88064522

Environmental Impact Statement

for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management Districts

of Salem, Eugene, Roseburg, Coos Bay, and
Medford Districts, and the Klamath Falls Resource
Area of the Lakeview District

Volume I

Salem, Eugene, Roseburg, Coos Bay, Medford, and Klamath Falls Offices

August 2007

BLM

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Oregon State Office
P.O. Box 2965
Portland, Oregon 97208

IN REPLY REFER TO:
1610 (OR-930)

Dear Reader:

I am inviting you to participate in a planning process that we feel is important to you and your interests. We're setting the course for the future management of approximately 2.6 million acres of your public lands spread throughout the coastal mountains and on the west slopes of the Cascades in Oregon. Some of these lands may surround your community or may lie within the watershed that supplies your drinking water. These lands provide habitat for wildlife and places for all of us to recreate. And above all, most of these lands were set aside years ago to provide a steady source of forest products and revenue to support the economy of western Oregon and the 18 western Oregon counties. We need your help in deciding their future.

This document is the Bureau of Land Management's (BLM) Draft Environmental Impact Statement for the revision of the resource management plans of the western Oregon BLM Districts that have provided the management direction for those lands for the past 12 years. We are revising these six plans with this single Draft Environmental Impact Statement. There are three action Alternatives presented in this document.

We have selected Alternative 2 as our preferred alternative because this alternative would best fulfill our statutory mission and responsibilities. We are looking for input on the plan and the analysis of the effects of the alternatives. During the next 90 days, I hope you'll take the time to review this draft Environmental Impact Statement and send us your ideas and suggestions regarding this proposed revision of our resource management plans; however, please recognize the BLM's obligation to meet the laws and regulations that we have to follow. Your comments, along with ideas from our cooperators, will help craft our proposed resource management plans that will be analyzed in a Final Environmental Impact Statement.

Examples of comments that would be useful to the BLM in developing the proposed resource management plans are:

- How to increase the fire resiliency of the forests in the Medford District and the Klamath Falls Resource Area of the Lakeview District.
- How to manage the harvestable land base in such a way that will increase the rate of recovery of the northern spotted owl and the marbled murrelet in the short term, while still providing a consistent and stable timber supply.
- How to speed the redevelopment of structurally complex forests after regeneration timber harvesting.

- What management techniques might we use to lessen the effects to special status species?

As you share your interests and suggestions with us, your comments will be most useful to us if they address one or more of the following:

- errors in our analysis;
- new or missing information that would have a bearing on the analysis;
- a definition of a substantive and new alternative. An example would be an alternative composed of parts of the other alternatives that meets all the statutory requirements applicable to the lands managed by the BLM in western Oregon as described.

The end product of this planning process will be six approved resource management plans that will guide the management for the western Oregon BLM Districts for the next 10 to 15 years.

We will accept mailed comments at:

Western Oregon Plan Revisions
P.O. BOX 2965
Portland, OR 97208

You can also make comments online at the following website:
<http://www.blm.gov/or/plans/wopr>

Your comments must be postmarked before November 9, 2007.

If you have questions, please contact Alan Hoffmeister, Western Oregon Plan Revision Public Outreach Coordinator, at (503) 808-6629 or at orwopr@or.blm.gov

Thank you for your interest in the management of BLM-administered lands.

Sincerely,

Edward W. Shepard
State Director

ID: 88064522

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United States Department of the Interior
Bureau of Land Management

**Draft Environmental Impact Statement
for the Revision of the
Resource Management Plans of the
Western Oregon
Bureau of Land Management Districts**

Prepared by
Oregon State Office
August 2007

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Medford District Manager

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Lakeview District Manager

DEIS for the Revision of the Western Oregon RMPs

Bureau of Land Management

Public Notice of Availability of Draft Environmental Impact Statement

Draft Environmental Impact Statement

It is hereby announced that the Bureau of Land Management (BLM) is preparing a Draft Environmental Impact Statement (DEIS) for the proposed revision of the Western Oregon Resource Management Plan (RMP).

Resource Management Plan of the

Western Oregon

Bureau of Land Management District

The proposed revision of the Western Oregon RMP is being prepared to address the needs of the public and the BLM.

