumulative effects analysis of foreseeable state and private actions provide the Service and the Medford BLM an accurate environmental baseline to assess impacts of Federal actions.

The land base in the action area has a checker board pattern of ownership of private land interspersed with BLM lands. A range of management practices occur on private lands from residential home site development to intensive industrial timber management.

In the Biological Opinion for the NWFP (USDA and USDI 1994b, Appendix G, 44-45), the Service concluded,

> "Non-Federal landowner compliance with the take prohibition of the [Endangered Species] Act does not assure the maintenance of spotted owl dispersal habitat within Areas of Concern and checkerboard ownership nor provide for improvement of existing populations. Consequently, it is likely that a reduction in dispersal habitat would occur on non-Federal lands in certain areas."

The majority of state and private forests in Washington, Oregon, and Northern California are managed for timber production. Non-Federal lands are not expected to provide demographic support for spotted owls across and between physiographic provinces (Thomas et al., 1990; USDA and USDI, 1994). Historically, non-Federal landowners practiced even-aged management (clear-cutting) of timber over extensive acreages. Private industrial forest lands are managed for timber production and will typically be harvested between 40 and 60 years of age, in accordance with State Forest Practices Act standards.

In 2008, during the development of the District Analysis and Biological Assessment of Forest Habitat, data was requested from Oregon Department of Forestry and the Pacific Northwest Inventory and Analysis team to help determine harvest rates in the past decade on private lands within the Medford district. These records indicated private harvest rates in Jackson and Josephine Counties have never exceeded 1.08 percent of the total private lands per year since 1998. These records did not provide information of pre-treatment habitat conditions. Some loss of owl habitat on private lands is anticipated, but cannot predict the rate of loss, or the specific location of harvest.

The Medford BLM assumes these past management practices will continue and reduce the amount of NRF habitat for spotted owl on non-Federal lands over time. Harvest activities on state and private lands can be expected to impact spotted owls located within adjacent Federal lands by removing and fragmenting habitat and through disturbance activities adjacent to occupied sites during sensitive periods. Under Oregon Forest Practice Rules (629-665-0210), owl nest sites (70-acre core areas) are protected for at least three years following the last year of occupation.

Past harvest activities on Federal land are reflected in current condition discussions in this document. Acres of habitat have been adjusted to reflect these activities. The only planned activity on BLM land in the Jenny Creek watershed in the reasonably foreseeable future is the Swinning timber sale. This harvest action, treating 536 acres, would take place outside the home range of any known northern spotted owl sites analyzed under the Cottonwood Forest Management Project. The Sampson Cove Forest Management Project is located in the Upper Bear Creek Watershed adjacent to the Cottonwood Project. Because the Cottonwood Project is designed to maintain existing spotted owl nesting, roosting, foraging and dispersal habitat treated, and because the Sampson Cove Project was designed to maintain existing spotted owl, nesting, roosting, foraging and dispersal habitat within the home ranges of known spotted owl sites, there is no potential for either project to contribute to significant adverse cumulative effects to the spotted owl.

G. SILVICULTURE

1. Affected Environment

a. Landscape Pattern

The 9,897-acre Cottonwood Forest Management Project Planning Area is located in the northern portion of the Keene Creek sub-watershed of the Jenny Creek 5th-field watershed, which is a tributary to the Klamath River. For purposes of analyzing the affected environment and developing the proposed silvicultural treatments; the analysis area for silviculture considered 5,444 acres of BLM lands within planning area boundary (Table 3-13).

The current landscape pattern of the vegetation in the Cottonwood analysis area is a result of topography, fires, wind events, timber harvesting, and forest pathogens. There is a natural diversity of vegetation condition classes[1] within stands and between stands whose patterns and boundaries are generally dictated by soils, aspect, past disturbance, and fire suppression. The combination of abiotic and biotic influences on the landscape pattern seem to work together in a delicate balance to maintain the uneven-aged structure and somewhat coarse grained landscape pattern of the forests of the watershed (USDI, 1995). Although some even-aged forest stands have been created by fire, the effects of most fires on the landscape are probably more masked because of their small size and low to moderate severity (USDI,1995). The present day vegetation pattern across the watershed landscape results from the dynamic processes of nature and human influences over time. The Cottonwood analysis area lies within the Mixed Conifer Zone and White Fir Zone as described by Franklin and Dyrness (1973). In the Jenny Creek Watershed there is a gradual transition from the Mixed Conifer Zone to the White Fir Zone beginning at 4,200 foot elevation (USDI 1995). The White Fir Zone becomes recognizable above 5,000 feet around Hyatt Lake, and on Table and Chinquapin mountains (USDI, 1995). The Cottonwood analysis area lies between 4,420 and 6,120 feet in elevation.

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

Table 3-13. Vegetation Condition Classes – Cottonwood Analysis Area; BLM Lands

Vegetation Condition Class	Acres
Grassland, Shrubs	761
Hardwood/Woodlands	219
Early (0-5 years) and Seedlings/Saplings (0-4.9 inches DBH)	458
Poles (5-11 inches DBH)	79
Mid (11-21 inches DBH)	1400
Mature (21+ inches DBH)	2527
TOTAL ACRES	**5,444**
TOTAL FOREST LAND ACRES	**4,464**

b. Plant Series and Associations

There are four plant series types in the Cottonwood Analysis Area: Douglas-fir, ponderosa pine, white fir, and white oak (Table 3-14). Plant association (a stand or group of stands made up of plants characterized by a definite floristic composition consisting of uniformity in physiognomy and structure and uniform habitat conditions) descriptions within these series can be found in Preliminary Plant Associations of the Siskiyou Mountain Province (Atzet & Wheeler, 1984) and the Field Guide to the Forested Plant Associations of Southwestern Oregon (USDA, 1996). The Preliminary Plant Associations of the Siskiyou Mountain Province can also be applied to segregate other landscapes that exhibit similar recognizable vegetation patterns (Atzet, 2008) as encountered on the landscape in the Southwestern Oregon Cascades.

Table 3-14. Tree Series and Plant Associations Common to Cottonwood Analysis Area

Douglas-fir Series / Plant Associations	Ponderosa Pine Series / Plant Associations	White Fir Series / Plant Associations	White Oak Series/Plant Associations
PSME-ABCO/BENE (Dwarf Oregon grape)	PIPO–PSME	ABCO/HERB	QUGA–CEMO (Birchleaf Mountain Mahogany)
PSME-ABCO/HODI (Pacific Ocean Spray)		ABCO-PSME/BENE	QUGA (Oregon White Oak)/FRVEB (Woods Strawberry)
PSME-ABCO-PIPO (Ponderosa Pine)		ABCO-ACGL (Rocky Mountain Maple)	
PSME (Douglas-fir)-ABCO (White Fir)			

The Douglas-fir plant associations comprise 52 percent of forestland in the analysis area. These associations are cool and dry. In frequency of occurrence, the PSME-ABCO/HODI plant association occurs the most frequently (71%) followed by PSME-ABCO-PIPO (18%), PSME-ABCO/BENE (6%), and PSME-ABCO (5%). In acreage, the PSME-ABCO/HODI plant association makes up 45% of the forestland followed by PSME-ABCO-PIPO (11%), PSME-ABCO/BENE (4%), and PSME-ABCO (2%).

Of the 2,006 acres of land in the analysis area classified as PSME-ABCO/HODI, 74 percent is in the understory reinitiation stage of forest development. This later stage of succession, according to Oliver and Larson (1996), begins several decades after the stem exclusion stage begins and displays a low stratum of herbs, shrubs, and advance regeneration invading the forest floor, which until then had been relatively free of low vegetation. According to Atzet and Wheeler (1984) this Association is moderately dry with a high percentage of total herb cover; Douglas-fir performs better while white fir exhibits transpirational stress and reduced growth; ponderosa pine and sugar pine perform well.

In contrast, 11 percent of the PSME-ABCO/HODI plant association in the analysis area is in the stem exclusion stage of forest development. Overstory trees grow very vigorously at the beginning, actively occupying all available growing space, and vigorously compete with neighbors (Oliver and Larson, 1996). Shade intolerant trees such as ponderosa pine and sugar pine struggle to survive against shade tolerant white fir as this species persists under increasingly lessening light conditions. Pine and other sun loving species become suppressed and eventually excluded from the stand giving way to a pure or nearly pure white fir forests. Without disturbances to release growing space, shade intolerant species such as pine continue to decline in number, reducing stand-level species diversity.

The white fir plant associations comprise 39 percent of the forestland in the analysis area prevailed by the ABCO/HERB plant association. This association is characterized by high forage and timber production. Deep soils help contribute to substantial natural regeneration of Douglas-fir, white fir, and incense cedar, which are all good performers (Atzet and Wheeler, 1984). In frequency of occurrence, the ABCO/HERB plant association occurs the most frequently (81%) followed by ABCO-ACGL (18%), and ABCO-PSME/BENE (1%). In acreage, the ABCO/HERB plant association makes up 31% of the forestland followed by ABCO-ACGL (7%), and ABCO-PSME/BENE (<1%).

Drier forest sites make up 9 percent of the forestland in the analysis area and are composed of the PIPO-PSME plant association. Ponderosa pine, Douglas-fir, and white fir occur with ponderosa pine being the most efficient. Only the hardiest sugar pine and white fir can survive on these sites and their growth rate is slow (Atzet and Wheeler, 1984).Non-forest lands make up 18 percent of the total analysis area and are composed of the QUGA-CEMO and QUGA/FRVEB plant associations where woodlands are observed.

Recognizing that landscape vegetative patterns are in a constant state of change, the landscape vegetation of today is observed at one single point in time. Although current vegetation stem densities are high and are mostly in the mid and mature seral stages, the vegetation condition classes of today are atypical when compared to historical patterns. With or without silvicultural management, the vegetation will continually change because of the natural process of forest succession.

c. Current Forest Stand Condition

Approximately 3,445 acres of forestland were initially reviewed for commercial treatment in the Cottonwood analysis area. Of the forestland acreage of vegetation series exhibited in the analysis area, stands in the Douglas-fir Series comprised 52 percent compared to stands in the White Fir Series at 39 percent (9 percent in the White Oak and Ponderosa Pine Series). A lack of disturbance, either natural or manmade, alters the vegetation condition of the forest. Subtle changes in species composition and stand structure are occurring over the landscape. Many trees with old-growth characteristics are dying as a result of increased competition for limited resources with second growth trees. White fir (WF) and Douglas-fir (DF) are replacing ponderosa pine (PP), sugar pine (SP), and incense cedar (IC) because of their more shade-tolerant nature. Conifer stands in the analysis area are dominated by white fir second growth and advance regeneration. The vast majority of insect and diseases present on the landscape are associated with white fir and pockets of mortality are observed where this species is dominating growing space. Forest openings that once supported grasses and shade intolerant trees are now dominated by white fir. In mixed conifer stands white fir is encroaching upon the edges of meadows and oak woodlands. Mortality of these trees along the edges is also evidence of their non-suitability to the site. Pine and cedar have dropped out of some mixed conifer stands where light and water have become limiting.

The average canopy cover for sampled stands in the Cottonwood analysis area is 80 percent and ranges from 61 to 100 percent (ORGANON). Some forested stands have been selectively logged, underburned by fire, commercially thinned, or have suffered mortality from natural processes. These stands tend to be more diverse in species composition and vertical structure as a result of disturbance.

The silvicultural activities proposed resemble natural disturbances that are inherent to forests in which openings in the forest canopy is created. Such a modification is similar to a moderate forest ecosystem disturbance regime (Oliver & Larson, 1996; Waring& Schlesinger, 1985) such as moderate and frequent fires and moderate insect and disease-induced mortality pockets.

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

Competition in a stand has been directly correlated with stand density. The more stems (i.e., plants) that exist per acre on a site, the fewer resources are available per stem to sustain it. Each stem draws water and nutrients from the soil and occupies a place in the stand that captures sunlight. Absent disturbance, such as, resulting from fire suppression, these sites become occupied by shade tolerant species capable of outlasting their shade intolerant neighbor trees. Various scientific methods have been developed over the decades that can predict or identify a threshold when a forest stand will decline in production and health due to factors such as competition. Relative Density Index (RDI: the ratio of actual stand density to the maximum stand density attainable in a stand with the same mean tree volume) and the Waring Tree Vigor Index are two such measures of both stand and tree level health and productivity.

Undisturbed populations eventually compete for growing space and gradually thin the population as individuals die in a self-thinning process (Barbour, et al., 1987). Drew and Flewelling (1979) concluded that the correlative density index rating of 0.55 for any given stand marks the initial point of imminent mortality and suppression. A productive forest stand absent of natural or human density control will continue growing until it reaches a condition where the vegetation in the stand occupies all the available growing space. The aftermath results in widespread competition and declining productivity as evident in dense stem exclusion stands. A decrease in stand vigor is expected and considered forthcoming with continued overstocking and increasing stand age.

All of the forested stands in the Cottonwood analysis area inventoried have relative density indices between 0.41 and 0.91, which bounds the zone of imminent competition-mortality (Drew &Flewelling, 1979). Currently, the relative densities of stands throughout the analysis area are high. This is primarily due to the lack of natural or human disturbance. The overall average relative density for forested stands in the Cottonwood analysis area inventoried is 0.60,indicating that physiologically, the trees have entered the zone of imminent competition induced suppression and mortality.

The absence of fire due to suppression efforts has changed the forest composition from a fire dependent ecosystem to a densely forested fire intolerant condition. Shade-tolerant conifers have regenerated on sites once occupied by ponderosa pine, Oregon white oak, and sugar pine. The absence of fire as a disturbance has altered the structural complexity, health, and fire resiliency of the forest. Throughout southwestern Oregon and most of the western United States, fire is no longer a natural agent of ecosystem stability as it now creates major shifts in forest structure and function. Frequent fires prevent fuel from accumulating and prepare a seedbed favorable for perpetuating pine species (Waring& Schlesinger, 1985). High severity fire regimes on the other hand, exhibit infrequent, intense, large, stand-replacing fires that denude entire forests. These occur when tree densities and surface and ladder fuels build up to a level where fire resiliency is compromised and the entire stand is threatened by intensified burning conditions.

Some of the forest lands within the analysis area have been previously harvested and most commercial forest stands originated between 1800 and 1900. Forest fires in the Cascade Range have been documented since about 1850. Morrison and Swanson (1990) found the natural fire rotation between 1500 and 1910 ranged from 95-149 years near the H.J. Andrews Experimental Forest. On lower elevation sites (1,719 to 4,248 feet elevation) where the topography was steeper and more dissected, fires were more frequent but low to moderate in severity (Morrison and Swanson, 1990). On another site (2,998 to 5,354 feet elevation) where topography was more gentle with broad valleys and ridge tops, the natural fire rotation was less frequent but the fires were stand-replacement in severity (Morrison and Swanson, 1990). The historical fire cycle in the mixed conifer forests of the Cascade Mountains occurred every 95 to 149 years. As a result of fire suppression, the analysis area has missed at least one fire cycle over the last 100 years. Forest fires have played a minor role in creating the present day landscape pattern of the Jenny Creek Watershed because of the lengthy natural fire rotation between stand replacement fires (USDI ,1995). Also refer to the Fire and Fuels section for additional discussion concerning fire history of the project and analysis area. Forest pathogens probably contribute more to diversity in forest structure and the landscape pattern of the watershed than fire (USDI ,1995).

d. Forest Pathogens

Forest pathogens shape stand structure and forest development patterns by creating openings of various sizes, allowing light to reach the forest floor and triggering the understory reinitiation stage. If disease susceptible trees continue to recolonize the sites, they will become infected, and their likelihood of attaining large sizes will be low. The pathogen will survive on the site unless immune species occupy the gaps.

In the analysis area, laminated (*Phellinus weirii*) and Armillaria (*Armillaria ostoyae*) root diseases are readily infecting and killing white fir and Douglas-fir. These diseases expand radially at a rate of about one foot per year and can remain viable in large stumps for at least 50 to 60 years. Brown cubical butt rot (*Phaelous schweinitzii*) is also present causing severe root and butt decay of older Douglas-fir. Douglas-fir beetles often attack *P. schweinitzii*-infected trees. The root diseases in the analysis area kill host cambium, decay root wood, plug water conducting tissue, or cause some combination of these effects. Tree mortality from root disease occurs when trees with decayed roots are windthrown or by bark beetle attack on root disease-weakened trees.

Most root pathogens spread when the roots of susceptible uninfected trees directly contact the roots of diseased trees as in the cases with *A. ostoyae* and *P. weirii* root diseases. *A. ostoyae* is most common in stressed trees and often associated with compacted soils, in poorly planted areas, and where trees have been wounded. This disease can create large openings where highly susceptible tree species never attain large sizes. In the project area white fir are the most susceptible and are readily infected and killed. *P. weirii* causes severe root and butt decay, growth loss, and mortality in both Douglas-fir and white fir. Bark beetles often attack *P. weirii*-infected trees.

Treatments are intended to target infection foci that have expanded to form a disease center which expands at an average radial rate of 1 ft. per year. The centers are variable in size, already understocked and open containing dead standing trees, windthrown trees, and occasionally unaffected escapes. The centers eventually fill in with hardwoods, shrubs, and resistant conifers. Symptomatic trees will occur around the margins of these centers and exhibit various stages of decline. Susceptible conifers (white fir and Douglas-fir) may regenerate and occupy the newly available growing space in the centers, but will probably contact inoculum and die at an early age, thereby perpetuating the cycle of mortality and keeping the source inoculum alive. Laminated root rot will not spread into dead tree roots, however, the pathogen can live saprophytically remaining viable and infective in dead roots for 50 years or more after its host has died.

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

e. Forest Insects

Forest insects shape stand structure and forest development patterns by creating openings of various sizes, allowing light to reach the forest floor and triggering the understory reinitiation stage. Most conifers have an associated bark beetle that is capable of killing the tree under the right conditions (The Southwest Oregon Forest Insect and Disease Service Center). The bark beetles successfully colonize live trees when their host is under some form of physiological stress. Dolph (1985) found that bark beetle attack occurred in unmanaged stands when trees grew a slow 20 or more annual rings per inch (less than or equal to one inch diameter growth per decade). Entomologists and silviculturists have found that at least 1.5 inches of tree diameter growth per decade decreases the risk of bark beetle attack (Cochran, 1992; Chadwick and Eglitis, 2007; USDA, 1998).

Pine bark beetles are initially attracted to pines that are under stress. Once a stressed tree has been successfully invaded, pheromones emitted by invading beetles attract additional beetles to the same tree, overpowering its defenses. A vigorous tree is able to eject invading beetles with its pitch; a tree under stress has a reduced capability of responding to the invasion. As a general rule, stands where growth rates are greater than or equal to 1.5 inches of diameter growth per decade or with less than 150 square feet of basal area[2] per acre are less prone to pine bark beetle attack.

Western pine beetle (*Dendroctonus brevicomis)* are attacking ponderosa pine in the analysis area. According to DeMars and Roettgering (1982), western pine beetles "breed in and kill scattered, overmature, slow-growing, decadent, or diseased trees and trees weakened by stand stagnation, lightning, fire, or mechanical injury." The beetles can aggressively attack and kill ponderosa pine of all ages and vigor classes, including vigorous host trees from 6 inches in diameter and larger. Group mortality can occur in dense overstocked stands or in dense pockets within a stand. Extensive mortality adversely affects distribution of trees and stocking level, depletes timber supplies, and increases fuel loading which can lead to catastrophic fires. DeMars and Roettgering describe tree resistance as one of the biotic conditions affecting outbreaks and beetle caused mortality. Vigorous trees produce sufficient oleoresins to expel beetles from their boring chambers inhibiting larval and fungal development. They suggest that prevention is the preferred method of control. "By maintaining thrifty, vigorous trees or stands that do not afford a suitable food supply for the beetle", land managers can prevent susceptibility of hosts to insect damage. The susceptibility of trees to damage by bark beetles can be mitigated by stocking control which is tied closely together with tree vigor (Larson, et al., 1983). Stocking control increases growing space, water and nutrient availability, sunlight penetration, and photosynthesis rates. Altogether, site disturbance such as fire and thinning improves tree vigor. Trees with vigor ratings above 70 can emit sufficient oleoresins to repel invading beetles and survive even relatively heavy insect attacks.

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

Beetle infestations are occurring in the analysis area and causing mortality in small pockets. Although there is not a current widespread beetle infestation, treatments are designed to improve the vigor of trees to withstand potential outbreaks. Treatments primarily bring the vigor of ponderosa pine to a level where they can withstand attacks of any intensity in order to ensure the survival and perpetuation of pine in the analysis area. DeMars and Roettgering (1982) recommend that "reducing stand stocking to 55 to 70 percent of the basal area needed for full site utilization will relieve the competitive stress among the remaining trees, improve their vigor, and make them less prone to successful bark beetle attack."

f. Tree Vigor

Waring and others (1980) developed a vigor rating using a physiological index of growth efficiency. The Waring Tree Vigor Index is a measure of health defined as the ratio of annual growth of stemwood to the area of leaves present to capture sunlight (Waring, et al., 1980). The vigor ratings can be accurately applied to individual trees and are comparable among conifers (Larsson, et al., 1983; Waring 2007). Vigorous trees have higher levels of productivity and increased incremental growth. Trees with high ratios of live crown will have more photosynthetic surface area and thus more photosynthetic capacity, subsequently increasing carbohydrate production for storage, seed production, and stem wood growth. Vigorous trees can also fight off beetle attacks with greater success. Waring and Pitman (1980) concluded that trees attacked and killed by bark beetles had such low carbohydrate reserves that they lacked the ability to produce sufficient oleoresins which protect the tree against beetles.

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

For all inventory stands, sample cores were taken from 272 trees representing all vegetation condition classes, major conifer species, and plant association groups across the analysis area. Each core was measured to determine individual tree age and growth rates. Individual tree vigor of Douglas-fir and ponderosa pine were also determined from these measurements. Vigor ratings were derived using the Waring Tree Vigor Index and growth rates were tabulated by decade. Figure 3-2 illustrates the 10-year growth rate of all 272 sample trees, combining Douglas-fir, white fir, and ponderosa pine, spanning a period from the year 1790 to 2010.

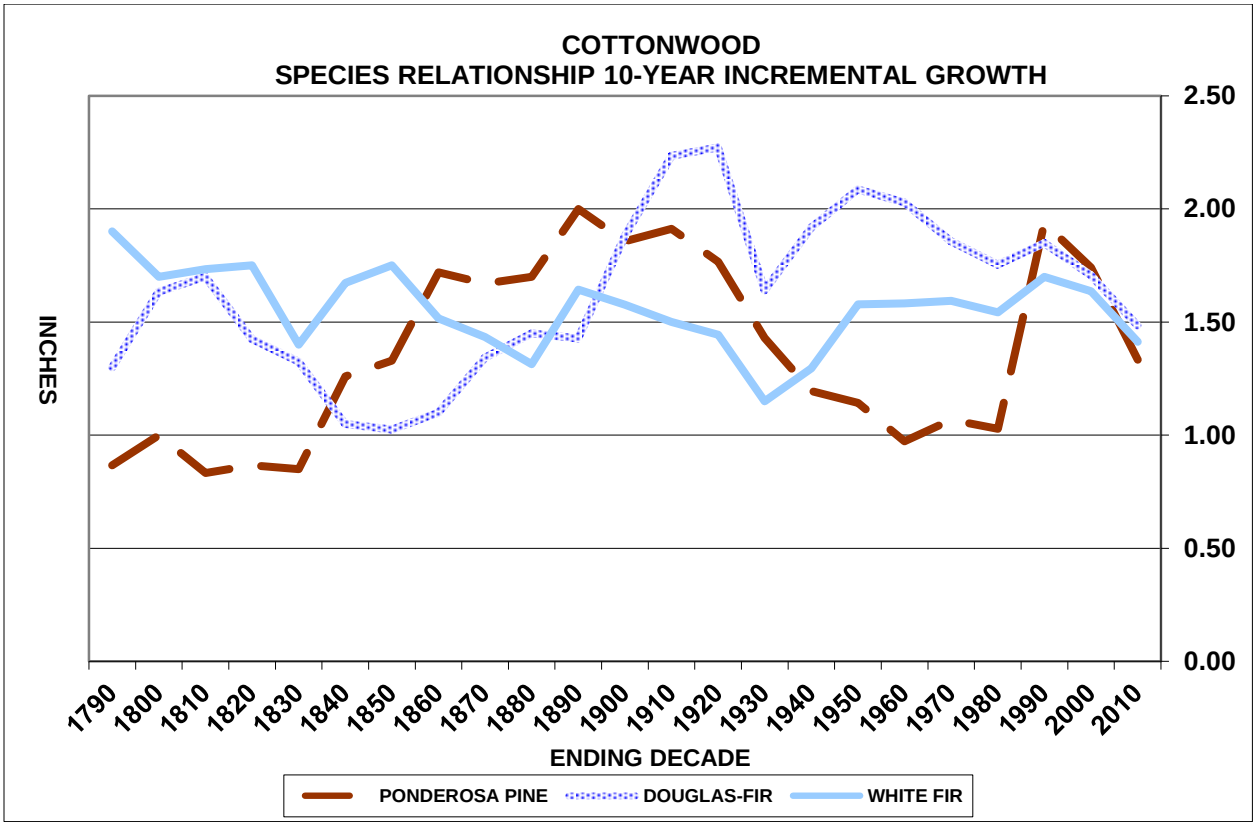
Pine species in the analysis area are becoming scarce. Stands in the analysis area that were identified as Pine and Douglas-fir plant associations, where pine are naturally encountered, shade tolerant species are encroaching and successfully competing against the pine for soil nutrients, water, and growing space. White fir and Douglas-fir continually advance into the shaded forest floor, occupying the growing space in the understory, and excluding the shade intolerant pine from naturally regenerating. Pine species currently exhibit poor vigor and their individual tree growth rates are declining.

The current average relative density index for ponderosa pine stands is 0.713. At this density, pine stands exhibit reduced growth, crown decline, and competition-induced mortality. Core measurements were taken from 27 ponderosa pine sample trees representing all vegetation condition classes. The current average ponderosa pine tree vigor rating is 20.45 g of annual wood production per square meter of foliage. The 10-year incremental growth data for ponderosa pine reveals a current rate of 1.33 inches per decade (Figure 3-2). The data indicates that, based on Waring's vigor rating indices, last decade's growth rate, and relative density indices, ponderosa pine survival in the analysis area is threatened. Ponderosa pine species in the analysis area are growing at a rate that leaves them prone to and at increased risk of bark beetle attack. Regarding tree vigor in general, a vigor index of 20.45 grams of stem growth per meter squared per year ($g/m^2/yr$) is very low.

Douglas-fir tree core samples were taken from 119 trees representing all vegetation condition classes in the Douglas-fir Series and all plant association groups. The average tree vigor index, as measured by leaf area index (g of annual wood production per square meter of foliage) is 62.03 for Douglas-fir (compared to 20.45for ponderosa pine) and the average growth last decade was 1.49 inches. Trees with vigor from 30-70 can withstand progressively higher attacks but are still in danger of mortality from infestation (Christiansen et al., 1987; Waring& Pitman, 1985). Based on Waring's vigor rating index, the data indicates that Douglas-fir in the analysis area can withstand progressively higher attacks but are still in danger of mortality from infestation. In addition, the 10-year diameter growth of 1.49 average inches in the last decade indicates that Douglas-fir is predisposed to bark beetle attack. White fir tree core samples were taken from 126 trees representing all vegetation condition classes in the White Fir Series and all plant association groups. The 10-year incremental growth data for white fir reveals a current rate of 1.41 inches per decade (Figure 3-2).

In the last decade the average diameter growth in the Cottonwood analysis area for all combined species was 1.41 inches/decade. As a general rule, stands with growth rates equal to or greater than 1.5 inches of diameter growth per decade are less prone to bark beetle attack (USDA 1998). This growth rate falls short of the 1.5 inches of diameter growth per decade required to withstand bark beetle attack. In addition, the growth trend over the last 20 years for all sampled species exhibits a declining curve (Figure 3-2). Since 1990, all three species (Douglas-fir, ponderosa pine, and white fir) in the analysis area have been declining. If all influencing variables, that is, temperature, precipitation, soils, elevation, and densities, remain constant or worsen in terms of optimal forest productivity, diameter growth within the Analysis Area will continue to decline.

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



g. Coarse Woody Material

Measurements of coarse woody material for sampled stands in the Cottonwood analysis area totaled 12,400 feet of transect line. The average amount of coarse woody material (CWM) equaled 16.1 tons per acre. CWM ranged from 3.8 to 38.9 tons per acre. The coarse woody material stems were mostly concentrated in the 12-15 inch classes at the large end, although some sites contained pieces between 47+ inches large end diameter. The average total length per acre equaled 1,442 feet. Coarse woody material was distributed across all decay classes, although decomposition classes 3 (twigs and branches gone but bole is still round, hard and in large pieces) and 4 (losing form) were most common.

2. Environmental Consequences

a. Alternative 1

Alternative 1 (No-Action) would allow forest stands to remain at the overall average of 0.60 relative density index, allowing density dependent mortality to occur and leaving forested stands more susceptible to insect and disease agents. Stand densities would continue on their current trajectory of stand development and remain overpopulated. A relative density index rating of 0.55 for any given stand marks the point of imminent mortality and suppression (Drew and Flewelling, 1979). The current average relative density for the area indicates that physiologically the trees have entered the zone of imminent suppression and mortality. No action would allow forest stands to remain overstocked and individual tree vigor and growth would remain poor. Tree mortality represents a reduction in stand volume production, a loss of revenue, and poor forest health.

No action would allow Armillaria (*Armillaria ostoyae*) and laminated root disease (*Phellinus weirii*) to persist on sites currently infected. Douglas-fir dwarf mistletoe and cases of true fir dwarf mistletoe, found primarily in the southern portion of the analysis area, would also persist and perpetuate the infection cycle on sites currently infected. These forest pathogens create openings of varied sizes allowing light to reach the forest floor and the understory reinitiation stage to begin. However, in the analysis area, disease-susceptible trees continue to recolonize these sites. The regeneration becomes infected and their likelihood of attaining large sizes will be low. The pathogen will survive on the site unless immune species occupy the gaps. No action would allow the unchecked spread of disease to continue on these sites.

Without action, forest structure and species composition could not be managed to meet the desired forest stand characteristics suitable for nesting, roosting, foraging, and dispersal habitat components within spotted owl habitat (see Chapter 1). On mixed conifer sites, white fir and Douglas-fir would remain the most prevalent species and stands would remain in the stem exclusion stage of development if mortality does not occur. Pine species that are found in mixed conifer stands in the analysis area are being crowded out by fir species. Out of all 27 ponderosa pine sampled, the current average ponderosa pine tree vigor rating is 20.45 grams of annual wood production per square meter of foliage. Trees with vigor ratings below 30 ($g/m^2/yr$) would succumb to attack from bark beetles of relatively low intensity (Christiansen et al., 1987; Waring and Pitman, 1985). The 10-year incremental growth data for ponderosa pine reveals a current rate of 1.33 inches per decade. 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). The current average relative density index for ponderosa pine stands is 0.713. Relative density indices between 0.55 and 1.00, bounds the zone of imminent competition-mortality (Drew and Flewelling, 1979). The data indicates that, based on Waring's vigor rating indices, last decade's growth rate, and relative density indices, pine survival in the analysis area is threatened.

Because white fir is growing on sites better suited to early seral species (ponderosa pine, oaks), the more shade tolerant species (Douglas-fir) exhibit poor vigor and demand more moisture than the site can deliver, becoming easily stressed and succumbing to density mortality or beetle kill. The average vigor rating index for Douglas-fir was 62.03 indicating that Douglas-fir are in danger of mortality from a beetle attack.

A relative density index of 0.705 in mixed conifer stands further indicates that Douglas-fir and white fir trees are competing for growing space and, rating above 0.55, are within the zone of competition induced mortality.

Without management action, individual trees including old-growth ponderosa pine, old-growth sugar pine, and old-growth Douglas-fir trees, with seedlings through poles within their dripline, would continue to die from competition for resources. Thinning would bring stands out of the stem exclusion or closed-canopy stage and accelerate the development of conditions found in late seral forests (Hayes, et al., 1997). Trees should develop large crowns, large diameter limbs, and deep fissures in the bark. Maguire, et al. (1991) found that large branches develop only on widely spaced trees or on trees adjacent to gaps or openings. Deep fissures in the bark are characteristic of large diameter Douglas-fir trees in old growth stands.

Shade intolerant pine and oak species would continue to decline in number from competition with encroaching shade tolerant white fir. 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 root diseases, lightning, wind-throw, and insects. This is ecologically significant in that resources previously used by the dead tree are reallocated to the surviving vegetation. These small diameter trees, instead of dying out, would continue developing into a dense unhealthy forest structure prone to a perpetual cycle of root disease infection, catastrophic fire, and eventual dieback from intense competition.

The accumulation of insect and disease infected trees and relative densities present a high fuel hazard across the landscape. The Medford District RMP describes the Forest Condition (Forest Health) Restoration Objective that requires management emphasis on treatments and harvests that restore stand condition and ecosystem productivity. It directs management actions to include density management and understory reduction operations that reduce competition, increased use of understory prescribed fire, and fertilization (USDI 1995). No action contradicts the Medford District Resource Management Plan forest condition objectives in regard to forest health.

Disease and fire suppression primarily have altered forest stand densities and species composition in the analysis area. Without any form of density control, including the crown bulk density of older stands that contribute to stand replacing fires, slow tree growth and poor vigor would result in individual tree and stand mortality. A decrease in stand vigor is expected with continued overstocking and increasing stand age. In regard to species and biological diversity, forested stands in the analysis area have become predisposed to stand replacing fires and insect and disease mortality. When left undisturbed, stands continue to grow and produce new seedlings, although in unhealthy and dense conditions. White fir, a shade tolerant species continues to occupy densely populated and shaded stand conditions, even stands that historically had far less numbers of white fir. The increase of white fir in the analysis area, especially in the mixed conifer zone, coincides with the amount of fire cycles missed in these stands.

Wildfires have functioned as a natural tool for thinning out the understories and removing dense pockets of forest. Without this tool, white fir has seen a sharp increase in numbers. Without the cleansing effect of fire to densities of white fir seedlings, insects and pathogens associated with white fir are consequently perpetuating on infected stands and spreading into previously uninfected stands. Growing conditions become so stagnant (at or above stand density index of 0.55) that intense competition follows and the stand begins excluding the weakest trees. During competition trees commit their energy sources for survival above their competing neighbors. This exhaustive effort predisposes a tree to damage or mortality by incoming insects and diseases. In severe cases, entire stands are completely decimated by insects, disease and/or fire.

Future silvicultural options diminish when severe stand mortality results. Sugar pine and ponderosa pine species would continue to decrease in number if openings are not created for these shade intolerant species. Shade tolerant white fir would continue to persist at high numbers in mixed conifer stands and species diversity would decline. Where dense forest stands persist overtime, canopy cover would remain at 61 to 100 percent. When tree mortality is singular or in small patches, canopy cover may approach 40 to 70 percent. In pockets of mortality, canopy cover would range from 0 to 40 percent. Without controlling the relative densities, some forest stands would naturally fall below 60 percent canopy cover. Fire hazard would increase with the abundance of dead vegetation and ladder fuels, and would be at maximum levels.

b. Alternative 2

The proposed prescriptions for this alternative are based upon the current vegetation structure, species composition, aspect, and vegetation condition class. Through forest stand treatments, tree densities would be reduced, thus, allowing for improved individual tree vigor and growth, and improved forest health. The silvicultural objectives for harvest are as follows: 1) Reduce stand density to increase tree growth, quality, and vigor of the remaining trees while maintaining existing owl habitat; 2) Create diversified stand structure (height, age, and diameter classes) and old-growth stand characteristics; 3) Increase growing space and decrease competition for large or legacy pine, oak, and cedar. (preserve existing genotypes which are physiologically better adapted to fire disturbance). The various prescriptions meet the specifications of restoration thinning and density management as outlined in the Medford District Resource Management Plan.

Trees would be marked for thinning within proposed treatment units by BLM personnel, with oversight from the Ashland Resource Area's silviculturist and wildlife biologist, to ensure that treatment units are marked according to the silvicultural prescriptions.

Northern Spotted Owl Nesting, Roosting, Foraging Habitat (NRF)

Forest stands that are currently providing for northern spotted owl nesting, roosting, and foraging habitat would be thinned to maintain and in some cases promote NRF habitat function. The complex forest structure that forms NRF habitat consists of dead down wood, snags, dense canopy, multi-storied stands, or mid-canopy habitat. However, southwest Oregon NRF habitat varies greatly and one or more of these habitat components might be lacking or even absent. Vegetative features of NRF habitat in southwest Oregon are typified by mixed-conifer habitat, recurrent fire history, and patchy habitat components. The silvicultural strategy here includes the use of selective thinning.

Selective thinning in NRF habitat is designed to accelerate the growth of large trees while maintaining a minimum of 60 percent canopy cover at the stand level. Canopy cover is the proportion of the forest floor covered by the vertical projection of tree crowns. Canopy cover is usually estimated with devices like the moosehorn, aerial photography, or remote imagery. Spacing of the residual (leave) trees would involve crown spacing off the healthiest dominant and co-dominant trees to achieve an average crown spacing range of 1-6 ft. (dripline to dripline) at the stand level. Trees targeted for removal should include those with crown ratios less than 30%, exhibit crown decline, narrow crown widths, and contribute least to the canopy layer. Trees would be individually selected for removal that demonstrate these characteristics, unless it compromises the required minimum canopy cover of 60%. Spacing of the residual trees would use the crown widths of the healthiest dominant and co-dominant trees to achieve an average relative density range of 0.35 to 0.55 (35 to 55%).

Northern Spotted Owl Dispersal Habitat (DSP)

Forest stands that are currently providing for northern spotted owl dispersal only habitat would be thinned to retain approximately 40 percent canopy cover to maintain the current distribution of dispersal habitat. Dispersal habitat is described as forested habitat greater than 40 years old with an average tree diameter of 11 inches, a canopy cover of about 40 percent or more, and flying space for owls in the understory.

Stands in DSP habitat that meet the above criteria would be selectively thinned to accelerate the growth of large trees while maintaining approximately 40 percent canopy cover at the stand level. Spacing of the residual (leave) trees would involve crown spacing off the healthiest dominant and co-dominant trees to achieve an average crown spacing range of 3-15 ft. (dripline to dripline)at the stand level. Trees targeted for removal should include those with crown ratios less than 30%, exhibit crown decline, narrow crown widths, and contribute least to the canopy layer. Trees would be individually selected for removal that demonstrate these characteristics, unless it compromises the required minimum canopy cover of 40%. Spacing of the residual trees would use the crown widths of the healthiest dominant and co-dominant trees to achieve an average relative density range of 0.25 to 0.45 (25 to 45%).

Mixed Conifer Stands

These stands are comprised of a mix of tree species including Douglas fir, ponderosa pine, sugar pine, incense cedar, and white fir. Thinning objectives for mixed conifer stands are to improve tree vigor and growth, maintain a larger proportion of Douglas-fir species while maintaining the highest diversity of mixed conifer species for the stand. Species composition of the forest must be considered as well as individual tree physiology. A minimum of 20 percent early seral species should be maintained in the mixed conifer forest stands as described by Franklin and Dyrness (1973). Therefore, selection of treatment trees would be based on 1) species; 2) tree dominance; 3) age class or diameter; and 4) individual tree characteristics. Suitable sugar pine, Douglas-fir, incense cedar, and ponderosa pine (disease free, non-chlorotic, sugar pine, Douglas-fir, incense cedar, and ponderosa pine with crown ratios ≥ 30%) would be favored for leave over white fir. Leave 100-140 sq. ft. BA/AC in DSP habitat and 160-200 sq. ft. BA/AC in NRF habitat at the stand level.

White Fir Stands

Stand density retention is relatively higher for white fir stands for several reasons: 1) To prevent frost damage to conifer regeneration; 2) To avoid basal scarring to residual white fir due to frost cracks; 3) To decrease the likelihood of gopher damage. Avoid mechanical damage to white fir crop trees. The most susceptible trees occur after mechanical or fire injury. Consider potential tree wounding from mechanical damage from logging when selecting a leave tree, especially white fir (thin bark) leave trees. Strategically mark trees to limit basal scarring during commercial entry. Leave 120-160 sq. ft. BA/AC in DSP habitat and 160-200 sq. ft. BA/AC in NRF habitat at the stand level.

Stands with Disease Detection

The silviculture objectives for stands that are currently infected with root disease are to minimize the spread of the root rot into uninfected areas, regenerate the moderate and severe root rot centers with resistant species, and protect the integrity of the remaining stand from wind damage. Stands that exhibit root disease infection would be selectively treated, leaving all resistant species and trees with old-growth characteristics, and cutting infected and susceptible tree species without compromising the canopy cover prescribed at the stand level. In Armillaria root disease areas the prescription calls for a removal of the most infected and susceptible trees species (white fir). In laminated root disease areas the prescription calls for an additional removal of all susceptible trees (white fir and Douglas-fir) 50 feet beyond the last visibly infected/symptomatic tree/stump (Hadfield and Johnson, 1977; Nelson et al., 1981, Hadfield et al., 1986). According to Hadfield et al. (1986) "many susceptible trees within 50 feet of the apparent edge of a disease center have a high probability of being infected even though they do not show crown symptoms". Whenever a large infected area borders an uninfected stand with no root disease, 50 feet of true fir and Douglas-fir trees would be removed from the last visibly symptomatic tree or visible edge of disease center. All pine, cedar, and other non-susceptible species within this buffer strip would remain. Trees with old-growth characteristics and large crowns should be left when possible for structural diversity and to maintain canopy cover. The stand matrix outside the infection centers would be thinned to prescription, removing highly infected and susceptible tree species.

The silviculture objectives for stands that are currently infected with mistletoe disease are to minimize the spread of the parasite into uninfected susceptible host trees and protect adjacent stands from infection. Stands that exhibit mistletoe disease would be selectively treated, leaving all resistant species and trees with old-growth characteristics, and cutting the most severely infected tree without compromising the canopy cover prescribed at the stand level.

Effects of Management on Stand Growth and Vigor

Stands were modeled in a growth and yield modeling system called ORGANON (Hann, 1992). Developed at Oregon State University, College of Forestry, the model predicts forest growth outputs based on scientific formulas programmed into it. The Southwest Oregon variant was used to model stands in the Cottonwood analysis area. Results of predicted outputs can be viewed in Table 3-15. Similar stands of each vegetation type were studied to develop the prescriptions. Currently, the relative densities of stands throughout the analysis area are high. This is primarily due to the lack of large-scale natural disturbance, fire suppression, and lack of silvicultural treatments. Table 3-16 shows the growth of mid-size conifer stands (11 to 21 inches DBH) and mature conifer stands (21+ inches DBH) with and without management intervention.