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Prepared by

The BLM is preparing a Draft Environmental Impact Statement (DEIS) for the proposed revision of the Western Oregon Resource Management Plan (RMP). The DEIS is being prepared to address the needs of the public and the BLM.

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Preface

Reader's Guide

This draft environmental impact statement is designed to provide a logical progression of information to the reviewer. The summary, five chapters, and appendices explain the management purpose and need being addressed, the scope of the issues involved, the alternatives designed to address the purpose and need, a description of the current biological and physical environment, and an analysis of the anticipated environmental consequences resulting from the implementation of any given alternative.

The progression of information in this document starts with a summary. The *Summary* chapter presents a digest of the document. Descriptions of the No Action Alternative and each of the three action alternatives are presented in enough detail to explain each alternative's overall management strategy for achieving the purpose and need, and to explain its associated land use allocations and management direction. The *Summary* also includes a comparison of the major land use and resource allocations and actions by alternative. For the purpose of brevity, the summary relies heavily on the use of graphics and brief descriptions of rather complex topics. Also for the sake of brevity and simplicity, the citations, references, and definitions included in the main text are omitted from the *Summary*. Therefore, the details provided in the five chapters of the document are needed to fully understand the alternatives and their effects.

Chapter 1 presents the purpose and need for the revision of the western Oregon resource management plans. Central to these plan revisions is the interplay between the laws directing or influencing the management of the BLM's O&C lands in western Oregon and the various legal precedents and opinions that guide the implementation of various laws. This chapter contains a more detailed discussion of these laws and legal precedents than is normally found in an environmental impact statement in order to help the reader clearly understand the purpose and need and the five major issues identified for analysis. This chapter also describes the planning area, the past management of the O&C lands, the planning process, and the involvement of local, state, and other federal agencies that are collaborating in the preparation of the plan revisions. Finally, this chapter identifies the seven recognized tribes within the planning area that are engaged in government-to-government relationships with the BLM.

Useful comments regarding Chapter 1 include whether the purpose and need require clarification or further explanation.

Chapter 2 presents the three action alternatives. The No Action Alternative would continue management under the current resource management plans (refer to the 1995 resource management plans for the districts of Salem, Eugene, Roseburg, Coos Bay, and Medford, and the Klamath Falls Resource Area of the Lakeview District). The action alternatives consist of a range of management approaches or strategies that are designed to meet the purpose and need and to resolve the planning issues. The alternatives consist

of management objectives, management actions, and land use allocations. Two of the action alternatives are based on a network of managed reserves that allow intensive timber management outside of the reserves. The other action alternative minimizes land use allocations and manages timber across the landscape on a long rotation to provide older forest habitats. Certain management objectives and management actions vary by alternative, while others are common to all three action alternatives. This chapter also describes the six subalternatives (variations of the three action alternatives) that were set forth to examine certain questions raised by the public and BLM managers. Finally, this chapter describes the alternatives that would not meet the purpose and need and, as a result, were not analyzed in detail.

Useful comments regarding Chapter 2 include:

- *Are the alternatives adequately and clearly described?*
- *Is it clear why some alternatives were eliminated from detailed study?*
- *Are there alternatives that appear to meet the purpose and need that are not included in the detailed study?*

Chapter 3 presents the existing condition and trends of the resources and programs within the planning area that would be affected by implementing the alternatives. Understanding the affected environment serves as a baseline against which to measure the potential effects, including the cumulative effects, of implementing an alternative. The description of the affected environment also provides the information necessary to understand the analysis of the environmental consequences in *Chapter 4*.

Chapter 4 presents the potential direct, indirect, and cumulative effects that would result from the implementation of individual action alternatives and subalternatives. The effects of the alternatives on the various resources are compared and contrasted against each other and against the No Action Alternative. This chapter also includes brief discussions of the use of models and the assumptions used in analyzing the alternatives. Adverse affects that cannot be avoided if the alternatives were to be implemented are disclosed, and mitigation is identified. A brief summary of the environmental consequences are located in the *Summary* and in *Chapter 2*. However, as in any overview or summary, detail is sacrificed for brevity; therefore, the information in *Chapter 4* needs to be read in order to fully understand the effects.