Table 3-15. ORGANON Modeled Stands; Thinned vs. Un-thinned and 20 Year Growth

STAND# MID SERAL/ MATURE	STAND AGE	CURRENT BA/AC (FT^2)	CURRENT TREES PER ACRE	CURRENT RDI	PROJECTED RDI AFTER INITIAL HARVEST	PROJECTED RDI IN 20 YEARS UNTHINNED	PROJECTED RDI IN 20 YEARS THINNED
MID							
124920✠**	98	200	540	0.793	0.457	0.818	0.569
121273✠**	129	207	420	0.632	0.392	0.691	0.442
124650✠‡	110	208	302	0.597	0.288	0.622	0.322
124649✠+	133	231	187	0.481	0.330	0.534	0.373
129062⌖‡	109	280	366	0.906	0.534	0.931	0.621
121280⌖‡	140	195	97	0.522	0.424	0.517	0.498
120671⌖‡	102	217	537	0.795	0.436	0.875	0.535
MATURE							
129058✠+	120	203	146	0.412	0.255	0.502	0.311
121216✠+	150	176	303	0.424	0.264	0.520	0.322
124433⌖+	126	236	524	0.600	0.386	0.694	0.489
121221⌖+	151	210	255	0.562	0.506	0.572	0.535
123995⌖+	149	211	135	0.483	0.423	0.577	0.511

⌖ NRF PRESCRIPTION
✠ DISPERSAL PRESCRIPTION
‡ DF PAG (MIXED CONIFER SITE)
** PP PAG (PINE SITE)
+ WFPAG (WHITE FIR SITE)

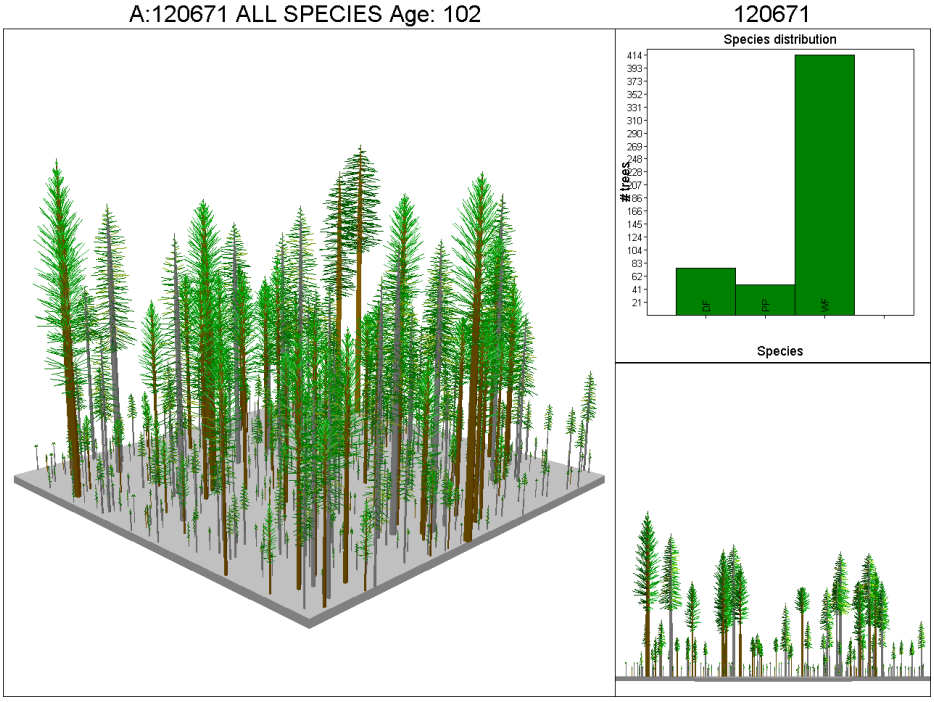
Table 3-16 displays the difference between no action and a treatment that maintains on average 60% canopy cover. No action exhibits tree loss through competition mortality versus trees removed and utilized through timber harvesting under a science-based silvicultural prescription.

Table 3-16. Description of Stand120671 With and Without Treatment of Maintain NRF Habitat

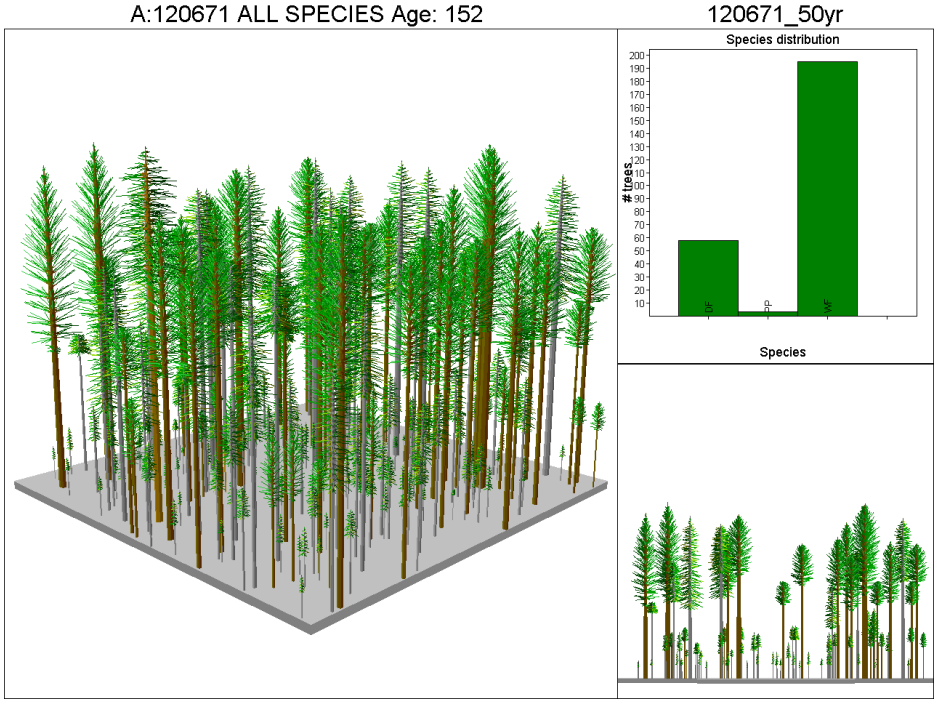
Existing Stand: 120671 (Mid Seral Stand)												
Stand Age	Trees Per Acre	Basal Area	Relative Density Index	Canopy Cover	Quadratic Mean Diameter	Mean Live Crown Ratio						
102	537	217	.795	99.5	8.6	.411						
Growth of Stand if Not Treated (note the decline in trees / acre from natural mortality							Growth of Stand if Thinned to Maintain 60% Canopy Cover					
Stand Age	TPA	BA	RDI	Canopy Cover	QMD	Mean Live Crown Ratio	TPA	BA	RDI	Canopy Cover	QMD	Mean Live Crown Ratio
112	440	245	.843	100	10.1	.415	122	168	.483	83	15.9	.547
122	371	267	.875	100	11.5	.414	117	192	.535	100	17.4	.518
132	321	286	.898	100	12.8	.407	110	215	.579	100	18.9	.482
142	283	302	.914	100	14.0	.399	103	236	.615	100	20.5	.457
152	253	316	.927	100	15.1	.390	95	255	.644	100	22.1	.439

The Stand Visualization System (SVS) illustrates the prescriptions to portray what existing forest stands look like today and after application of the proposed prescriptions (USDA and University of Washington, 1995). ORGANON plot data was input into the SVS program for the simulations. The following images represent the current and projected post-harvest condition of Stand 120671 (Figure 3-3).

Figure 3-3. Cottonwood Stand 120671

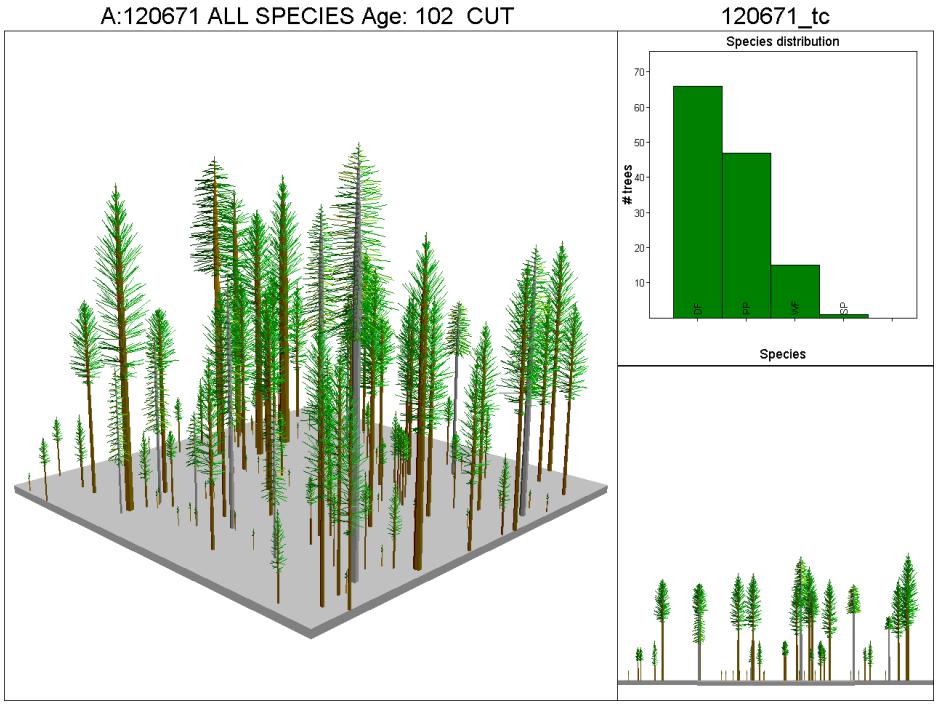


(a): Original Stand Condition

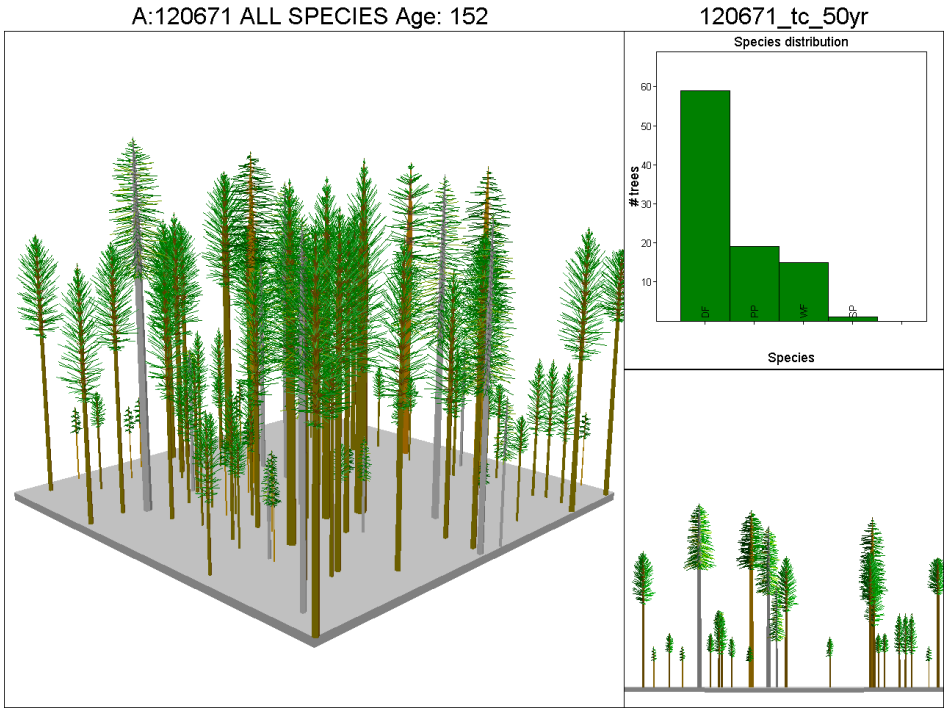


(b): 50-Year Untreated Stand Condition

Figure 3-3. (cont.) Cottonwood Stand 120671



(c): Post-Harvest Stand Condition



(d): 50-Year Post Harvest Stand Condition

Table 3-17 displays the difference between no action and a treatment that maintains on average 40% canopy cover, and compares the difference between the treated and untreated condition of stand 124650.

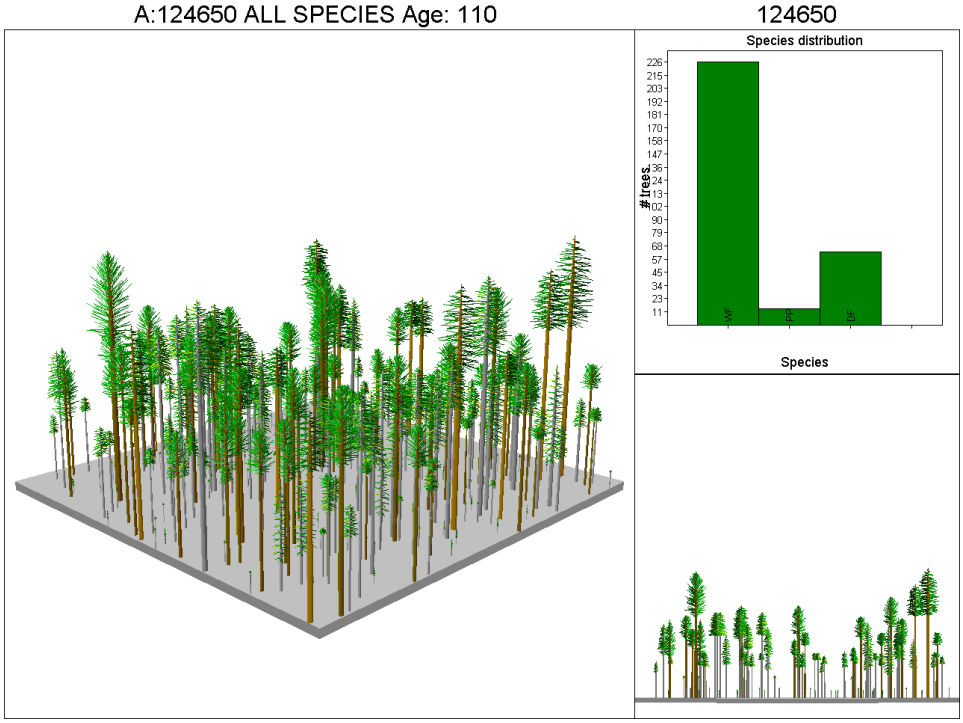
Table 3-17. Description of Stand 124650 With and Without Treatment of Maintain DSP Habitat

Existing Stand: 124650 (Mid Seral Stand)												
Stand Age	Trees Per Acre	Basal Area	Relative Density Index	Canopy Cover	Quadratic Mean Diameter		Mean Live Crown Ratio					
110	302	208	.597	80	11.2		.321					
Growth of Stand if Not Treated (note the decline in trees / acre from natural mortality							Growth of Stand if Thinned to Maintain 40% Canopy Cover					
Stand Age	TPA	BA	RDI	Canopy Cover	QMD	Mean Live Crown Ratio	TPA	BA	RDI	Canopy Cover	QMD	Mean Live Crown Ratio
120	265	219	.607	100	12.3	.343	50	129	.303	55	21.8	.397
130	240	231	.622	100	13.3	.344	49	139	.322	70	22.9	.424
140	222	243	.638	100	14.2	.343	48	151	.343	82	24.0	.431
150	208	255	.654	100	15.0	.340	47	163	.364	87	25.1	.429
160	196	266	.669	100	15.8	.335	47	175	.384	91	26.2	.423

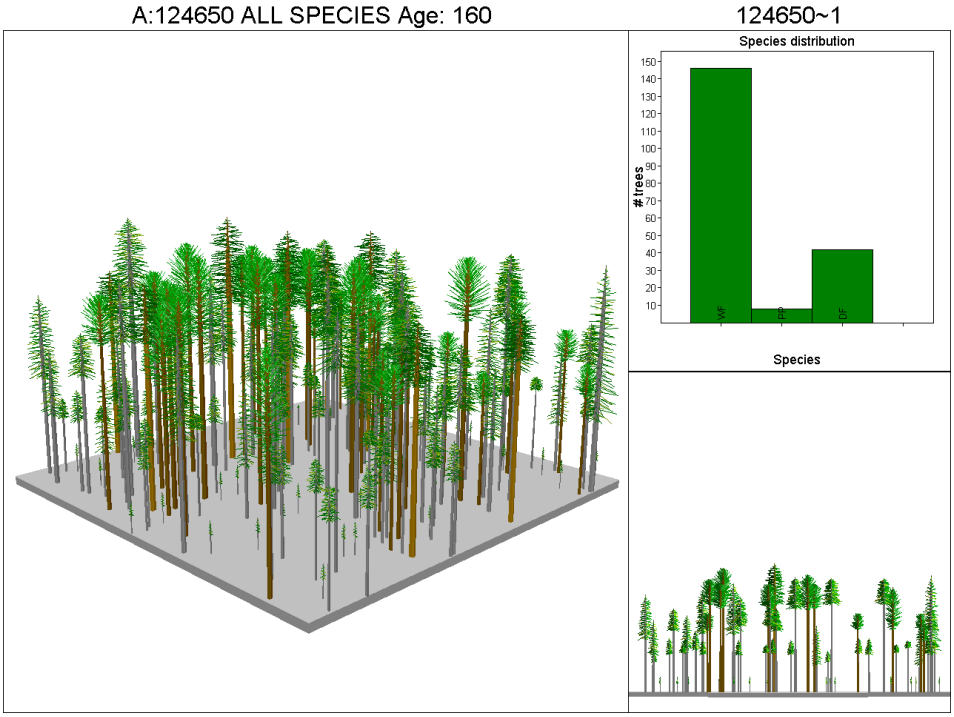
The original stand exhibited a RDI of 0.597 (a RDI from 0.55 to 1.00 bounds the zone of imminent mortality and suppression) a RDI of 0.550 marks the threshold for competition mortality. The untreated stand, 50 years later, projects a reduction in trees per acre each decade resulting from competition induced mortality. Each decade compounds the competition as a result of uncontrolled densities. However, in comparison, the fewer numbers of trees lost per acre per decade occurs in the treated stand due to a prescription that lowers the RDI from 0.597 to 0.288. After 50 years, the untreated stand holds 196 TPA at a stand RDI of 0.669. In contrast, the 50 year treated stand holds 47 trees per acre at a stand RDI of 0.384 (still below the threshold of 0.550; anything at 0.55 and greater results in mortality from competition between trees for limited resources). The model also projects a dramatic increase in mean live crown ratio and quadratic mean diameter when a treatment is applied.

Figure 3-4 illustrates the pre and post-harvest stand conditions of a mixed conifer stand in the Douglas-fir plant series (Stand 124650, T39S-R03E-Sec.04). Currently, the stand has 302 TPA, a relative density index of 0.597, a mean live crown ratio of 0.321 percent, and a species composition of 74% white fir, 22% Douglas-fir, and 4% ponderosa pine (Figure 3-4(a)). The stand immediately after harvest produces an outcome that lowers the RDI to 0.346. Immediately following harvest the stand exhibits a projected 51 TPA with a basal area of 120 ft^2 per acre. The species composition after harvest projects 47% Douglas-fir, 31% white fir, and 22% ponderosa pine (Figure 3-4(c)). Openings created from thinning would allow suitable growing conditions for shade intolerant oak and pine species to regenerate, thereby increasing species diversity within the stand. The proposed treatment would shift the species dominance from white fir to once again Douglas-fir in this mixed conifer stand.

Figure 3-4. Cottonwood Stand 124650

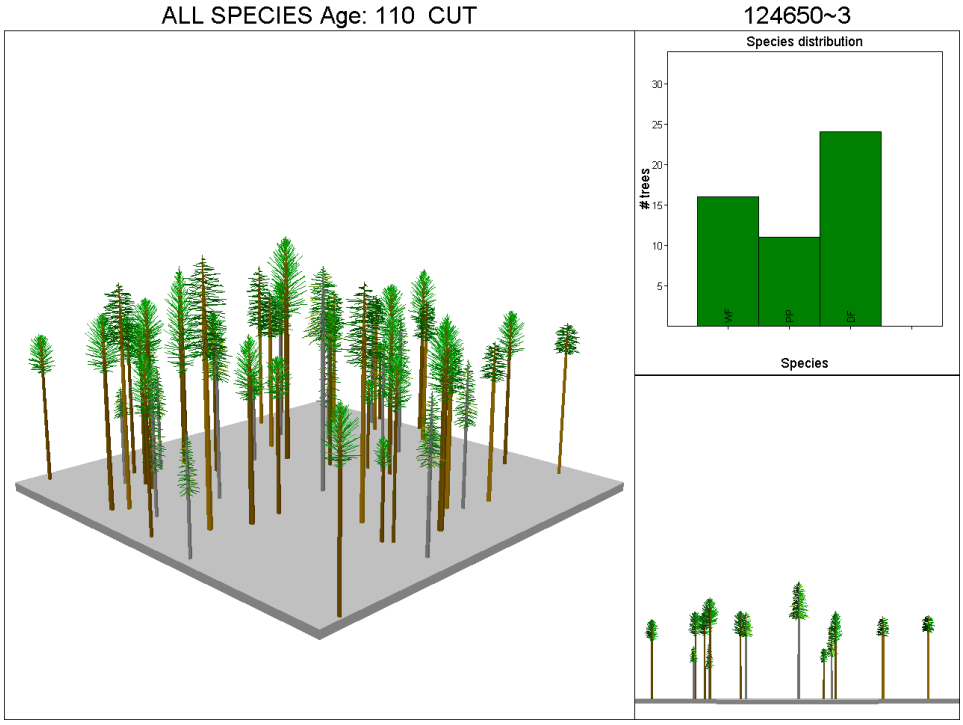


(a): Original Stand Condition

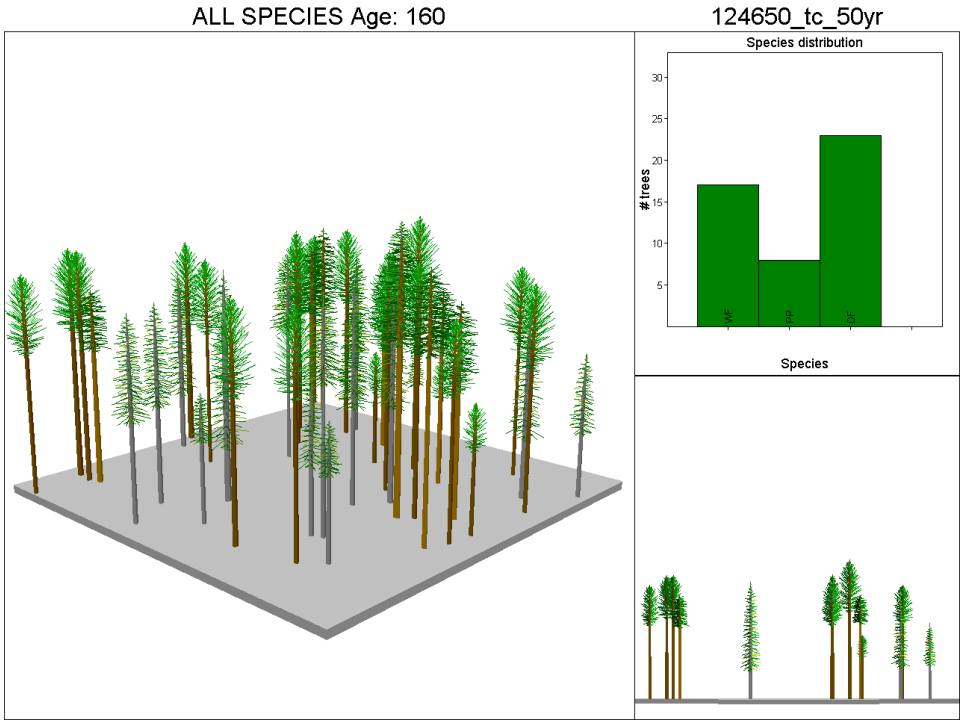


(b): 50-Year Untreated Stand Condition

Figure 3-4. (cont.) Cottonwood Stand 124650



(c): Post-Harvest Stand Condition



(d): 50-Year Post Harvest Stand Condition

This alternative includes 1,108 acres of various levels of commercial harvest, representing 20% of the BLM lands in the analysis area. Under this alternative only 25% of the forest land base in the analysis area is proposed for commercial treatment. This amount constitutes 11% of the land base in the planning area (4,336 acres of forest land in the analysis area are not being treated commercially). A total of 2,001 acres of Riparian Reserves, owl cores, and other reserves for plants and animals in the analysis area would not be treated.

Further, a mix of hardwoods, grasses, forbs, shrubs and conifers would remain on the landscape providing future organics and soil nutrients. Retaining a mix of species across the landscape and residual duff or organic layers provides for current and future productivity. Since these key components of ecosystem productivity are retained there are no expected decreases in forest productivity.

All thinning activities would increase individual tree vigor, reducing the potential for insect populations to build up and forest disease to spread to adjacent lands. Through recovery of past harvest units and management activities emphasizing thinning to increase growth rates, there would continue to be an increase in mature stand structure at both the watershed scale and project level. Additionally, minimizing the spread of insects and disease to adjacent lands would reduce cumulative effects of insects and disease. These effects would be beneficial to forest stands, rather than detrimental.

The cumulative effects of 1,108 acres of prescribed fire (approximately 11% of the planning area) would provide for future stand development, restore key ecosystem structures (diversity) and processes (fire) and in combination with the commercial treatments proposed, reduce the likelihood for a fire start on BLM land to spread to adjacent lands. Since this alternative proposes the highest level of treatment, it would result in the highest level of individual tree release. This would reduce white fir regeneration in mixed conifer stands and benefit early successional species such as pines and oaks, which are currently in decline. As growth and regeneration advance, the effects of treatments would be less apparent.

Within the areas proposed for commercial treatment the effects of the treatments would vary depending upon the site characteristics. This proposed action has two components, an initial thinning followed by underburning. The level of removal would be guided by species, individual tree vigor and site indicators of soil moisture/nutrients. In the initial thinning, trees showing signs of stress, in direct competition with vigorous pine, oak and cedars, or determined to be in excess of density targets would be removed. Since canopy cover targets are highly variable (40% CC for dispersal stands and 60%CC for nesting, roosting, and foraging stands), the resultant structure and species mix would be highly variable. In order to maintain this structure into perpetuity, prescribed fires in the understory, which mimics the natural disturbance of fire would be the only vegetation manipulation tool used in the future. The effects of prescribed fire and forest thinning are similar to those disclosed for the other harvest prescriptions.

Pre-commercial thinning treatments are proposed on 18 acres, representing <1% of the land base in the analysis area under this alternative. The total footprint of all non-commercial vegetation treatments in the analysis area for this alternative is 18 acres or <1% of the planning area. The excess, small diameter conifer trees less than 8 inches dbh would be cut from under the drip lines of old-growth trees to assure their survival. Elsewhere, the excess tree stems would be thinned to a desired stocking level to improve the growth and vigor of the remaining trees. Pre-commercial thinning would also help to accelerate the development of vertical stand structure and reduce hazardous ladder fuels. These treatments are designed to increase drought resistant conifer and hardwood species such as ponderosa pine, black oak and incense cedar. Maintaining these drought resistant species ensures the resiliencies of forest stands during cycles of drought.

c. Consideration of the 2005 Black Report

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

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

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

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

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

Dry Douglas fir stands (Douglas-fir/poison oak) and pine-oak stands historically, were shaped by frequent fire and because of fire suppression the number of Douglas-fir trees is far in excess of historical ranges (Brown, Agee et al., 2004; North, Chen et al., 2004). The proposed forest management project does not attempt to eradicate dwarf mistletoe from the landscape; rather it attempts to minimize it in specific areas so that the objectives of Matrix lands as defined by the Medford District Resource Management Plan can be attained. Management efforts are focused towards minimizing the impacts of Douglas-fir dwarf mistletoe by maximizing tree species diversity and by reducing canopy layering. Stands composed of mixed tree species of all size classes provide barriers that inhibit the horizontal and vertical spread of mistletoe. Ponderosa pine, sugar pine, incense cedar, white fir and hardwoods are not susceptible to Douglas-fir dwarf mistletoe. Suppressed and intermediate size classes of Douglas-fir are targeted for removal, reducing the canopy height structure and reducing the potential for the vertical spread of mistletoe.

With or without management activities, dwarf mistletoe will continue to be a stand and landscape feature on lands managed by the BLM. About 60-70 percent (approximately 550,000 to 600,000 acres) of BLM-administered lands on the Medford District are not proposed for timber management activities. Because the vast majority of BLM-administered lands are not allocated to intensive or restricted forest management, it is expected that Douglas-fir mistletoe would occur at natural rates and levels within those areas. On the remaining 30 to 40 percent of BLM-administered lands designated as Matrix to provide a sustainable supply of timber. The acres proposed in this forest management project are part of the planned annual timber harvest acres.

H. FIRE& FUELS

1. Affected Environment

The landscapes that comprise the project area evolved with frequent fires affecting the vegetation and other key components of the ecosystem. Since the establishment of Euro-settlement in this area human relations and interactions with these landscapes have affected many of the processes that had previously played a large part in the evolution of the site. Of these interactions one management decision that has affected one of the evolutionary processes has been that of fire exclusion.

Fire is recognized as a key natural disturbance process throughout Southwest Oregon (Atzet and Wheeler, 1982). Human-caused and lightning fires have been a source of disturbance to the landscape for thousands of years. Native Americans influenced vegetation patterns for over a thousand years by igniting fires to enhance values that were important to their culture (Pullen, 1996). Early settlers to this area used fire to improve grazing and farming (USDI 1995: 57).

Historically, frequent, low intensity fires maintained dry Douglas-fir and pine forest types in more open conditions than exist today (Agee, 1993). In these forest types, 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, but they likely affected a smaller proportion of the landscape in comparison to wildfire incidents experienced across the Pacific Northwest over the last two decades.

a. Fire Regimes

Climate and topography combine to create the fire regime found throughout the project area. Fire regime refers to the frequency, severity and extent of fires occurring in an area. The Cottonwood planning area is characterized by mixed-conifer, White fir, and pine forest types, and a history of anthropogenic fire use. 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). Historical fire regimes and the departure from them, correlates 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.

One historical fire regime, Fire Regime 3, is found within the analysis area (Schmidt et al., in press). Fire Regime 3 is characterized as Mixed Severity with an average fire return interval of less than 50 years. Typical plant communities include mixed conifer and dry Douglas-fir forests. Mixed-severity fire regimes are characterized by mosaics of frequent, low severity and infrequent but high severity, and therefore are more difficult to describe due to complexities that result in a mosaics of fire effects. Lower to moderate 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 (USDI 1995:27).

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.

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

The forest stands proposed for treatment, primarily mixed conifer stands (Fire Regime 3), are in Condition Classes 2 and 3. Stand densities are very dense in some areas due to the absence of fire or other disturbances. Other areas, such as the higher elevation white fir forests may be at near their historical range of conditions as they experienced more infrequent fire return intervals historically.

c. Past Actions and Events Affecting the Fire Environment

Past actions that have cumulatively contributed to the current wildfire behavior and potential include timber harvesting, fuels reduction, and fire suppression. Road building and land development (on private lands) have contributed to the current level of risk by expanding human influence further into the wildlands.

Fire Suppression

In the early 1900s, uncontrolled fires were considered to be detrimental to forests. Suppression of all fires became a major goal of land management agencies. In ecosystems that historically burned frequently, particularly the ponderosa pine and the dry mixed-conifer forest types found in the lower and mid elevation areas of the Medford District BLM (Sensenig, 2002; Huff and Agee, 2000), the exclusion of fire combined with periods of higher than normal precipitation has promoted increases in fuel quantity and changes in fuel continuity and arrangement.

As a result of the absence of fire, there has been a build-up of fuels and a change to more fire-prone vegetative conditions. This is particularly true for ponderosa pine, dry Douglas-fir, and mixed-conifer forest types. Trees facing more intense competition often become weakened and are highly susceptible to insect epidemics and tree pathogens. Increased tree mortality contributes to increased dead and down fuel loadings and increased fire behavior. The additional surface fuels provide for longer duration heat intensity (residence time), which in turn affects the severity with which the site burns, and the increased canopy closure along with the lower canopy heights allow for more scorching in the canopy and when environmental conditions are conducive to crown fire initiation and sustained crown fire runs. High intensity fires can damage soils and can impact riparian vegetation as well.

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

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

Logging

Selection harvesting likely started on the Plateau in the early 1900s. In the 1950s, harvesting became more intense removing overstory wood and leaving pole timber standing. Clearcutting started on the Plateau by 1958 and by 1963 it became apparent that clearcutting caused reforestation difficulties (frost and gophers) and this practice was gradually replaced by shelterwood harvesting (USDI, 1995: 32). Past harvest techniques such as clearcutting or overstory removal, resulted in stands of young, more flammable trees which has contributed to the current fire hazard ratings for the fire analysis area.

d. 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, developed campgrounds, dispersed camp sites, recreational use, and major travel corridors add to the risk component for the possibility of a fire occurring from human causes. The time frame most conducive for fires to occur in the project area is from July through September.

Information from the Oregon Department of Forestry database from 1960 to 2009 show a total of 103 fires occurred throughout the analysis area. Lightning accounted for 47 percent of the total fires and human caused fires accounted for 53%. Only 62% or 64 fires started on BLM managed lands. Lightning fires on BLM land accounted for 40 fires (62%). Of the total fires, 93 were less than 1 acre and 10 were less than 10 acres.

e. 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 and reflect the results of past human and natural disturbances. In general the existing fuel profile within the project area represents a moderate to high resistance to control under average climatic conditions. The following table summarizes the percent acres of BLM land in each fire hazard rating category for the entire project area. This data is from the Jackson County Fire Risk Analysis.

Table 3-18. Fire Hazard Rating Category for the Cottonwood Fire Analysis Area

Fire Hazard Rating	Percentage by Hazard Category
Low hazard	28%
Moderate hazard	61%
High hazard	11%

2. Environmental Effects

a. Alternative 1

Because no new management is proposed under this alternative, the effects described reflect current conditions and trends that are shaped by ongoing management and events unrelated to the Cottonwood Project described under the Affected Environment. 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 in some stands would lead to increased mortality as stem exclusion process continues (see silvicultural section). The transition from ponderosa pine stands to dense fir stands would also continue in some of the stands 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 1,117 acres of forest thinning units, which are in Condition Classes 2 and 3, would not be treated and fuels reduction objectives for these areas would not be accomplished. Without treatment the condition class of these stands would continue to deteriorate to a Condition Class 3.

With no forest management actions, there would be no temporary increase in surface fuels from timber harvest activities. Although there would be no harvest created slash, the existing surface, ladder, and canopy fuels would remain untreated. Mixed conifer forests in the project area would have a higher potential for large scale stand replacing fires in comparison to the Proposed Action. These forest types are experiencing fires today that are uncharacteristic of historic fires (Agee and Skinner, 2005).

The majority of the BLM managed land in 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. 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.

Fire suppression would continue because there are no policies in place or being proposed that would allow fires to burn naturally within the project area. The entire project area is within the Wildland Urban Interface (WUI) and is a priority for fire suppression especially in close proximity to homes.

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

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

BLM resource advisors will be dispatched to fires which occur on BLM lands. These resource advisors are utilized to ensure that suppression forces are aware of all sensitive areas and to insure damage to resources is minimized from suppression efforts.

When feasible, existing roads or trails will be used as a starting point for burn-out or backfire operations designed to stop fire spread. Backfires will be designed to minimize fire effects on habitat. Natural barriers will be used whenever possible and fires will be allowed to burn to them.

In the construction of fire lines, minimum width and depth will be used to stop the spread of fire. The use of dozers should be minimized and resource advisors will be consulted when appropriate. Live fuels will be cut or limbed only to the extent needed to stop fire spread. Rehabilitation of fire lines will be considered.

The felling of snags and live trees will only occur when they pose a safety hazard or will cause a fire to spread across the fire line.

The construction of helispots should be minimized. Past locations or natural openings should be used when possible. Helispots will not be constructed within riparian reserves, or areas of special concern.

Retardant or foam will not be dropped on surface waters or on occupied spotted owl nests.

Resource advisors will determine rehabilitation needs and standards in order to reduce the impacts associated with fire suppression efforts.

BLM's 1995 RMP assumes that all suitable forested lands on industrial forest land ownership would be logged at about 60 year tree-growing rotations, although, there are no private industrial lands that are known to be scheduled for timber harvest at this time. Any private land timber harvest would meet Oregon Department of Forestry standards for post-harvest fuels reduction. Defensible space and driveway treatments would likely continue by private land owners, but the amount is unknown. As a result of ongoing programs to implement defensible space around structures, driveways and roads for potential escape/evacuation routes, the risk of structure and human loss during wildfire events continually decreases.

Seventy two percent of the fire analysis 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 fire would exhibit high severity fire effects. As fire is continually excluded and stand densities continue to increase, coupled with predicted climatological changes, the chance for higher proportions of high severity fire effects increases.

Based on trends in the last 40 years, humans would continue to be responsible for approximately 38% of wildfires (79%). Most of the human-caused fires would continue to be associated within about 300 feet of roads.

b. Alternative 2

Discussions for this alternative reflect the direct and indirect impacts of the activities associated with the Proposed Action. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable.

Fire Severity

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 this alternative are based not on restoring historic conditions, but on meeting the objectives of Matrix land allocation.

Activity Fuels / Surface Fuels

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, 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 (but can be up to 2years) 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.

Utilizing the modeling tool BEHAVE, with the parameters of a 6 mph wind speed and one hour fuels moisture of 6% ,flame lengths in a slash fuel model are 4 feet compared to 1foot in a timber litter model. Direct attack can be used under both of these scenarios. Rate of spread of a fire increases by 5 chains per hour in a slash fuel model. The size of a fire in a one hour period for a fire that is not suppressed would be 0.3 acres in a timber fuel type versus 2 acres in a slash fuel model.

Fuels treatments for stands that are commercially harvested are proposed for treatment within the first year the 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. The reduction of this material, along with reduced fire ladders and canopy fuels from forest thinning, would reduce fire behavior such as flame length, rate of spread and fire duration. With the reduction of flame length and fire duration the chance of a crown fire initiating in treated stands would be greatly reduced. Also, mortality of the smaller diameter conifers would be reduced. Thinning treatments may be 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. The reduction of flame length in treated stands would also increase the chance that direct attack of a wildfire could occur which would reduce acres burned in the event 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 in reducing the effects of wildfire (Omi and Martinson, 2002; Pollet and Omi, 2002; Agee, 1993; Graham, 1999; VanWagtendonk ,1996). Treatments that result in forests with a lower density and larger trees show lower potential for crown fire initiation and propagation and for less severe fire effects (Pollet and Omi, 2002).

Anecdotal observations should not be applied the same as rigorously tested scientific study, but they can be used to report and interpret trends. Anecdotal evidence on the Squires fire in Southern Oregon, 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.

Fire Resiliency

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

The implementation of this alternative would promote fire resilient forest stands by thinning from below, removing suppressed, diseased, and/or over crowded intermediate and co-dominant trees while retaining the larger co-dominant and dominant trees within treated stands. This alternative would conduct forest management on approximately 1,117 acres of timbered stands that are in Condition Class 2 and 3. Forest thinning prescriptions would result in a reduction in ladder fuels, an increase in the height to the base of tree crowns, and the reduction of crown bulk density (canopy fuels). All of these are important factors in reducing the potential for initiating and sustaining a crown fire in these stands (Omi and Martinson, 2002; Agee, 1996; Agee and Skinner, 2005; Agee et al., 2000).

Thinning from below, removing the smaller diameter trees within a stand, would increase the average tree diameters as soon as treatments are completed. Over time, tree diameters would continue to increase with the growth of the residual stand. Larger diameter trees are more tolerant to surface fires 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).

While the silvicultural prescriptions and objectives vary by prescription type, they are all designed to retain healthy large trees (see Chapter 2). The maintenance of pine species in mixed conifer forest stands would contribute 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). A trees 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 for logging operations (landings and cable corridors) the fire resilience of the project area as a whole is improved due to the overall reduction in fire hazard within treatment units.

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

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

Changes in Micro-climate and Effectiveness of Fuels Treatments

Management of forest stands can result in altered micro climates (Agee, 1996). Increasing spacing between the canopies of trees can contribute to increased wind speeds, increased temperatures, drying of topsoil and vegetation (Countryman, 1955; Countryman, 1972), and increased shrub and forb growth (Agee 1996). A more open stand allows more wind and solar radiation resulting in a drier microclimate compared to a closed stand. A drier microclimate generally contributes to more severe fire behavior.

The degree of effects of microclimate change on fire behavior is highly dependent on stand conditions after treatment, mitigation to offset the effects of microclimate change, and the degree of openness. For example, Pollet and Omi (2002) found that more open stands had substantially less fire severity, while Weatherspoon and Skinner (1995) found greater fire severity. In Pollet and Omi's study, more open stands had substantially less fire severity compared to the more densely stocked untreated stands. The degree of openness in the studied treated stands may not have been sufficient to increase fire activity. Weatherspoon and Skinner found commercially thinned stands in a mixed-conifer forest in the South Fork Trinity River watershed of the Klamath NF in northwest CA burned more intensely and suffered higher levels of tree mortality than unlogged areas (Weatherspoon and Skinner, 1995). The partial cuts they examined were typically overstory removals, where large (mature and old growth) trees were removed leaving smaller trees.

The study simply validates that smaller trees, due to thinner bark and crowns closer to the ground, will suffer more damage than large trees. Logging slash was not treated in the study areas. The Proposed Action for this project proposes to treat slash generated by the treatments and forest thinning would harvest some commercial sized ladder fuels.

Moisture content of live vegetation is an important consideration. The moisture content of live fuels compared to fine dead and down fuels is generally much greater. Where overstory canopy reduction results in the growth of live understory vegetation could contribute to reduced or increased surface fire behavior. Live fuels with higher moisture content can have a dampening effect on fire behavior compared to dead fine fuels (Agee et al., 2002; Agee, 1996). Cured grasses and forbs can increase fire line intensity (Agee, 1996); however, due to project design where ladder fuels have been removed and crown base heights increased, the risk of crown fire initiation and fire severity is reduced (Agee, 1996; Omi and Martinson, 2002; VanWagtendonk, 1996; Agee et al., 2000).

Effects of Canopy Reduction on Fuel Moistures

Silvicultural prescriptions proposed for the Douglas fir sites (Dry and Moist) would retain average canopy closures greater than 50 percent. The pine prescriptions would open stands up more, retaining average canopy closures at about 40 percent.

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

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

Utilizing the example from above (1 hour time lag fuels at 3%) to correct fuel moisture on a site that has the following attributes you would add 3% to the fuel moisture for a total of 6%.:

- north slope
-slope greater than 31%
-12:00 pm in August
- shading greater than 50%

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

Fall Versus Spring Underburning

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. 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 (cutting, hand piling and burning). Even after manual treatments surface fuel levels in the 1, 10 and 100 hour fuels (1/4" to 3") are often too high to accomplish a low intensity fall burn. When this is the case, underburning is done in the spring.