Useful comments regarding Chapter 4 include:

- *Are the conclusions clearly stated?*
- *Are the conclusions supported by evidence, analysis, and logic?*
- *Is there information included that appears to be unnecessary and gets in the way of understanding?*

Chapter 5 presents information on the consultation and coordination that occurred in the preparation of this draft environmental impact statement. The public involvement, cooperators, and preparers are identified. Reference information and a glossary of

words and terms that are not in common usage are included. In addition, future actions, such as the consultation on species listed under the Endangered Species Act, adaptive management, and plans for monitoring, are discussed.

Commenting

Well-written comments can be the most important contribution from citizens. It is the goal of citizen involvement to help the agency make better-informed decisions. Comments should be clear, concise, and on point. Comments that are solution-oriented and provide specific examples will be more helpful than those that simply oppose or support a particular alternative or position.

Numerous comments that repeat the same basic message of support or opposition will typically be responded to collectively. General comments that simply state that an action will have significant environmental consequences may not help the agency make a better decision unless the relevant causes and environmental consequences of concern are explained.

When providing comments, it is most helpful if you:

- Reference your comments to a chapter, subheading, or page.
- Locate errors in the analysis that had been performed.
- Provide new or missing information that would have a bearing on the analysis.
- Locate misinformation that may have been used and could affect the outcome of the analysis.
- Suggest a different way to combine the features from the analyzed alternatives.
- Suggest a new alternative that meets the purpose and need.

Comments received in response to this draft environmental impact statement, including names and addresses, become part of the public record and are available for public inspection. Comments, including names and addresses, may be published as part of the final environmental impact statement. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware 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 due to limitations under the Freedom of Information Act.

If you wish to withhold your name or address from public review, or from disclosure under the Freedom of Information Act (FOIA), you must state this prominently at the beginning of your written comments. Persons requesting such

confidentiality should be aware that, under FOIA, confidentiality may be granted in only very limited circumstances, such as to protect trade secrets.

Comments can be mailed to:

Western Oregon Plan Revisions
P.O. BOX 2965
Portland, OR 97208

You can also make comments online at the following website:

<http://www.blm.gov/or/plans/wopr/index.php>

Your comments must be postmarked before November 9, 2007.

Abstract

Draft Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management Districts

1. Responsible Agency: United States Department of the Interior, Bureau of Land Management
2. Draft (X) Final ( )
3. Administrative Action (X) Legislative Action ( )
4. Abstract: This draft environmental impact statement has identified three action alternatives for managing approximately 2.6 million acres of federal land, which is mostly revested California Railroad and Coos Bay Wagon Road Grant Lands Act lands (i.e., the O&C lands), within the approximately 22 million acre western Oregon planning area. The BLM intends to revise six resource management plans with this single draft environmental impact statement.

Public comment played an important role in shaping the alternatives, which are described and analyzed in this document.

- The No Action Alternative maintains the decisions in the current resource management plans.
- Alternative 1 creates late-successional management areas that are similar to the large late-successional reserves in the No Action Alternative, applies new criteria for designating the width of riparian management areas, and provides for intensive timber management in other areas.
- Alternative 2 designates late-successional management areas based on the habitat requirements for the northern spotted owl and the marbled murrelet, applies new criteria for designating the width of riparian management areas, and provides for intensive timber management in other areas.
- Alternative 3 manages most of the land base for timber production under long rotations, or uneven-aged management in fire-prone ecosystems, in order to provide late-successional habitat across the landscape and also to provide for timber production.

Six subalternatives, which are variations of the three action alternatives, are also analyzed in this document.

The major resource management plan issues include:

- Providing a sustainable supply of wood and other forest products as mandated by the O&C Act, while also meeting the requirements of other applicable laws.
- Providing for the conservation of species that are listed under the Endangered Species Act.
- Contributing toward meeting the goals of the Clean Water Act and the Safe Drinking Water Act.
- Reducing the risk of wildfires and integrating fire back into the ecosystem.
- Providing for off-highway vehicle management to meet that demand while protecting other resources.

This document acknowledges the primacy of O&C Act in regards to the management of timber resources. Therefore, specific changes to the current management direction for areas of critical environmental concern and research natural areas, scenic values as identified through a visual resource management inventory, and sensitive species protection are proposed across the alternatives.

5. Date comments must be received: November 9, 2007.

6. For further information contact:

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Introduction

Summary

This *Summary* provides a synopsis of the information presented in this draft environmental impact statement for the proposed revision of the resource management plans of the six western Oregon BLM districts that are within the planning area.

In this chapter:

Introduction	XLIII
What is the purpose and need for the action being proposed?.....	XLIV
What alternatives are being proposed?	XLV
What are the environmental consequences of the alternatives?.....	L

Summary

This Summary provides a synopsis of the information presented in the final environmental impact statement for the proposed revision of the resource management plans of the six western Oregon BLM districts that are within the planning area.

In this chapter:

XLIII	Introduction
XLIV	What is the purpose and need for the action being proposed?
XLV	What alternatives are being proposed?
L	What are the environmental consequences of the alternatives?

Introduction

Key Points

This draft environmental impact statement has been written because (1) the BLM plan evaluations found that the BLM has not been achieving the timber harvest levels directed by the existing plans, (2) there is an opportunity to coordinate the BLM management plans with new recovery plans and re-designations of critical habitat currently under development and (3) the BLM has re-focused the goal for management to the objectives of its statutory mandate to utilize the principles of sustained yield management on the timber lands covered under the O&C Act. There are four alternatives—the No Action Alternative and three action alternatives (Alternative 1, Alternative 2, and Alternative 3).

This draft environmental impact statement is broken up into the following sections:

- Chapter 1, which provides the purpose and need for revising the resource management plans.
- Chapter 2, which details the alternatives found to be reasonable solutions for the purpose and need presented in Chapter 1.
- Chapter 3, which details the current condition of the affected environment.
- Chapter 4, which provides the effects on the environment that result from each of the alternatives.
- Chapter 5, which lists those that participated in the development of this draft environmental impact statement.
- And an appendix volume and a map packet that each provides details regarding the analyses of the alternatives.

For details about the process up to this point (e.g., the published notice of intent, the scoping effort, and the planning criteria) and beyond the public commenting period, go to <http://www.blm.gov/or/plans/wopr>.

The Bureau of Land Management (BLM) administers the use of a variety of natural resources on approximately 2.6 million acres within an area of approximately 22 million acres, which is the western Oregon planning area. Resource management plans (RMPs) define the management direction for specified areas of BLM-administered lands (typically, for individual BLM districts or BLM resource areas). Resource management plans are typically designed to continue a defined management direction for a specified period of time that includes periodic evaluation. Resource management plans are formally evaluated periodically to determine whether there is a significant cause for amending or revising them.

The primary direction for administering the approximately 2.2 million acres of what are called the O&C lands that lie within the approximately 2.6 million acres of BLM-administered lands in western Oregon is derived from the statutory authority of the Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act (O&C Act). The remaining BLM-administered lands within the western Oregon planning area are public domain lands, and other statutory authorities direct the administration of those lands.

The BLM is proposing to revise existing plans to replace the Northwest Forest Plan land use allocations and management direction because (1) the BLM plan evaluations found that the BLM has not been achieving the timber harvest levels directed by the existing plans, and the BLM now has more detailed and accurate information than was available in 1995 on the effects of sustained yield management on other resources, (2) there is an opportunity to coordinate the BLM management plans with new recovery plans and re-designations of critical habitat currently under development and (3) the BLM has re-focused the goal for management of the BLM-administered lands to the objectives of its statutory mandate to utilize the principles of sustained yield management on the timber lands covered under the O&C Act of contributing to the economic stability of local communities and industries, and other benefits from such management to watersheds, stream flows, and recreation.

What is the purpose and need for the action being proposed?

The goals for the Northwest Forest Plan were broader than the specific requirements of the Endangered Species Act and Clean Water Act and sought to provide consistent management of the Forest Service and the BLM-administered lands, by applying National Forest Management Act requirements to the BLM-administered lands. The selected alternative for the Northwest Forest Plan was selected because it would “maintain the late-successional and old-growth forest ecosystem and provide a predictable and sustainable supply of timber, recreational opportunities and other resources at the highest level possible.” The purpose and need for this plan revision is focused on specific legal requirements and intended benefits of the BLM’s unique mandate under the O&C Act, distinct from the mandate to the Forest Service under National Forest Management Act.