Burning in the fall with high surface fuel loadings would have adverse impacts to numerous resources due to fires being of higher intensity. Large down woody debris consumption is higher in the fall. Duff consumption is higher and soil heating 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 the residual vegetation is minimal and the chance of escape is also minimized. Visual observations of areas that have been underburned in the spring in the Ashland Resource Area over the past decade have not shown any adverse 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 would occur in the spring if fall burning conditions might result in unwanted intensities, damage from prescribed fire would be minimal due to higher moisture levels, and benefits from prescribed fire would be maximized. Any areas planned for fuels treatment may be reexamined by resource specialists at any stage of treatment to determine if the planned fuels treatment is still applicable. At the discretion of resource specialists, planned treatments may be changed to better meet the objectives outlined in this EA. Proposed changes would be limited to treatments and their anticipated effects analyzed under this EA.

Cumulative Effects

Forest management treatments would increase the fire resiliency of stands treated. As large wildfires burn in mosaic patterns of stand replacement to mild underburns, the net effect of the fuels reduction treatments in wildfire situations are determined by numerous factors in a complex situation. Activities outside the scope of the project area and future planned activities that alter fire risk or hazard within the fire analysis area potentially include timber harvesting logging on private lands, fuels reduction, road construction, and private land development.

I. BOTANY

1. Introduction

Analysis regarding botanical resources within the Cottonwood Forest Management Project has been conducted at the 6th Field sub watershed level, and includes the Keene Creek sub watershed in its entirety. All references to the "Cottonwood analysis area" include the area of this sub watershed.

Bureau Special Status Plants, Lichens, and Fungi (SSP) include species that are listed as threatened or endangered under the Endangered Species Act (ESA), proposed or candidates for listing, State listed, and Bureau designated Sensitive species. For these species, the BLM implements recovery plans, conservation strategies, and approved project design criteria of biological opinions, and ensures that actions authorized, funded, or carried out by the BLM promotes their conservation and reduces the likelihood and need for their future listing under the ESA.

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

This project will meet the provisions of the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (not including subsequent Annual Species Reviews). Details of the project surveys are described below.

2. Affected Environment

Portions of the Cottonwood analysis area are within the range of *Fritillaria gentneri*, a species listed under the Endangered Species Act with ranges on the Medford District. However, all units proposed for activity are outside of the range of *F. gentneri*. The Cottonwood analysis area is entirely outside the ranges of other Federally Endangered species found on the Medford District (*Arabis macdonaldiana*, *Limnanthes floccosa* ssp. *grandiflora*, *Lomatium cookii*). Range maps were updated with the Biological Assessment/Letter of Concurrence for the Effects of Proposed FY 2009-2013 Forest Management Activities on Federally Listed Species and Designated Critical Habitat on September 25, 2008 (USDI BLM 2008) (USDI FWS 2008). Any sites of listed, proposed or candidate plants found outside their defined range would have been reported. Table 3-19 lists the SSP found within the Cottonwood analysis area, including those sites that are located within or bordering proposed treatment units or haul routes.

Surveys for all species on the Medford SSP list (current at the time of survey) were conducted in 2010. Surveys were conducted using the intuitive controlled survey method. This method includes a complete survey in habitats with the highest potential for locating Sensitive species. Surveys are completed by walking routes that cover a representative cross section (approximately 80%) of all major topographic (slopes, draws, benches, ridges) and special features (wet areas, rock outcrops, ridges, riparian areas, serpentine, etc.) of each unit. In areas of high potential habitat, a more thorough and intensive survey is made. Field work is conducted during the stage of plant phenological development that assures visibility of characteristics necessary for accurate identification of special status plant species. Multiple visits may be required in some habitats for certain species to ensure that the phenological development is such that accurate identification is possible. Vascular plant surveys are conducted from April 15 through September 1. Nonvascular plant surveys may occur in any season. Timing of fieldwork takes into consideration seasonal climate, elevation, aspect, target species and suitable habitat.

a. Vascular and Non-Vascular Plants

Surveys have documented 30 occurrences of 6 Bureau Special Status and 2001 Survey and Manage plant species within the Cottonwood analysis area that occur within 100 feet of roadsides within the analysis area and/or within 100 meters of proposed units. Two other species located during project clearance surveys currently have no status on the Medford District and/or have been previously undocumented in the area and are awaiting a status determination.

Table 3-19. Sensitive Status Plant Species In or Adjacent to Units or Roads

Scientific Name	Common Name	Lifeform	2001 Survey & Manage Status*	2010 Heritage Rank**	2010 ORBIC List***	2010 Federal Status+	2010 ODA Status++	2011 BLM Status	Sites
Allium peninsulare	Peninsular onion	Vascular	--	G5/S1	2	--	--	SEN	7
Codriophorus depressus		Moss	--	G2?/S1	2	--	--	SEN	1
Cypripedium fasciculatum	Clustered lady's slipper	Vascular	C	G4/S3	2	SOC	C	SEN	1
Cypripedium montanum	Mountain lady's slipper	Vascular	C	G4/S3S4	4	--	--	--	1
Dermatocarpon rivulorum	Silverskin lichen	Lichen	--	--	--	--	--	+++	4
Hackelia bella	greater showy stickseed	Vascular	--	G3?/S1	2	--	--	SEN	19
Orthotrichum euryphyllum (syn. O. papillosum)	Streamside Orthotrichum moss	Moss	--	GNR/S1	3	--	--	--	1
Schistidium cinclidodonteum	Schistidium moss	Moss	--	G2G3/S1	2	--	--	SEN	1

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

A= Rare, and all known sites are managed. Current and future known sites will be managed according to the Management Recommendation for the species. Minimize inadvertent loss of undiscovered sites. Pre-disturbance surveys are practical.
B= Rare, and all known sites are managed. Pre-disturbance surveys are not practical.
C = Uncommon, and not all known sites or populations are likely to be necessary for reasonable assurance of persistence, as indicated by several factors. Pre-disturbance surveys are practical.
D= Uncommon. Manage all known sites until high-priority sites can be determined. Pre-disturbance surveys are not practical or not necessary.
E=Rare, status undetermined. Manage all known sites while category assignment is being determined.
F= Uncommon, or Concern for Persistence Unknown. Management of known sites NOT required because species are uncommon, not rare. Until reassignment of species to a new category or removal from list occurs, inadvertent loss of some sites is not likely to change the level of rarity.

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

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

G = Global Rank
S = State Rank
1 = Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurrence.
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.

+Federal Status

SOC=Species of Concern-Taxa for which additional information is needed to support a proposal to list under the Endangered Species Act.

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

1=taxa which are threatened or endangered throughout their range or which are presumed extinct.
2=taxa which are threatened, endangered, or possibly extirpated from Oregon but are stable or more common elsewhere.
3=taxa for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range.
4=taxa which are very rare but are currently secure, as well as taxa which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered.

++ODA Status: Oregon Department of Agriculture

C=Candidate for (State) listing as Threatened or Endangered by the ODA.

+++Species currently has no status due to recent discovery in Southwest Oregon; may be a candidate for future listing based on rarity.

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

Allium peninsulare is a perennial monocot with a range that is found primarily in California and northern Baja California, with a very limited distribution north into Southwest Oregon. Typically blooming in July, this species usually occurs in areas with mild slopes and varying moisture regimes. The 7 documented sites occurring within 100 feet of roads or 100 meters of project units represent 100% of the total sites in the Cottonwood analysis area, and 64% of the known sites on the Medford District.

Cypripedium fasciculatum is a relatively long-lived perennial orchid, living at least 30 years, and perhaps as long as 95 years. Despite appearing to have a broad range, its distribution within the 8 western states from which it is known to occur is relatively scattered and disjunct. It can occur in a variety of plant community types throughout its range, and within these communities, there is great diversity in soils, elevation, aspect, and plant communities. Site moisture regime varies from dry to damp, soils vary from rocky to loamy, and elevations range from 1000-5300 feet. Aspect tends to be northerly, but this, too, varies (USDA and USDI, 1998). However, despite a seemingly flexible preference for habitat, numbers of individuals within populations appears to affect the longevity of populations, more so than the number of populations distributed over a given area. An ongoing Population Viability Analysis (PVA), in which Medford District known *C. fasciculatum* sites are relocated annually and analyzed for population numbers suggests that there is "an ongoing trend of population decline and local extinction" and that population size is significantly correlated with extinction events (i.e., the probability of extinction decreases as population size increases). "Nearly all sites in Oregon and Washington (96%) have stem counts less than 100, with most ranging between 1 and 20" (Thorpe et al., 2010). There is one (1) known site occurring within 100 feet of roads or 100 meters of project units, representing 20% of the total sites within the Cottonwood analysis area, and 0.1% of the total known sites on the Medford District.

Cypripedium montanum is an orchid known from Washington, Oregon and California. It has small and scattered populations that are declining. Effects of logging, collection for horticultural use, loss of habitat on private land, and lack of fire have reduced populations and habitat. The loss of small, isolated populations due to activities such as timber harvest, road and trail construction, soil and litter disturbance, and a decrease of canopy closure to less than 60 percent have been identified as threats to this species (DOI/USFS 2004). There is one (1) known site occurring within 100 feet of roads or 100 meters of project units, representing 100% of the known populations in the Cottonwood project area and <1% of all sites on the Medford District.

Hackelia bella is a perennial forget-me-not that typically grows on stream banks, roadsides, open slopes, or in forest openings at elevations ranging from 3000-6000 feet. Sites in Southwest Oregon represent the northernmost extent of this species' range, which extends into northern California. The 19 documented sites occurring within 100 feet of roads or 100 meters of project units represent 79% of the total sites in the Cottonwood analysis area, and 34% of the known sites on the Medford District.

*Dermatocarpon rivulorum*is a lichen that frequents semi-aquatic habitats in elevations considered to be relatively high (McCune and Geiser, 2009). There are 4 sites in the Cottonwood analysis area, occurring within 100 meters of project units or roads, and representing 100% of the total sites in the analysis area and 100% of the total known sites on the Medford District. Prior to surveys conducted in 2010, this species had previously been undocumented in southwestern Oregon or on the Medford District.

Orthotrichum euryphyllym is a moss that grows on exposed tree roots, bases of trees along streams, and on large boulders at stream and river edges. Occasionally, it can be found on rocks that are frequently inundated by water, and rarely in aquatic habitats. Elevation ranges from 500-2000 meters, and has been documented in British Columbia, California, Idaho, Nevada, Oregon, Washington, Wyoming, and Europe (Vitt, 2009). There is one site in the Cottonwood analysis area, occurring within 100 meters of a project unit, and representing 100% of the total sites in the analysis area and 100% of the total known sites on the Medford District.

The ORBIC status is applicable for Harney and Union Counties, in eastern Oregon, and an applicable status has yet to be assigned to the species for southwestern Oregon. While the species was suspected to occur in the area, prior to surveys in 2010, this species had previously been undocumented in southwestern Oregon or on the Medford District.

Schistidium cinclidodonteum is a moss can be found on open bedrock and seasonal creeks and seepages in areas where other species would prefer the presence of soil (Sagar and Wilson, 2007). Elevation tends to be relatively high, ranging from 2000-3500 meters, and the range includes California, Idaho, Oregon, Washington and Europe. Capsules mature in late spring to early summer (McIntosh, 2007). There is one site in the Cottonwood analysis area, occurring within 100 meters of a project unit, and representing 100% of the total sites in the analysis area and 100% of the total known sites on the Medford District. The ORBIC status is applicable for Union County, in northeastern Oregon, and an applicable status has yet to be assigned to the species for southwestern Oregon. While the species was suspected to occur in the area, prior to surveys in 2010 this species had previously been undocumented in the area or on the Medford District.

c. Fungi

Of the 20 species of fungi that are on the Medford District Sensitive Species list, 18 are Survey and Manage species whose status determines that pre-disturbance surveys are impractical and not required; one species is a hypogeous (underground) fungus, as are other of the previously referenced fungi, where pre-disturbance surveys would be impractical. Oregon State Office Information Bulletin No. OR-2004-145 reaffirmed this, stating that Bureau policy (BLM Manual Section 6840) would be met by known site protection and large-scale inventory work (strategic surveys) through fiscal year 2004.

Surveys have documented one fungi site located 100 meters from proposed units. Prior to the "Sensitive Status" designation on the BLM State Director's list, the species was previously addressed under the Northwest Forest Plan and the provisions for Survey and Manage species within the Cottonwood Analysis Area **(**Table 3-20). Suitable habitat is present for other species on the Medford District Sensitive Species list (Table 3-21).

Table 3-20. Special Status Fungi Located In or Adjacent to Project Roads or Units

Scientific Name	Lifeform	2001 S&M Status*	2010 Heritage Rank**	ORBIC List***	2008 BLM Status	Sites
Boletus pulcherrimus	Fungus	B	G3/S2	1	SEN	3
Bondarzewia mesenterica	Fungus	B	--	--	--	1
Pithya vulgaris	Fungus	D	--	--	--	1

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B= Rare, and all known sites are managed. Pre-disturbance surveys are not practical.
C = Uncommon, and not all known sites or populations are likely to be necessary for reasonable assurance of persistence, as indicated by several factors. Pre-disturbance surveys are practical.
D= Uncommon. Manage all known sites until high-priority sites can be determined. Pre-disturbance surveys are not practical or not necessary.
E=Rare, status undetermined. Manage all known sites while category assignment is being determined.
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****Heritage Rank: an international system for ranking rare, threatened, and endangered species**

G = Global Rank
S = State Rank
1 = Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurrence.
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.

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

1=taxa which are threatened or endangered throughout their range or which are presumed extinct.
2=taxa which are threatened, endangered, or possibly extirpated from Oregon but are stable or more common elsewhere.
3=taxa for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range.
4=taxa which are very rare but are currently secure, as well as taxa which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered.

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

Table 3-21. Medford District Sensitive Fungi Species with Habitat in the Analysis Area

Scientific Name	2001 S&M Status*	2007 Heritage Rank**	ORBIC List***	NWFP Sites
Boletus pulcherrimus	B	G2G3/S2	1	23
Dermocybe humboldtensis	D	G1G2/S1	1	4
Gastroboletus vividus	B	G2?/S1	1	5
Gomphus kauffmanii	B	G2G4/S3?	1	74
Gymnomyces fragrans (syn. *Martellia fragrans)*		G2G3/S1S3	3	1
Helvella crassitunicata	B	G3/S2	1	29
Leucogaster citrinus	B	G3G4/S3S4	2	49
Otidea smithii	B	G2/S2	3	10
Phaeocollybia californica	B	G2?/S2?	3	46
Phaeocollybia olivacea	B	n/a	1	126
Phaeocollybia oregonensis	B	G2?/S2?	n/a	15
Phaeocollybia pseudofestiva	B	G3/S3?	1	50
*Pseudorhizina californica (*syns. *Gyromitra California, Helvella californica)*		G4/S2	3	14
Ramaria largentii	B	G3/S2?	2	20
Ramaria spinulosa var.*diminutiva*	B	GUT2/S1?	3	1
Rhizopogon chamalelotinus	B	G2G3/S1S2	1	1
Rhizopogon clavitisporus		G2G3/S1S2	2	4
Rhizopogon ellipsosporus	B	G2G3/S1S2	2	6
Rhizopogon exiguus	B	G2G3/S1S2	2	3
Sowerbyella rhenana	B	G3G4/S3	2	58

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3=taxa for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range.
4=taxa which are very rare but are currently secure, as well as taxa which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered.

d. Sensitive Fungi Known to Occur within Analysis Area

*Bondarzewia mesenterica*is a large, fleshy, annual polypore that is associated with conifer-dominated forests, fruiting from August through December. The sporocarp (fruiting structure produced from longer-lived mycelium) is known to occur in late successional conifer forests in Washington, Oregon and California, and is often associated with stumps or snags, or soil nearby. Outside of the range of the Northwest Forest Plan, the species is also known to occur in British Columbia, Germany and Switzerland (Castellano et al, 1999). There is one (1) site located within 100 meters of a project unit, representing 25% of the known populations in the Cottonwood analysis area and 1.9% of the total sites documented on the Medford District.

Boletus pulcherrimus is the red-pored bolete mushroom. It is listed as endemic to the Pacific Northwest, including northern California, but has also been reported from New Mexico. In the range of the Northwest forest Plan (NWFP), there are 23 known sites. Four sites are on the Medford District, all of which are located within the Cottonwood analysis area. NWFP habitat data is available for only the Medford BLM and Winema NF sites. This plant community data shows this species occurs on White fir/Douglas-fir early mature forests, Douglas-fir/White fir/Ponderosa pine young forest, White fir/chinquapin communities, and Shasta red fir/chinquapin communities. Elevation ranges from 4,620’ to 5,640’. Habitat data for other NWFP sites is in humus in association with roots of mixed conifers (Grand fir, Douglas-fir) and hardwoods (tanoak) in coastal forests. There are 3 populations occurring within the Cottonwood analysis area, representing 100% of the known populations in the Cottonwood analysis area.

Pithya vulgaris is a saprophytic or needle endophyte that fruits on wet and dead (usually detached) branch tips and twigs of fir species, in montane areas often within several yards of snow banks or within a few weeks of snow melt. It typically fruits from March through May, and in November. There is one (1) documented site occurring within 100 meters of a project unit and within a Riparian Reserve, representing 100% of the known populations in the Cottonwood analysis area and <1% of all sites on the Medford District.

3. Environmental Effects

This section discusses the direct and indirect effects of implementing each of the alternatives and the impacts it would have on botanical resources. This section also discusses any cumulative effects considering the range of alternatives plus the effects of other actions that are currently happening or will be happening in the foreseeable future.

a. Alternative 1

Special Status Plants and Sensitive Fungi

The analysis area includes areas of varying stand density understory density, due to a history of previous land management activity. Stands with a prior harvest history have low- to-moderate shrub cover and tree seedling and sapling cover, resulting in relatively open understories, light ground cover, and filtered light. Under Alternative 1, there would be no increase in fire risk or fire hazard in those areas with previous management activity. Habitat for SSP in these areas would continue to be in good standing for the reasonably foreseeable future.

Without vegetation treatment, Special Status Plants, Mosses, Lichens, and Fungi populations in areas of with more dense vegetation would continue to decline over time due to the slow degradation of suitable habitat through continued increase of low-growing shrub cover, increased seedling and sapling cover, and increased canopy cover. Through fire suppression, the plant communities will continue to become overly dense, decadent thickets with increased competition for resources. Fire risk and fire hazard would remain higher in those areas with unnaturally high fuel loading and fuels structure. A resulting high-intensity fire in this area would destroy the habitat and directly kill existing SSP populations.

b. Alternative 2

The following documents the analysis of effects to botanical resources resulting from the implementation of Alternative 2 (see Chapter 2 for details).

The greatest threats to plant community health resulting from project activity would be soil disturbance that could result in non-native/noxious weed introduction into areas previously not infested, and the potential loss of canopy cover for those species dependent on filtered light and/or higher moisture levels for survival. Soil compaction would also be a mechanism for habitat loss and degradation for SSP.

Commercial Timber Harvest, Pre-Commercial Thinning and Follow-Up Fuels Treatments

Known SSP sites in units would be protected either by no-treatment buffers or seasonal restrictions, or a combination of both (see Table 2-7 for site and species specific protection measures). Trees proposed for cutting outside of the buffer areas would be directionally felled away from the buffers to prevent unintended soil disturbance or damage to plant populations. No-treatment buffers would be large enough to suit the individual needs of species to ensure that changes in moisture regime, canopy cover, light filtration and population continuity would be appropriate to meet SSP protection objectives. However, while no-treatment buffers would provide the maximum protection from site disturbance related to project activity, habitat conditions within the buffer would deteriorate over time as a result of increased forest density without some form of management. Risk for long-term fire hazard would also increase over time.

Pre-disturbance surveys for the 20 Sensitive Medford District fungi species (or fungi of related type) are impractical and not required, as determined by the Northwest Forest Plan. Pre-disturbance surveys are impractical because these species are difficult to identify and/or their occurrence is sporadic or unpredictable. All 20 species are associated with a forest component found in the analysis area; i.e., habitat exists in the analysis area to support these species. Most fungi on this list are mycorrhizal (associated with specific host trees) and depend on wind and/or animals to spread the spores. For these 20 fungi, species specific information on connectivity and habitat requirements, range (including occurrences within the analysis area), and disturbance effects is incomplete. Therefore, there is no information that would lead to a finding that the Proposed Action would have any effect on any of these 20 species.

Under Alternative 2, there would be no effect on documented sites of SSP located in Riparian Reserves due to implementation of PDFs described in Chapter 2. PDFs establish that activity is prohibited from taking place within the established reserves.

Roads and Landings

In the Cottonwood analysis area, construction of 2 new permanent roads and 2 temporary spur roads is proposed, with a proposed combined approximate length of 1.7 miles. Road 39-3E-20.00 is proposed to be barricaded, mulched and seeded at the entrance after project activity is completed to prevent unwanted and unauthorized use, but would remain an inventoried road. Road 39-3E-28.02 would also be barricaded to prevent unauthorized use. Spur roads (Temp Spur Roads A and B) would be obliterated to prevent further use beyond the scope of the proposed project activities.

The area proposed for Road 39-3E-20.00A is BLM land that is primarily coniferous forest, with one proposed crossing through a Riparian Reserve. There is a history of prior disturbance, including grazing and forest management in the area of proposed road construction. There is one SSP site located in the general area of original proposed construction, with a distance of no less than 350 feet proximity. The site would be protected by a no-activity buffer to prevent construction from passing through or immediately adjacent to the population. Closure of the road after project activity is complete is intended to prevent the area in and around the site from potential OHV use that can arise with the creation of new road systems on public and private lands. However, prior observations across the Medford District have indicated that barriers (i.e., ditches and berms, fallen logs, boulders, visual barriers), gates and partial obliteration do not always prevent unauthorized land use and travel once a new road is constructed. To reduce the likelihood of unauthorized use, road construction and road closure would occur the same season of use. Installing a temporary crossing through an ephemeral streambed increases the risk of sedimentation to be deposited downstream, putting the known SSP at risk. To reduce the likelihood of impacts due to the building of a road crossing, the proposed road was redesigned under advisement of BLM's botanist to allow for the greatest distance possible between the known SSP population and the proposed crossing to protect the known population.

The redesigned crossing passes through a portion of the meadow where conifer encroachment is reducing the size of the meadow and in an area of prior soil disturbance is evidenced by the presence nonnative species and visible signs of cattle use. The removal of some of the conifer encroachment into the meadow would, over time, benefit meadow plant species. The redesign of the road combined with the implementation of PDFs, would further reduce the potential for effects on SSP from sediment deposits during high water events, nonnative species introductions, and potential OHV activity. Monitoring in this area will be implemented for the 5 years following completion of the Cottonwood Forest Management Project

An estimated 1.9 miles of roads are proposed for decommissioning in the project area. All three roads are natural surface BLM roads. Road 39-3E-9.05 (0.93 miles) has 3 SSP populations located adjacent to or within 100 feet of the road prism. Decommissioning activity would be limited to the existing road bed and previously disturbed areas. Plant populations are large and determined to be healthy, and while there is a chance members of the populations would be unintentionally removed, professional judgment is that the removal of the existing road provides a more stable habitat in the future. The loss of a few individuals would not trend the species toward future listing. There are no SSP located on or adjacent to roads 39-3E-5.04 and -5.05. The roads pass through a seasonally wet meadow, and the removal of this road system would benefit the native plant communities. Implementation of PDFs would ensure that the benefits of road removal outweigh any short-term adverse impacts that ground disturbance may have.

Roads used as haul routes would be maintained as needed (ditch cleaning, spot rocking, etc.) to ensure adequate protection. In addition to minor maintenance, road re-alignment is proposed on approximately 0.53 miles of road in the analysis area (see Chapter 2). These roads are existing and need treatment that would enable large equipment to travel through. All disturbance activity would occur in the existing road prism, and there would be no effect on known SSP sites. Prior to disturbance activity, all known noxious weed sites located on haul routes or road proposed for improvements would be treated to prevent further spread of plant material and/or weed seed.

c. Cumulative Effects

Land ownership in the Cottonwood analysis area is both public (BLM) and private. The condition of the local landscape and its associated sub watersheds relies heavily on privately-owned land and activities that affect its habitat condition.

Grazing

Approximately 123 acres of the Cottonwood analysis area is currently authorized for grazing as part of the Buck Point allotment, which authorizes 150 Animal Unit Months (AUMs). However, a large portion of the allotment that overlaps with the Cottonwood analysis area receives little-to-no average usage due to a privately (and well) maintained fence that prevents cattle from entering the area. However, surveys conducted in 2010 and 2011 indicate that there has been cattle presence in the aforementioned area within the last 2 or 3 years, and it is assumed that it is trespass from neighboring allotments, where fences are not as diligently maintained (Schuster, personal communication, 2011). Use appears to be light, and impacts minimal. The plant community appears in areas to be altered with regard to the presence of nonnative and introduced species (e.g. dandelions in meadows and along roadsides, seeded grasses for forage), and this is likely partially due to the presence of cattle, historic or current.

The Cottonwood analysis area was also historically grazed as part of the Keene Creek allotment, which was bought out in its entirety in 2009 as part of the Omnibus Public Lands Management Act of 2009, Public Law No. 111-011. Cumulative effects within the Cottonwood analysis area due to active grazing within the Keene Creek grazing allotment will be addressed here due the long history that grazing has had in the area, and the long-term impacts that can be generally associated with grazing practices, including the introduction and spread of non-native and noxious weed species. Unauthorized grazing did occur in the Keene Creek Allotment in 2009 and 2010 after the Omnibus Public Lands Management Act of 2009 buy-out was finalized, primarily in the following sections: T39S R03E S10, 12, 13 and 20, and T39S R04E S07. Trespass has occurred on both BLM and privately-owned lands, and in small numbers resulting in a measurable level of use of 0-5% (slight) in each instance.

Due to the low level of unauthorized use on the Keene Creek allotment, small numbers of cattle involved in trespass and the slight level of use prior to removal, professional judgment is that there is no anticipated measurable cumulative effect of grazing in relation to the activities proposed in the Cottonwood Forest Management Project.

While soil disturbance does increase the likelihood of movement and introduction of noxious weed and non-native plant species, the human activity in these areas (privately-owned timber lands, Little Hyatt Reservoir, Hyatt Pines and the general Hyatt Lake recreational areas) presents a more likely mode of transport for non-native species than the low level of trespass occurring on the former Keene Creek grazing allotment or current grazing activity on the Buck Point allotment.

Private Land-Use Operations

The effects of past or future private timber harvest and other vegetation treatments on native plant communities and SSP are not known. It is assumed that most timber harvest projects and other vegetation treatments on private land will have adverse effects on native plant communities (including SSP) due to timber removal prescriptions, logging methods, and less resource protection measures. Federal laws protecting endangered and special status plans do not apply to private land without a Federal nexus.

Recreational Operations

Areas with mild-to-moderate hill slopes are susceptible to unauthorized recreational uses (i.e., trail building, OHV use) due to fewer natural barriers on the landscape, which can lead to weed and non-native species infestations and SSP habitat degradation. Areas of new road construction and re-opened roads are particularly vulnerable to increased OHV use.

New road construction is proposed in sections T39S R03E S17 and 20 (1.30 miles) and T39S R03E S28 (0.20 miles), for a total of 1.46 miles of new road construction. Road 39-3E-28.02 is proposed on lands that are entirely privately-owned, and would be constructed to gain access to project units on BLM lands. Surveys were conducted on private lands for noxious weeds and federally endangered species in 2010. Road 39-3E-17.04 is proposed on lands that are administered by the BLM, and complete surveys were conducted in 2011. Both areas are considered to be mild-to-moderate hill slopes, and without implementation of PDFs, would be susceptible to unauthorized recreational operations. However, proper implementation of the PDFs (i.e., same-season open and closure, blockading/obliterating entry points) would result in no effect on botanical resources, and no increase in unauthorized use.

Two temporary spur roads are proposed for construction, each with a length of 0.10 miles each. Both would be closed at the completion of the project as addressed in Chapter 2. Both are located in areas with mild-to-moderate hill slopes, and without implementation of PDFs, would be susceptible to unauthorized recreational operations. However, proper implementation of the PDFs (i.e., same-season open and closure, obliteration) would result in a no effect on botanical resources, and no increase in authorized use.

Areas currently prone to unauthorized use would continue to be problematic due to the lack of natural barriers throughout the project area. The creation of skid trails and areas of lighter vegetation cover would further increase the risk presented to natural resources with regard to illicit recreational operations, due to the further removal of natural barriers and increased accessibility in areas where slope is mild-to-moderate.

Past and Proposed Actions

Recent past and proposed Federal timber sales and commercial/non-commercial vegetation projects in the Cottonwood analysis area considered under cumulative effects have mostly been for forest health and fuels reduction. These treatments attempt to remedy the effects of long-term fire suppression and, as such, are generally beneficial to native plant communities (including SSP). If left untreated, the chances for a stand-replacement, catastrophic fire are increased.

The Sampson Cove Forest Management Project neighbors the Cottonwood Forest Management Project, with approximately 5.5 acres overlapping into the Cottonwood analysis area. Any noxious weed species or sensitive status species sites within this area were analyzed as part of the Sampson Cove Forest Management Project EA. Through mitigation measures, project activities were determined to have “no effect” on those species present.

There are no documented sites of special status species or noxious weeds within the Cottonwood Forest Management Project units (Units 32-4A and 32-4B) or associated roadways (Roads 39-3E-32 and -32.1) that would be affected by proposed project activities in the neighboring Sampson Cove Forest Management units. With the implementation of designated project design features in both projects, there would be no effect on botanical resources related to the proximity of these two projects and therefore no potential for adverse cumulative effects to botanical resources as a result of implementing the Sampson Cove and Cottonwood Forest Management Projects.

J. NOXIOUS WEEDS AND INTRODUCED PLANTS

1. Affected Environment

a. Noxious Weeds

Analysis regarding known noxious weed populations within the Cottonwood Forest Management Project has been conducted at the 6th Field sub watershed level, and includes the Keene Creek sub watershed in its entirety. All references to the “Cottonwood analysis area” refer to the area of this sub watershed.

Noxious weeds are generally non-native plants that cause or are likely to cause economic or environmental harm or harm to human health. Introduced plants are species that are non-native to the ecosystem under consideration. Introduced plants may adversely affect the proper functioning condition of the ecosystem. "Noxious Weed" describes any plant classified by the Oregon State Weed Board that is injurious to public health, agriculture, recreation, wildlife, or any public or private property.

There are a total of 431 documented noxious weed sites, comprised of 6 species, within the Cottonwood analysis area (Table 3-22).

Table 3-22. Noxious Weed Species and Occurrences in Cottonwood Analysis Area

Scientific Name	Common Name	Documented Occurrences in HUC 6	ODA Designation*
Centaurea biebersteinii (syn. *C. stoebe, C. maculosa*)	spotted knapweed	2	B, T
Centaurea pratensis (syn.*C. debeauxii* ssp. *thuilleri*)	meadow knapweed	4	B
Centaurea solstitialis	yellow star-thistle	14	B, T
Cirsium arvense	Canada thistle	407	B
Isatis tinctoria	Dyer's woad	2	B
Linaria dalmatica	dalmatian toadflax	2	B, T

***Oregon Department of Agriculture (ODA) Noxious Weed Control Program: provides a statewide leadership role for coordination and management of state listed noxious weeds.**

A= a weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent.
B= a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties.
T= a priority noxious weed designated by the Oregon State Weed Board as a target for which the ODA will develop and implement a statewide management plan. "T" designated noxious weeds are species selected from either the "A" or "B" list.

Of these sites, 85 are located in the northern portion of the Keene Creek sub watershed, and outside of the Cascade Siskiyou National Monument, in areas potentially affected by proposed Cottonwood activities (Table 3-23). Surveys in 2010 would have confirmed the presence or absence of these populations within proposed unit boundaries, along roadsides associated with traveling to proposed units, or in lands neighboring proposed units.

Table 3-23. Noxious Weed Species and Occurrences in Areas Affected by Cottonwood Activity

Scientific Name	Common Name	Occurrences*	ODA Designation**
Centaurea biebersteinii (syn. *C. stoebe, C. maculosa*)	spotted knapweed	2	B, T
Centaurea solstitialis	yellow star-thistle	1	B, T
Cirsium arvense	Canada thistle	80	B
Cirsium vulgare	Bull thistle	Unknown	B
Linaria dalmatica	dalmatian toadflax	2	B, T

*****Species is under-reported in the GeoBob Weeds database, but is known to occur with frequency within analysis area, based on survey reports and professional knowledge.

****Oregon Department of Agriculture (ODA) Noxious Weed Control Program: provides a statewide leadership role for coordination and management of state listed noxious weeds.**

A= a weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent.
B= a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties.
T= a priority noxious weed designated by the Oregon State Weed Board as a target for which the ODA will develop and implement a statewide management plan. "T" designated noxious weeds are species selected from either the "A" or "B" list.

All of the documented noxious weed species are considered to be "B-Designated Weeds", as determined by the Oregon Department of Agriculture. Three of these species are also considered to be "T" species. There are no species from the Federal noxious weed list in the analysis area.

Oregon Department of Agriculture List B Noxious Weeds

Spotted knapweed (*Centaurea biebersteinii*, syn. *C. stoebe, C. maculosa*) is a native of Eurasia that easily invades areas with disturbance and causes a reduction in desirable plant communities. It can easily out-compete native plants for soil moisture and nutrients, and there is some evidence that knapweeds release chemical substances that can inhibit the growth and reproductive cycles of surrounding vegetation. The flowering period of this species can extend from June to October (Whitson et al., 1999). There are 79 documented sites of spotted knapweed on the Medford District BLM and 2 documented sites in the Cottonwood analysis area. However, 2010 surveys confirmed that there are no documented sites within areas proposed for ground-disturbing activity in the Cottonwood Forest Management Project.

Yellow star-thistle (*Centaurea solstitialis*) is an annual or biennial with a deep taproot. The yellow flower heads have spines, 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 seed bank for six to 10 years. Non-native honeybees are the main pollinator of yellow star-thistle, accounting for 50% of seed set. This weed is a native of Eurasia. It lowers forage value, increases farming and ranching costs, depletes soil moisture, displaces native plants, decreases plant diversity, and is toxic to horses. Successful control methods include chemical, biological, cultural, and mechanical (including pulling and mowing). There are 2,483 sites reported for the Medford District and one (1) documented site in the Cottonwood analysis area. However, 2010 surveys confirmed that there are no documented sites within areas proposed for ground-disturbing activity in the Cottonwood Forest Management Project.

Canada thistle (*Cirsium arvense*) is a colony-forming (primarily by asexual reproduction) perennial that is a native of Eurasia. This prickly rose-purple flowered plant can produce up to 1,500 wind transported seed per flowering shoot. Seed can remain viable in the soil for 20 years. Vegetative reproduction contributes to local spread and persistence. The large fibrous taproot can send out lateral roots as deep as three feet below the ground, from which shoots sprout up at frequent intervals. It also regenerates from root fragments less than one inch in length. Considered to be an aggressive weed, it thrives in areas with soil disturbance and is difficult to control. Flowering typically occurs during July and August (Whitson et al., 1999). There are 1,187 documented sites reported on the Medford District, and 514 documented sites within the Cottonwood analysis area. Of these sites, 41 occur within 100 feet of roads in the analysis area, and 10 documented sites are located within 100 meters of project units. Detrimental effects attributed to the establishment of Canada thistle include displacement of native species, decrease of plant diversity, reduced forage, and it serves as an alternate host for insects and pathogenic microorganisms that attack various crops. Successful control methods include biological, chemical, cultural, and some limited success with mechanical methods.

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 but is capable of long distance transport by wind and animals. 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. This weed is a native of Eurasia. There are 1,755 sites reported on the Medford District. However, this weed is under-documented within the GeoBob weed database, as active control methods are not usually employed. Based on recent records and field reconnaissance, BLMs botanist verified sites within the analysis area. Detrimental effects include displacement of native species, decrease of plant diversity, limits wildlife movement, and reduced forage. Bull thistle is eventually outcompeted by other vegetation for light, moisture, and nutrients.

Common St. Johnswort (*Hypericum perforatum*) is a perennial forb with extensive creeping rhizomes introduced from Eurasia as an ornamental plant. It is both a toxic and invasive weed. It can form dense stands in meadows, pastures, rangelands, disturbed sites, and along roads. It is toxic to livestock but also has human medicinal value. This weed is dramatically under-reported on the Medford District and active control methods, other than the release and monitoring of biological control agents, are not usually employed. Based on recent records and field reconnaissance, BLMs botanist verified sites within the analysis area, on both Federal and privately-owned lands. Detrimental effects include displacement of native species, decrease of plant diversity, and reduced forage. Successful control methods include biological and chemical.

Dalmatian toadflax (*Linaria dalmatica*) is a deep-rooted perennial that was introduced in the mid-1800s as an ornamental. It is a native of the Dalmatian Coast of Croatia in the Mediterranean region. It blooms from summer to fall, and out-competes desirable forage plants for moisture and nutrients. It thrives in arid rangelands, pastures, railways and roadsides. It spreads both by seeds and creeping lateral roots (asexually). There are 18 documented sites on the Medford District, and two sites within the Cottonwood analysis area. However, 2010 surveys confirmed that there are no documented sites within areas proposed for ground-disturbing activity in the Cottonwood Forest Management Project.

Himalayan (Armenian) blackberry (*Rubus armeniacus,* syn. *R. discolor*) is a perennial that blooms June to August. It is considered by the Oregon Department of Agriculture to be the most widespread and economically disruptive of all the noxious weeds in Western Oregon. An aggressive competitor, it effectively displaces native plant species, dominates riparian habitats upon introduction, and has a significant economic impact on right-of-way maintenance, agriculture, park maintenance and forest production. Capable of both sexual and asexual reproduction, it is able to quickly spread across landscapes or to jump great distances and create new infestations. Often, as plants reach an appropriate height, stem tips will bend down to the ground and establish a root system. Rhizomes also utilize adventitious rootstalks to enable the plant to spread from a single nutrient source. Long-term control methods are required for effective eradication. There are 676 documented sites of Himalayan blackberry on the Medford District; however, this species is under-reported due to the magnitude of occurrences and improbability of eradication in this area. This species, while reported in the HUC 6 analysis area, was not found in 2010 surveys to be located within units proposed for activity or associated roadsides.

Medusahead rye (*Taeniatherum caput-medusae*) is a grass that is native to the Mediterranean region of Eurasia, and was introduced to the United States in the late 1800s. The first recorded occurrence of the medusahead rye in Oregon was in Douglas County in 1887, and it can now be found throughout the West. An annual, it usually blooms May to June. Known for its ability to out-compete other grasses by extracting the majority of soil moisture before native perennial grasses have begun their growing season, it is also rich in silica and quickly becomes unpalatable as early as late spring. The stiff awns and hard florets can injure eyes and mouths of grazing animals. Medusahead rye also changes the temperature and moisture dynamics of the soil, which can greatly reduce seed germination of other species, and can create increased fuel for wildfires. Control methods usually involve chemical treatment; currently, there is no known biological control that can effectively manage for this species. There are 11 documented sites on the Medford District; however, medusahead rye is underreported District-wide and active control methods are not currently being used for management. Medusahead rye is documented in multiple areas throughout the Cottonwood analysis area, on both BLM and adjacent private lands in semi-wet and dry meadows. However, 2010 surveyors did not locate or document the species in the areas proposed for ground-disturbing activities.

b. Introduced Species

Introduced plants are species that are non-native to the ecosystem under consideration. Introduced plants may adversely affect the proper functioning condition of the ecosystem. Although not listed on the ODA Noxious Weed list, introduced species pose a threat to natural plant communities in the Cottonwood analysis area. Recorded surveys indicate that there are many non-native species located within the analysis area (Table 3-24).

Table 3-24. Noxious Weeds and Introduced Plants within Cottonwood Analysis Area

Scientific Name	Common Name	Lifeform	ODA List*	Frequency %
Agrostis capillaris	colonial bentgrass	graminoid		38.5%
Aira caryophylla	silver hairgrass	graminoid		46.2%
Anthemis cotula	stinking chamomile	forb		15.4%
Arabidopsis thaliana	mouseear cress	forb		7.7%
Arrhenatherum elatius	tall oatgrass	graminoid		15.4%
Avena fatua	wild oat	graminoid		15.4%
Bromus hordeaceus	soft brome	graminoid		38.5%
Bromus laevipes	woodland brome	graminoid		7.7%
Bromus tectorum	cheatgrass	graminoid		30.8%
Capsella bursa-pastoris	shepherd's purse	forb		7.7%
Cerastium fontanum ssp *vulgare*	big chickweed	forb		15.4%
Cirsium arvense	Canada thistle	forb	B	15.4%
Cirsium vulgare	bull thistle	forb	B	69.2%
Crepis capillaris	smooth hawksbeard	forb		23.1%
Cynosurus echinatus	bristly dogstail	graminoid		15.4%
Dactylus glomerata	orchard grass	graminoid		30.8%
Descurainia sophia	herb sophia	forb		7.7%
Elytrigia intermedia	intermediate wheatgrass	graminoid		30.8%
Elytrigia repens	quackgrass	graminoid		23.1%
Hordeum murinum	mouse barley	graminoid		23.1%
Hypericum perforatum	St. Johnswort	forb	B	69.2%
Hypochaeris radicata	hairy cat's ear	forb		30.8%
Lactuca serriola	prickly lettuce	forb		38.5%
Lepidium campestre	field pepperweed	forb		38.5%
Leucanthemum vulgare	oxeye daisy	forb		23.1%
Linum usitatissimum	common flax	forb		15.4%
Myosotis discolor	changing forget-me-not	forb		7.7%
Phleum pratense	timothy	graminoid		38.5%
Plantago lanceolata	narrowleaf plantain	forb		7.7%
Poa bulbosa	bulbous bluegrass	graminoid		69.2%
*Poa pratensis**	Kentucky bluegrass	graminoid		61.5%
Potamogeton crispus	curly pondweed	forb		15.4%
Ranunculus repens	creeping buttercup	forb		23.1%
Rumex acetocella	common sheep sorrel	forb		61.5%
Rumex crispus	curly dock	forb		23.1%
Sanguisorba minor	small burnet	forb		23.1%
Taraxicum officinale	dandelion	forb		53.8%
Tragapogon dubium	yellow salsify	forb		61.5%
Trifolium arvense	rabbitfoot clover	forb		7.7%
Trifolium repens	white lawn clover	forb		7.7%
Valeria nellalocusta	Lewiston cornsalad	forb		7.7%
Verbascum thapsus	wooly mullein	forb		7.7%
Vulpia myuros	rattail fescue	graminoid		15.4%

***Naturalized Introduced**

Frequency=percentage that species occurs on reported survey species lists

2. Environmental Effects

a. Alternative 1

Noxious Weeds and Introduced Plants

Without vegetation treatment, there would be no increase in disturbed ground and no increase in forest and woodlands with lessened canopy cover. Both are conditions that would enhance the opportunities for weed establishment. Weed populations would be limited to existing weed sites and spread would be limited to adjacent areas. New weed establishments would be limited to existing disturbed areas and areas of open canopy.

Noxious weed inventory and treatment would continue to occur. Treatments are scheduled by priority and occur based on the potential of the weed population to cause economic or environmental harm or harm to human health and as funding is available.

The potential remains for a stand replacement fire that would produce early seral habitat conditions that are favorable for weed and non-native plant establishment.

b. Alternative 2

Noxious Weeds and Introduced Plants

Vegetation treatment would increase the amount of disturbed ground and areas of less canopy cover. Both of these conditions favor noxious weeds and introduced plant establishment.

The creation of new roads also increases the risk of spread of weeds into otherwise weed-free areas on the landscape. Roads and streams promote the introduction of non-native species by acting as corridors or agents for seed dispersal, as well as providing for suitable habitat and reservoirs of propagules for future invasions. The increase of light availability, bare soil and road traffic is correlated to the increase of non-native species diversity and population numbers (Parendes and Jones, 2000; Gelbard and Belnap, 2003).

Project Design Features as described in Chapter 2 are incorporated into the Proposed Action to minimize the spread of noxious weeds and non-native plant species. Noxious weeds would not be spread as a direct result of executing the Proposed Action with the implementation of the Project Design Features. However, weed seed can be transported into the analysis area by human actions not associated with the project and also by wind, water, and animals.

Weed Risk Assessment Field Review and Field Reconnaissance Results

Surveys for all species on the Medford Weed list were conducted in 2010. Surveys were not conducted on private land but general occurrences were noted as casual observations. Noxious weeds are found throughout the analysis area on BLM and adjacent private lands, with populations varying in size and density. Noxious weed populations in the analysis area and on BLM are mostly associated with roads.

Class "A" Weeds

Those noxious weeds that are exotic (not native) to the State or area, and are of limited distribution or are unrecorded in the State or area and pose a serious threat to agricultural crops and rangelands in the State. Class A weeds receive highest priority. Management emphasis is complete control. These weeds approximate the Oregon Department of Agriculture List A weeds. A record check and surveys of areas that may be affected by the proposed project resulted in zero sites.

Class "B" Weeds
Those noxious weeds that are non-native (exotic) plant species that are of limited distribution or unrecorded in a region of the State but are common in other regions of the State and have been identified by the BLM or State as potentially harmful. Class B weeds receive second highest priority. Management emphasis is to control the spread, decrease population size, and eventually eliminate the weed population when cost-effective technology is available. These weeds approximate the Oregon Department of Agriculture List B weeds. A record check and surveys of areas that may be affected by the proposed project resulted in at least 692 sites of 12 species (Table 3-25) below. Bull thistle, Himalayan blackberry, Medusahead rye, and common St. Johnswort are under-reported on the Medford District.

Class "C" Weeds
Those noxious weed species (exotic or native) or undesirable plants not categorized in the previous categories. This classification receives the lowest priority. Management emphasis is to contain spread to present population size or decrease population to a manageable size. Class C Weed species commonly found on the Medford District BLM primarily include non-native annual grasses and non-native buttercup species, and are not typically managed for due to widespread occurrences and unmanageable populations sizes.

The following species are located within the Cottonwood analysis area, and fill the following criteria: they are exotic, have a high frequency from recent survey lists, and have the potential to cause ecological damage.

Table 3-25. Weeds Occurrences in Cottonwood Analysis Area

Scientific Name	Common Name	Weed Class	# Sites Counted	Frequency %
Centaurea solstitialis	yellow star-thistle	B	178	
Centaurea biebersteinii (syn. *C. stoebe, C. maculosa*)	spotted knapweed	B	5	
Cirsium arvense	Canada thistle	B	507	
Cirsium vulgare	bull thistle	B	unknown*	
Hypericum perforatum	St. Johnswort	B	unknown*	
Linaria dalmatica	dalmatian toadflax	B	2	
Bromus hordeaceus	soft brome	C	*	38.5
Bromus tectorum	cheatgrass	C	*	30.8
Cynosurus echinatus	bristly dogstail	C	*	15.4
Poa bulbosa	bulbous bluegrass	C	*	69.2
Poa pratensis(naturalized)	Kentucky bluegrass	C	*	61.5
Ranunculus repens	creeping buttercup	C	*	23.1

***Species are typically underreported and/or not cataloged in the District weed database. Exact population numbers are not available.**

Risk Assessment Factors

The likelihood of noxious weed species spreading into and within the analysis (Table 3-26) area is **low-moderate**; the project includes elements of both low and moderate risk factors. There are small but numerous Class B and C weed populations immediately adjacent to and within project roads and units. Project Design Features (PDFs) are included that would prevent the spread of noxious weeds due to direct effects of the proposed project. Weed populations within the affected area would be reduced for five years, per PDF and BLM Manual 9015. Weed spread and new establishments after five years are expected from unrelated seed transport mechanisms and relic populations. The budget to treat and monitor noxious weeds is not fixed for this project. There is no budget to treat Class C weeds; also, it is not permitted to use herbicides on Class C weeds. If the weeds are not treated due to insufficient budget or workforce, the likelihood of noxious weed species spreading into and within the analysis area would be high.

Table 3-26. Factor 1: Likelihood of Noxious Weed Species Spreading to Analysis Area

Level	Value	Description
None	0	Noxious weed species not located within or adjacent to the analysis area. Project activity is not likely to result in the establishment of noxious weed species in the analysis area.
Low	**1**	**Noxious weed species present in areas adjacent to but not within the analysis area. Project activities can be implemented and prevent the spread of noxious weeds into the analysis area.**
Moderate	**5**	**Noxious weed species located immediately adjacent to or within the analysis area. Project activities are likely to result in some areas becoming infested with noxious weed species even when preventative management actions are followed. Control measures are essential to prevent the spread of Noxious weeds within the analysis area.**
High	10	Heavy infestations of Noxious weeds are located within or immediately adjacent to the analysis area. Project activities, even with preventative management actions are likely to result in the establishment and spread of noxious weeds on disturbed sites throughout much of the analysis area.

The consequence of noxious weed establishment in the analysis area (Table 3-27) is **moderate**. The majority of the noxious weed populations in the affected areas are small and mostly associated with roads. With additional ground disturbing activities (road construction/re-construction, road renovation, and logging, burning) and operations that transport weed seed (log hauling, other road use); there is the potential to spread weeds into, within, and out of the analysis area. Also, unrelated activities can transport weed seed (e.g., wind, water, wildlife, hiking, OHV, etc.) into the newly disturbed areas. Weed infestations adversely affect a healthy functioning ecosystem.

Table 3-27. Factor 2: Consequence of Noxious Weed Establishment in Analysis Area

Level of Consequence	Value	Description of Possible Effects
Low to Nonexistent	1	None. No cumulative effects expected.
Moderate	**5**	**Possible adverse effects on site and possible expansion of infestation within analysis area. Cumulative effects on native plant community are likely but limited.**
High	10	Obvious adverse effects within the analysis area and probable expansion of noxious weed infestations to areas outside the analysis area. Adverse cumulative effects on native plant community are probable.

<u>Risk Rating</u>

Step 1 - Identify level of likelihood and consequence of adverse effects and assign values according to the following:

None-0 Low-1 Moderate-5 High-10

Step 2 - Multiply the level of Likelihood value (Table 3-26) by the Consequence value (Table 3-27) to determine Value.

Step 3 - Use the value resulting from Step 2 to determine Risk Rating and Action in Table 3-28 below.

Table 3-18. Risk Rating and Action

Value	Risk Rating	Action
0	None	Proceed as planned.
1-10	Low	Proceed as planned. Initiate control treatment on noxious weed populations that get established in the area.
25	Moderate	Develop preventative management measures for the proposed project to reduce the risk of introduction or spread of noxious weeds into the area. Preventative management measures should include modifying the project to include seeding the area to occupy disturbed sites with desirable species. Monitor area for at least 3 consecutive years and provide for control of newly established populations of noxious weeds and follow-up treatment for previously treated infestations.
50-100	High	Project must be modified to reduce risk level through preventative management measures including seeding with desirable species to occupy disturbed sites and controlling existing infestations of noxious Weeds prior to project activity. Projects must also provide for control of newly established populations of Noxious weeds and follow-up treatment for previously treated infestations.

If weed work is funded, the **weed risk rating under Alternative 2 would be Low to Moderate**.

With suitable weed habitat increasing initially as a consequence of the Proposed Action, total exclusion of new weed establishments is unattainable due to indirect effects. Particularly vulnerable areas would be new road construction (1.5 miles permanent, 0.6 temporary), landings (less than ¼ acre each), road renovation/maintenance sites (approximately 0.53 miles) as listed in Chapter 2 (Table 2-3), yarding corridors, and openings created for mistletoe and pine areas (less than ¼ acre each). With adequate funding for vegetation inventory and weed treatment, existing noxious weed population sizes are expected to decrease and new establishments are expected to be minimized.

K. RECREATION

1. Affected Environment

Recreation use across the Medford District BLM is described in the Medford District Proposed Resource Management Plan/Environmental Impact Statement. BLM lands fall into two recreation management categories, special recreation management areas and extensive recreation management areas. Extensive recreation use areas are all BLM-administered lands not included in Special Recreation Management Areas identified in the RMP (PRMP/EIS, p. 3-71) that provide for dispersed recreation opportunities across the Medford District BLM. Special Recreation Management Areas are those areas identified with high concentrations of recreation use and developed facilities.

Dispersed Recreation
An estimated 799,243 acres provide for dispersed recreation use across the Medford District (PRMP/EIS p. 3-84). Much of the Cottonwood project area is described by the RMP as extensive recreation use areas (approximately 444 acres) that provide for dispersed recreation. These areas are characterized as low use recreational areas where no developed or designated recreational sites or activities exist. Dispersed recreation in the project area includes hiking, horseback riding, sightseeing, OHV activities, fishing, driving for pleasure, hunting, target practice, dispersed camping, and vegetative gathering.

Hyatt-Howard Special Recreation Management Area
The majority of the Cottonwood Project Area (663 acres) is within the Hyatt-Howard Special Recreation Management Area (SRMA). The Hyatt-Howard SRMA is approximately 17,000 acres and encompasses the lakes, facilities, and slopes around Hyatt Lake and Howard Prairie Reservoir on the Dead Indian Plateau, approximately 18 miles east of Ashland, OR.

SRMAs are managed to realize their potential to provide appropriate/prescribed recreational experience opportunities while protecting sensitive resources, increasing public awareness, reducing conflicts and diversifying the regional economy (USDI 1995). Due to its year around accessibility and many resource values, there are numerous outdoor recreational opportunities available in the SRMA. A heavily used multi-use winter trails system (32 miles), open to both motorized and non-motorized uses, exists within the Hyatt-Howard SRMA. Based on field observation, administrative file documentation and comments from the public the major recreation activities that people take part in include hiking, equestrian use, Nordic Skiing, snowmobiling, fishing, camping, hunting, and sledding at Table Mountain Winter Play Area within the SRMA.

Pacific Crest National Scenic Trail (PCNST)

A portion of project Units 20-4, 21-2, 21-3, 21-4, 21-5, 30-1, 32-4A, 32-4B, and 32-5 are within approximately 50 – 200 ft. of the Pacific Crest National Scenic Trail (PCNST). The PCNST was established through the National Trails System Act (1968) "*in order to provide for the ever-increasing outdoor recreation needs of an expanding population and in order to promote the preservation of, public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the Nation*". The PCNST passes through California, Oregon and Washington from Mexico to Canada. Use of the PCNST is limited to hiking and stock use. The Medford District BLM manages 42.5 miles of the PCNST.

On the Medford District BLM, the Recreation Area Management Plan for the Pacific Crest National Scenic Trail Special Recreation Management Area (1998) provides guidance for the management of the PCNST. The Recreation Area Management Plan for the PCNST calls for no timber harvest within the 100-foot wide Special Recreation Management Area corridor (50' from trail centerline either side of the trail), except for the removal of safety hazard trees. As such, the boundaries for project units are outside of the PCNST 50' no cut buffer.

In order to further minimize impacts to the PCNST and to protect and preserve the aesthetic and social characteristic within the trail corridor the BLM undertook a collaborative process with the Pacific Crest Trail Association (PCTA) in which project units were individually visited and a no cut buffer was determined based on various landscape components and the projects potential effect on PCNST users. Landscape elements such as topography, canopy cover, tree density, species composition, tree health, and vegetation screening that affect the view of the PCT user were used to determine a no cut buffer on a unit by unit basis. Specifically the group worked in a collaborative fashion to determine based on the above mentioned factors, the adequate no cut buffer distance needed to minimize or eliminate the visual effects of the forest management project on the trail user. The outcomes from this process are described in Chapter 2 as mitigation measures that have been adopted by the Responsible Official (Chapter 2, pgs. 2-32-34). The groups also worked to identify solutions to minimize impacts to the trail tread itself. Equipment associated with the project would likely cross the PCNST, other than where the PCNST crosses at an existing road, between Units 32-5A and 32-5B. This is due to the absence of existing roads to utilize as crossing points from one project unit to another project unit.

Environmental Consequences

a. Alternative 1

In the No-Action Alternative, recreation opportunities would remain unchanged. Dispersed recreational activities such as hiking, horseback riding, sightseeing, OHV activities, fishing, driving for pleasure, hunting, target practice, dispersed camping, and vegetative gathering would continue. Activities on the PCNST and within the Hyatt-Howard SRMA would remain unchanged.

b. Alternative 2

Dispersed types of recreation within the Cottonwood project area would receive adverse short-term intermittent impacts as a result of the Cottonwood Proposed Action. Recreational users of the area would encounter log trucks, equipment, noise from machinery, and some traffic congestion. However, some of the safety risks associated with project activities would be mitigated through increased signage on major travel routes. The types of prescriptions called for in each unit of the Cottonwood Project would not change the overall character of the landscape from the point of view of the average recreationist and therefore would not impact the desirability of the area for dispersed recreation in the long-term. Creation of skid roads and trails along with opening up of the forest could provide an opportunity for increased OHV use in the area. Short term impacts to recreation use at the developed and designated trails (PCNST and Multi-Use Winter Trails within the Hyatt-Howard SRMA) near project units would occur.

Hyatt-Howard SRMA

The majority of the Cottonwood Project Area (663 acres) is within the Hyatt-Howard Special Recreation Management Area (SRMA). Much of the SRMA has experienced timber harvest in the past. Visual evidence of these past harvests remain on the landscape and it is likely that the quality of recreation within the SRMA would not be diminished as realized by the average person recreating in the Hyatt-Howard SRMA in the long-term. Short term effects to users of the SRMA would occur as users of the SRMA will likely encounter machinery, noise from the projects, and visual evidence of the project (i.e., freshly cut stumps, logpiles). As part of the project, 1.9 miles of road will be decommissioned. A portion of the 1.9 miles of road scheduled to be decommissioned serves as a multi-use trail route (open to both non-motorized use such as Nordic Skiing and motorized uses such as snowmobiling) during the winter season.

Although the road would be decommissioned, over the snow travel would still be allowed and the route would still serve as a multi-use winter trail. During the project, a snow depth of approximately 4 inches is left on top of roads that will be used by project equipment. A snow depth of 4 inches is sufficient to allow for the use of snowmobiles and cross country skis on winter routes that also serve as roads. Signs would also alert drivers associated with the project of the possibility of encountering foot traffic near the Table Mountain Winter Play Area. If winter logging is to occur on weekends or during holiday breaks (including designated holiday breaks for the local Rogue Valley public schools) the purchaser would be required to post a flagger near the Table Mountain Sledding Hill in order to provide for pedestrian safety. A sign will alert recreationist of the logging activity when passing from the Buck Prairie Nordic system to the Multi-use trails system on Buck Prairie Rd. Following the project and over time recreational use of the area will likely not be impacted as a result of the Cottonwood project.

Pacific Crest National Scenic Trail

A portion of the boundaries of Units 20-4, 21-2, 21-3, 21-4, 21-5, 32-4A, 32-4B, and 32-5 are within approximately 50-200 ft. of the (PCNST). The silvicultural prescription for these units would use selective thinning to improve tree growth and vigor while maintaining 40- 60 percent canopy cover. This type of thinning, which retains large trees and substantial canopy cover, along with the adopted project mitigation measures resulting from a collaborative process between the BLM and the Pacific Crest Trail Association (Chapter 2, pgs. 2-32 to 34) which in most cases extends the no cut buffer from 50’ to 170’ in most units along the trail, allows for the persistence of the existing landscape character as observed from the PCNST. Therefore, long-term impacts to the trail and the trail user would not be realized.

In the short-term, intermittent negative impacts as a result of the Cottonwood Project would occur. PCNST users would encounter log trucks, equipment, and noise from machinery. In Unit 32-5 designated skid trail crossings of the PCNST would occur. As mitigation, this skid trail crossing would be perpendicular to the trail and would not follow the trail tread surface. Following the project these skid trail crossings would be rehabilitated by matching the trail tread surface as closely as possible to the PCNST tread surface on both sides of the skid trail crossing and using slash to camouflage the skid trail off of the PCNST tread surface. To improve the safety of PCNST users, signs would be placed at the trail crossing.

L. VISUAL RESOURCE MANAGEMENT

1. Affected Environment

Medford District BLM-administered lands have been classified under a Visual Resource Management (VRM) Inventory Class system established by the BLM "Visual Resources are the land, water, vegetation, structures, and cultural modifications that make up the scenery of BLM-administered land" (RMP/EIS p. 3-70). The criteria used to determine VRM classes were scenery quality ratings, public sensitivity ratings and distance zone-seen area mapping criteria.

Approximately 60 percent of the viewsheds in the Medford District RMP planning area have fragmented land ownership patterns with private lands dominating the viewed landscape (RMP/EIS p. 3-70). Project units in the Cottonwood Project Area are classified as VRM Class II and Class III (RMP Map 10), with most of the project units classified as VRM Class II. Units 17-2, 17-3, 17-4, 17-5, 17-6, 20-1, and 20-2 are classified as VRM Class III.

Class II Objective
The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III Objective
The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

2. Environmental Consequences

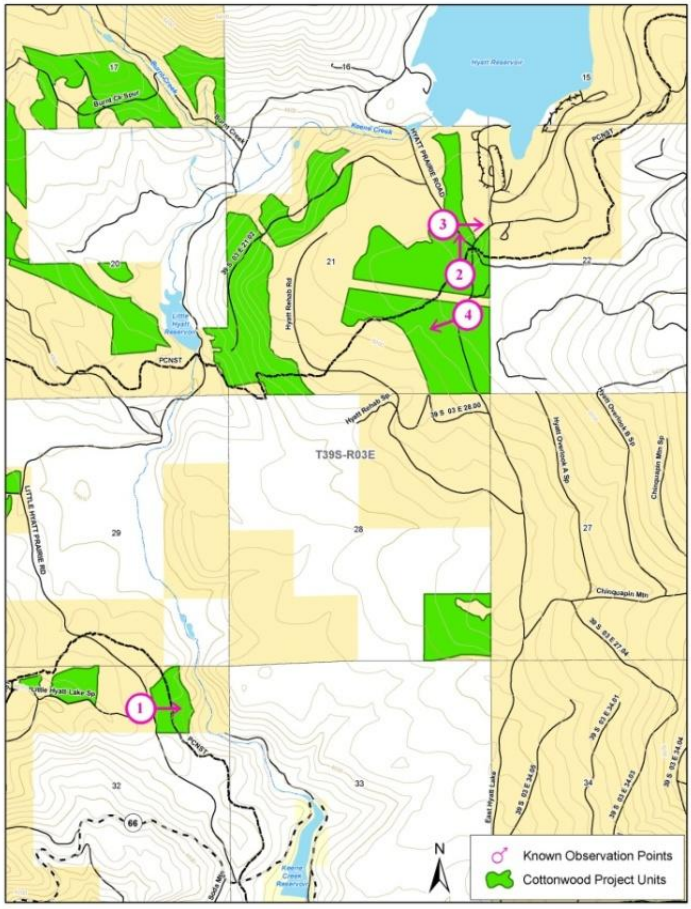
a. Alternative 1

Visually, the area associated with project would remain the same. There would be no changes to the existing landscape.

b. Alternative 2

Resource development patterns that disrupt the land surface (road construction) and vegetative patterns (vegetation thinning) can have adverse effects on visual resources (RMP/EIS p. 4-86). As described above, units of the Cottonwood Project are classified as VRM Class II or Class III (RMP Map 10), with the majority of these units classified as VRM Class II. The management objective of this class is to retain the existing character of the landscape.

Map 3-5. Location of Known Observation Points (KOP)



In accordance with the 1995 RMP, a visual resource contrast rating system analysis was completed for the Cottonwood Forest Management Project. Four Known Observation Points (KOPs) near project Units 32-5, 21-2, 21-5, and 21-3 (Map 3-5) in lands classified as VRM Class II management areas were used to complete the visual resource contrast rating system analysis. Views of the landscape from the major roads of travel in the project area along with views from the PCNST were used to determine if any changes in landscape character from the point of view of a casual observer would be observed.

KOP 1

KOP 1 is located off of Little Hyatt Prairie road near where this road intersects with Road 39-3E-32. The landscape was viewed looking southeast in the direction of the PCNST. This location was chosen as this route likely receives higher use than other secondary routes in the area as it is used to reach the PCNST, Little Hyatt Reservoir, and residences in the area of Little Hyatt Reservoir. A vehicle traveling down this portion of Little Hyatt Prairie road will typically be traveling between 20 and 35 mph. At this speed and due to the projects prescription that leaves at least 40% canopy cover, it is likely that the attention of the casual observer would not be captured by the resulting landscape after the project is complete (Visual Contrast Rating Worksheet.

Figure 3-5. KOP 2 on the PCNST Looking North

KOP 2

KOP 2 is located on the PCNST near Hyatt lake Recreation Complex. This portion of the PCNST is popular, receiving use from the campground as well as for day use trips on the PCNST between Hyatt Reservoir and Little Hyatt Reservoir. The landscape was viewed from the point of view of a hiker traveling north, viewing the forest to the north. The PCNST has a no-cut buffer of 100’ (50’ either side of the trail centerline). The effects of this no-cut buffer were taken into account when completing the Visual Contrast Rating Worksheet (VCRW).

The no-cut buffer was flagged in at the time the VCRW was completed (Figure 3-5). Orange/red flagging visible from the trail delineates the extent of the no-cut buffer. From this KOP the Cottonwood Project would have a weak degree of contrast on the element of line as there would be a reduction in the bold vertical lines caused by the presence of visually dominant tree trunks. There would be a moderate degree of contrast on the element of form when looking at the vegetation as a result of the project. The project would result in slightly less complex vegetation patterns and a loss of some of the visually dominant features (trees) when compared to the current landscape. There would also be less internal contrast and a loss of some of the complex spatial variability. This results in a moderate degree of contrast visually when considering the element of line, following completion of the project. It is likely that the results of the Cottonwood project would be seen but would likely not attract the attention of the casual observer. In response to public comments received, mitigation measures (described in Chapter 2– pages 2-32 to 34) are proposed, that if selected, would extend the current no-cut buffer on the PCNST to 400 feet and would remove some project units or portions of units near the PCNST.

Figure 3-6. KOP 3 looking east from Hyatt Prairie Road toward Hyatt Lake Recreation Complex

KOP3

KOP 3 is located on Hyatt Prairie road near the southwestern portion of the Hyatt Lake Recreation Complex. The landscape was viewed from KOP 3 looking east into project Unit 21-5. This KOP was chosen as Hyatt Prairie road is a well-traveled road within the area of the proposed project. A vehicle traveling down this portion of Hyatt Prairie road will typically be traveling between 25 and 40 mph. At this speed and due to the treatment prescribed for Unit 21-5, which leaves at least 40 percent canopy cover, it is likely that the attention of the casual observer would not be captured by the resulting landscape after the project is complete (Visual Contrast Rating Worksheet). There would be a moderate degree of contrast resulting from the project to the elements of form and line. There would also be a weak degree of contrast to the element of line as a result of the project. A person standing on the road and viewing the landscape would most likely notice a low degree of change to the landscape after the completion of the project but the attention of the casual observer would not be drawn to the landscape following the project as a result in this change to the landscape character.

KOP4

KOP 4 is located on East Hyatt Lake Rd. The landscape is viewed looking west into the Cottonwood project area in Unit 21-3. This KOP was chosen as East Hyatt Lake road is a well-traveled road within the area of the proposed project. A vehicle traveling on this portion of East Hyatt Lake Rd will typically be traveling at speed of between 25 and 40 mph. At this speed and due to the projects prescription that leaves at least 40% canopy cover, it is likely that the attention of the casual observer will not be captured by the resulting landscape after the project is complete (Visual Contrast Rating Worksheet). There would be a moderate degree of contrast resulting from the project to the elements of form and line. There would also be a weak degree of contrast to the element of line as a result of the project. A person standing on the road and viewing the landscape would most likely notice a low degree of change to landscape character after the completion of the project; however it is unlikely that the change in the landscape would attract the attention of the casual observer.

It was determined that Alternative 2, the Cottonwood Proposed Action, would meet Visual Resource Management objectives. The level of change to the landscape character as a result of the project would be low. The changes in landscape character as a result of the project would not attract the attention of the casual observer. An observer living in the area or more familiar than the casual observer with the landscape may notice the changes in character of the landscape as a result of the project. However, the project as proposed in Alternative 2 would meet Visual Resource Management objectives of the 1995 Medford District RMP.

M. CARBON STORAGE

1. Background

The purpose of the this section is to provide a basis for the decision maker to determine whether the proposed action or alternatives are likely to significantly impact the human environment with respect to greenhouse gas levels (i.e., atmospheric carbon levels). Changes in greenhouse gas levels affect global climate (Forster, et al. 2007, 129-234) which is incorporated here by reference, reviewed scientific information on greenhouse gas emissions and climate change and concluded that human-caused increases in greenhouse gas emissions are extremely likely to have exerted a substantial warming effect on global climate. Because forests store carbon, they affect the atmospheric concentrations of carbon dioxide, a greenhouse gas. Forest management can change the amount of carbon stored in a forest.

Scientific knowledge on the interrelationship between greenhouse gas levels and climate change is rapidly changing, and substantial uncertainties and several key limitations remain. One limitation is the inability of current science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. This limitation was identified by the U.S. Geological Survey in a May 14, 2008 memorandum to the U.S. Fish and Wildlife Service, which summarized the latest science on greenhouse gases. That memorandum is incorporated here by reference.

Definitions:

Forest ecosystem carbon pools – live trees, standing dead trees, understory vegetation, coarse woody debris, forest floor organic layer, and soil organic carbon (Smith, Heath, & Birdsey, 2006).

Disposition of carbon in harvested wood – defines where the carbon from harvested wood is stored and how it may be emitted (Smith, Heath, & Birdsey, 2006).

Products in use- End use products that have not been discarded or otherwise destroyed, examples include residential and nonresidential construction, wooden containers, and paper products.

Landfills- Discarded wood and paper placed in landfills where most carbon is stored long-term and only a small portion of the material is assumed to degrade, at a slow rate.

Emitted with energy capture - Combustion of wood productions with concomitant energy capture as carbon is emitted to the atmosphere.

Emitted without energy capture- Carbon in harvested wood emitted to the atmosphere through combustion or decay without concomitant energy recapture.

Sawlog- A log meeting minimum standards of diameter, length, and defect that is used in the manufacture of lumber.

Project Area – where action is proposed, such as the actual forest stands where thinning is proposed.

Pulpwood - Roundwood, whole-tree chips, or wood residues that are used for the production of paper, orientated stand board, particleboard or biomass for energy production.

Metric tonne (MT) - a measurement of weight. A tonne is equal to 2200 pounds.

2. Methodology

The information contained in the Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management (USDI, 2008) examined recent and applicable science regarding climate change and carbon storage. That analysis concluded that effects of forest management on carbon storage could be analyzed by quantifying the change in carbon storage in live trees, storage in forests other than live trees, and storage in harvested wood. The discussion in Volume I, Pages 220-224; Volume II, Pages 537-543, and Volume III, Appendices, Pages 28-30 are relevant to the effects analysis for this project and are incorporated by reference.

The analysis of carbon stored in harvested wood in the ***2008 FEIS*** used a factor for converting board feet of harvest wood to mass of carbon from Smith et al. 2006, p. 35. Based on information developed after the ***2008 FEIS***, this factor has been refined to better account for regionally-specific conditions and the fraction of harvested volume that is typically milled into solid wood products and into processed wood products. Harvest volumes were converted to cubic feet, converted to pounds of biomass, and then to carbon content, yielding an overall conversion factor of 1,000 board feet = 1.326 tonnes of carbon. Of this total amount of carbon in harvested wood, 36.2% of harvest volume is considered as sawlogs and 63.8% as pulpwood (USDA, 1999) for evaluation using the storage rates over time from Smith et al., 2006, p. 27. The improved conversion factor is used in this analysis to evaluate the amount of carbon stored in harvested wood. Information on the development of this conversion factor is on file in the BLM office and is available for review upon request and is incorporated here by reference (R. Hardt, personal communication, 11/6/09, on file in the Medford BLM Office).

For the Cottonwood project area the conversion factor has been adjusted further to reflect the mixed species composition of the stands to be treated. Rather than using the Douglas-fir factor of 35 pounds of biomass per cubic foot, 29 pounds per cubic foot was used (mixed conifer stands), with a conversion factor of 1,000 board feet = 1.098 tonnes of carbon.

Assumptions:

- In the absence of large disturbance events (wildfire, severe blowdown or insect epidemics) carbon storage on about 70 percent of BLM-administered lands on the Medford District would increase. On the remaining 30 percent of BLM-administered lands designated as Matrix, the RMP/EIS assumes an annual timber harvest of 3000 acres. On those acres, timber harvesting would decrease carbon storage levels at varying rates and for varying lengths of time dependent upon the amount of vegetation removed and how quickly re-growth occurs. Because the vast majority of BLM-administered lands are not allocated to intensive or restricted forest management it is expected that continued vegetative growth on those lands would lead to more carbon capture and storage than the amount of carbon lost from timber harvesting, vegetative respiration or disturbance events.
- White fir is the dominant species that would be harvested. Ground based logging systems would be used with sawlogs the primary product.
- The carbon calculations are estimates based upon data from a representative stand of each silvicultural system proposed. The values are not absolute rather they are generalized estimates that allow a comparison between alternatives.
- Future management may occur within the next 20-30 years in the proposed thinning and density management stands.
- The carbon storage and emission analysis period is based upon current stand age. For this project, a 20 year analysis period was used for selective thinning-60% and selective thinning-40%. Harvest operations (cutting, yarding and hauling) result in short term carbon emissions. For the analysis area for silviculture, an average harvest volume of 10,000 board feet per acre was used to estimate a total emission of about 45 tonnes of carbon from harvest operations (Salem District, 2010). This value is common to Alternative 2.

3. Affected Environment

The 2008 FEIS described current information on predicted changes in regional climate (pp. 488-490), and is incorporated here by reference. That description concluded that the regional climate has become warmer and wetter with reduced snowpack, and continued change is likely. That description also concluded that changes in resource impacts as a result of climate change would be highly sensitive to specific changes in the amount and timing of precipitation, but specific changes in the amount and timing of precipitation are too uncertain to predict at this time. Because of this uncertainty about changes in precipitation, it is not possible to predict changes in vegetation types and condition, wildfire frequency and intensity, stream flow, and wildlife habitat. This analysis therefore does not attempt to predict changes in the project area due to existing or potential future changes in regional climate.

In the Cottonwood project area, mixed conifer, white fir, and ponderosa pine stands that are 70 to 173 years old are proposed for treatment. Within these forests, the quantity of stored carbon varies from stand to stand and is influenced by site quality and the amount, type and size of vegetation present. The current amount of vegetation defines the existing levels of on-site carbon and is considered the baseline amount that would be affected by management actions.

4. Environmental Consequences

a. Alternative 1

This alternative would not implement the Medford District RMP management direction for general forest management areas. No timber management actions would occur.

No forest vegetation would be removed; the current amount of on-site carbon would not be affected. In the long-term, it is expected that continued growth of forest vegetation would result in the increase of stored carbon. Limited reductions in carbon would happen as periodic mortality or decomposition from natural processes occurs. In the absence of catastrophic disturbance events, it is expected that continued forest growth would capture and store more carbon than would be lost from natural processes. The No-Action alternative would result in 1,108 acres not being thinned. This would result in a net carbon storage increase of about 41,648 tonnes over the next 20 years.

Table 3-29. Alternative 1 - No Action: Carbon Emissions and Storage – 20-Year Analysis Period

Silvicultural Treatment	Acres	1 Emissions 2010-2030	2 Live tree storage current conditions 2010	3 Storage 20 year analysis period	4 Net change live trees	5 Harvested wood storage 2030	6 Total storage increase	7 Net Carbon (Storage or Emission)
ST-60%	456	0	38760	55632	16872	0	16872	16872
ST-40%	652	0	54116	78892	24776	0	24776	24776
Total	1108	0	92876	134524	41648	0	41648	41648

- The average thinning stand age is about 128 years old. RMP direction provides for another entry when the stand reaches culmination of mean annual increment (CMAI). A 20 year analysis provides the timeframe until CMAI is reached.
- A representative Selective Thinning /NFR 60% stand (T39S 3E Section 05, OI 012) was modeled in Organon (Hann 2003) to derive decadal cubic foot volume growth rates. The calculated value is applied as an average for all Selective Thinning/NFR 60% stands. The thinning unit selected for analysis is 17 acres and has a current volume of 41,981bdft/acre.

- A representative Selective Thinning /DSP 40% stand (T39S 3E Section 17, OI 025) was modeled in Organon (Hann 2003) to derive decadal cubic foot volume growth rates. The calculated value is applied as an average for all Selective Thinning /DSP 40% stands. The thinning unit selected for analysis is 94 acres and has a current volume of 40,675bdft/acre.

b. Alternative 2

This alternative implements the Medford District RMP management direction for general forest management areas. This alternative applies silvicultural treatments that would increase landscape resiliency to environmental disturbances and increase stand structural diversity. Dispersal and nesting, roosting, and foraging habitat within active spotted owl home ranges would be treated and maintained.

Table 3-30. Proposed Silvicultural Treatments in Alternative 2:

Cottonwood Silvicultural Treatment	Treatment Acres
Selective Thinning (ST) – Nesting Roosting and Foraging 60%	456
Selective Thinning (ST) – Dispersal Habitat 40%	652
Total	1,108

It is estimated that about 5,066 board feet per acre of harvested wood would be removed by selectively thinning to 60% canopy cover in NRF stands; 5,066 board feet contains approximately 6 tonnes of carbon. The amount of live tree carbon in selective thinning NRF stands would be reduced from approximately 85 tonnes per acre to 75 tonnes per acre, resulting in the transfer of 10 tonnes of live tree carbon to other pools (on-site dead woody debris, lumber, wood products discarded to landfills, biomass, pulpwood). A carbon analysis period of 20 years is used.

It is estimated that about 6,883 board feet per acre of harvested wood would be removed by selectively thinning to 40% canopy cover in DSP stands; 6,883 board feet contains approximately 8 tonnes of carbon. The amount of live tree carbon in selective thinning DSP stands would be reduced from approximately 83 tonnes per acre to 69 tonnes per acre, resulting in the transfer of 14 tonnes of live tree carbon to other pools (on-site dead woody debris, lumber, wood products discarded to landfills, biomass, pulpwood). A carbon analysis period of 20 years is used.

Harvested Wood Carbon Emissions

Selective Thinning/NRF (60%), 20 year analysis period:
Wood harvested from this treatment would have a short term (post-harvest to 10 years) carbon emission of 1.4 tonnes/acre. In the long-term (11-20 years), the carbon emitted is .22 tonnes/acre. For the 20 year analysis period, carbon emissions from the harvested wood are about 1.6 tonnes/acre. The balance of the carbon, 5 tonnes/acre would remain stored in products still in use or in landfills, or emitted with energy capture.

Selective Thinning/DSP (40%), 20 year analysis period:
Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of about 2 tonnes/acre. In the long-term (11-20 years), the carbon emitted is 0.30 tonnes/acre. For the 20 year analysis period, carbon emissions from the harvested wood are about 2.3 tonnes/acre. The balance of the carbon, 6 tonnes/acre would remain stored in products still in use or in landfills, or emitted with energy capture.

Carbon Dioxide Emission

The total carbon dioxide emitted during the 20 year analysis periods is considered negligible in the context of total U.S. carbon dioxide emissions of 6 billion metric tons (DOE, 2009).

Selective Thinning/NRF (60%) in this alternative would result in the emission of about 1.6 tonnes of carbon per acre or about 6 tonnes of carbon dioxide per acre[3]during the 20 year analysis period. Thinning 456 acres would result in the emission of 2,736 tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000005 percent of current U.S. emissions.

Selective Thinning/DSP (40%) in this alternative would result in the emission of about 2.3 tonnes of carbon per acre or about 8 tonnes of carbon dioxide per acre during the 20 year analysis period. Thinning 652 acres would result in the emission of 5216 tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000009 percent of current U.S. emissions.

Live Tree Carbon Storage

Continued forest growth following Selective Thinning/NRF (60%) would increase carbon storage approximately 1,244 cubic feet per acre per decade (Hann, 2003) which is equal to about 15.2 tonnes of stored carbon per acre per decade or 1.5 tonnes per year. Within 2 years after thinning the carbon emission level (1.6 tonnes/acre) for the 20 year analysis period would be offset by carbon storage in tree growth.

Continued forest growth following Selective Thinning/DSP (40%) would increase carbon storage approximately 1168 cubic feet per acre per decade (Hann, 2003) which is equal to about 14.3 tonnes of stored carbon per acre per decade or 1.4 tonnes per year. Within 2years after thinning the carbon emission level (2.3 tonnes/acre) for the 20 year analysis period would be offset by carbon storage in tree growth.

Table 3-31. Alternative 2: Carbon Emissions and Storage – 20 Year Analysis Period – Thinning

Silvicultural Treatment	Acres	Emissions 2010-2030	Live tree storage current conditions 2010	Storage 20 year analysis period	Net change live trees	Harvested wood storage 2030	Total storage increase	Net Carbon (Storage or Emission)
ST-60%	456	730	38760	48792	10032	2280	12312	11582
ST-40%	652	1500	54116	62592	8476	3912	12388	10888
Total	1108	2230	92876	111384	18508	6192	24700	22470

d. Summary – Comparison of Alternatives

Table 3-32. Carbon Emissions and Storage by Alternative - 20 Year Analysis Period

Alternative	Acres	Emissions 2010-2030	Live tree storage current conditions 2010	Storage 20 year analysis period	Net change live trees	Harvested wood storage 2030	Total storage increase	Net Carbon (Storage or Emission)
1	1,108	0	92,876	134,524	41,648	0	41,648	41,648
2	1,108	2,230	92,876	111,384	18,508	6,192	24,700	22,470

The No-Action Alternative would result in greater net carbon storage over the 20 year analysis period than Alternative 2 by approximately 19,178 tonnes.

[3] To convert carbon to carbon dioxide multiply carbon by 44/12 (the ratio of the molecular weight of carbon dioxide to carbon).

N. OTHER EFFECTS

1. Air Quality

Prescribed burns are conducted within the limits of a Burn Plan which describes prescription parameters so that acceptable and desired effects are obtained. Smoke produced from prescribed burning is the major air pollutant of concern.

Fuels management activities generate particulate pollutants in the process of treating natural and activity related fuels. Smoke from prescribed fire has the potential to effect air quality within the project area as well as the surrounding area. The use of prescribed fire for ecosystem restoration can produce enough fine particulate matter to be a public health and/or welfare concern. Fine particulates in smoke can travel many miles downwind impacting air quality in local communities, causing a safety hazard on public roads, impairing visibility in class I areas, and/or causing a general nuisance to the public. If properly managed, most adverse 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%) remains in intermittent contact with the ground. This impact is dissipated by dispersion, surface wind turbulence and particle deposition on vegetation and the ground. The risk of impact on the human environment differs between the two portions of smoke plume.

Smoke Aloft

Until recent decades, the impact of the lifted portion of smoke was ignored because it seemed to "just go away." These impacts are generally not realized until the mechanisms of dispersal bring the dispersed smoke back to ground level. Because the smoke has already dispersed over a broad area, the intensity of ground-level exposure is minimal. The duration of exposure may include the better part of a day, however, and the area of exposure may be large.

Ground Level Smoke
Unlike smoke aloft, the potential for ground level smoke to create a nuisance is immediate. This part of the smoke plume does not have enough heat to rise into the atmosphere. It stays in intermittent contact with the human environment and turbulent surface winds move it erratically. Also in comparison to smoke aloft, human exposure is more intense, relatively brief (a few hours) and limited to a smaller area. Smoke aloft is already dispersed before it returns to the human environment while ground level smoke must dissipate within that environment. Dissipation of ground level smoke is accomplished through dispersion and deposition of smoke particles on vegetation, soil and other objects.

Smoke Sensitive Receptor Area (SSRA)
The population centers of Grants Pass, Medford/Ashland (including Central Point and Eagle Point), and Klamath Falls in the past were in violation of the national ambient air quality standards for PM 10 and were classified as nonattainment for this pollutant. The nonattainment status of these communities was not attributable to prescribed burning. Major sources of particulate matter within the Medford/Ashland SSRA are smoke from woodstoves and dust and industrial sources. The contribution to the nonattainment status of particulate matter from prescribed burning was 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.

2. Environmental Justice

This project was reviewed for the potential for disproportionately high or adverse effects on minority or low income populations; no adverse impacts to minority or low income populations would occur.

CHAPTER 4 - PUBLIC PARTICIPATION

A letter briefly describing the Proposed Action and inviting comments was mailed to adjacent landowners, interested individuals, organizations, and other agencies on October 29. 2010. The BLM led a field trip to the project area on November 6, 2011. The purpose of the field trip was to view and discuss the project proposal in the field with interested individuals and organizations. Comments were originally requested to be received by December 1, 2010; the scoping period was extended to December 30, 2010 in response to a request from the public for additional time to prepare their comments. Comment letters received were reviewed by the interdisciplinary team of specialists and by the Responsible Official, the Ashland Resource Area Field Manager. Issues identified to be relevant to the analysis of the proposed action were incorporated into the list of relevant issues in Section G, 1, Relevant Issues. The scoping letter requested that people contact the BLM using an attached Interest Response Form or by sending a comment letter if they wanted to be updated as the project progressed. A copy of this Environmental Assessment was sent to those individuals and organizations who responded to the scoping notice. The following organizations were among those who received a copy of the Cottonwood Forest Management Project Environmental Assessment.

Organizations and Agencies
American Forest Resource Council
Association of O&C Counties
Cascadia Wildlands Project
Center for Biological Diversity
Hannon Library Southern Oregon University
Jackson Co. Commissioners and Courthouse
Klamath Siskiyou Wildlands Center
Lone Rock Timber Management Co.
Oregon Wild
Pacific Crest Trail Association - Northern California/Southern Oregon
Soda Mountain Wilderness Council
The Wilderness Society

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