The purpose and need for this proposed action is to manage the BLM-administered lands for permanent forest production in conformity with the principles of sustained yield, consistent with the O&C Act.¹ The plans will also comply with all other applicable federal laws including, but not limited to, the Endangered Species Act, the Clean Water Act, and, to the extent that it is not in conflict with the O&C Act, the Federal Land Policy and Management Act. In accord with the Endangered Species Act, the plans will use the BLM’s authorities for managing the lands it administers in the planning area to conserve habitat needed from these lands for the survival and recovery of species listed as threatened or endangered under the Endangered Species Act.²

In selecting among the alternatives in this plan revision, BLM will evaluate which alternative or combination of alternatives best meets the Purpose and Need. In addition, BLM will consider the environmental consequences related to the issues identified during scoping and the cost of implementation.

---

¹ The Ninth Circuit in *Headwaters v. BLM*, 914 F.2d 1174 (9th Cir. 1990) confirmed that in the O&C Act Congress mandated timber production as the dominant use of these BLM-administered lands.

² This revision process will satisfy a settlement agreement resolving long-standing litigation of the Northwest Forest Plan (*AFRC v. Clarke*, Civil No. 94-1031-TPJ (D.D.C.)) that alleged the current RMPs violate the O&C Act. The settlement agreement requires BLM to consider revisions to the RMPs by the end of the year 2008, and include at least one alternative that “will provide permanent forest production across the O&C lands without reserves except as required to avoid jeopardy under the Endangered Species Act.” See *Appendix A* for a discussion of the Settlement Agreement.

What alternatives are being proposed?

There are three action alternatives, along with the No Action Alternative, being proposed. The No Action Alternative would continue the management of the current resource management plans, which were approved in 1995 and subsequently amended. The three action alternatives consist of a range of management strategies that are designed to meet the purpose and need discussed in *Chapter 1*. These management strategies encompass management objectives, management actions, and land use allocations. Some management objectives, management actions, and land use allocations are common to all three action alternatives. Examples of management objectives, management actions, and land use allocations that are common to the three action alternatives are:

- Congressionally reserved areas would be retained and managed for the purposes for which they were established.
- A diversity of developed and dispersed outdoor recreational experiences would be maintained. District recreation sites, management areas, facilities, trails, and visitor service programs would be carried forward.
- The BLM would take actions to reduce fire hazards to communities that are at risk from uncharacteristic wildfires.
- The BLM would provide for the harvest and collection of special forest products.

Some management objectives, management actions, and land use allocations vary by action alternative. These differences would result in a variance in the degree or rate in which each action alternative achieves the identified purpose and need for the proposed action. See *Table 1 (Limited comparison of the key features of the four alternatives)*. It highlights specific examples of these differences between the alternatives. For a complete comparison of the key features of the four alternatives, see *Table 39 (Comparison of the key features of the four alternatives)* in *Chapter 2*.

The key differences between the four alternatives include:

- the width and management of riparian areas;
- the retention of green trees, snags, and down wood;
- the salvaging after disturbances; and
- the management of habitat for the northern spotted owl and the marbled murrelet.

Following are the key land use allocations that vary by action alternative.

Alternative 1

The key land use allocations for this alternative are:

- **Late-successional management areas.** These areas are designated to provide structurally complex forests. They are similar to the existing late-successional reserves under the No Action Alternative. There would be no salvaging after disturbances in these areas, except for safety or operational reasons.
- **Riparian management areas.** These areas would maintain or promote the development of mature or structurally complex forests, and provide for the riparian and aquatic conditions that supply streams with shade, sediment filtering, leaf litter and large wood, and root masses that stabilize stream banks. They are half the width of the current riparian reserves under the No Action Alternative (with the exception of non-fish-bearing perennial streams which remain the same).
- **Timber management areas.** In these areas, forests would be managed to achieve a high level of continuous timber production that could be sustained through a balance of growth and harvesting and an allowable sale quantity of timber. The rotation age would be approximately 80 to 100 years and there would be no green tree retention after regeneration harvesting.

Alternative 2

The key land use allocations for this alternative are:

- **Late-successional management areas.** These areas would provide habitat for the northern spotted owl (large, connected blocks of suitable habitat) and the marbled murrelet. Salvaging would be allowed to recover economic value from the timber harvested after stand-replacement disturbances. These areas are based on new recovery planning efforts for the northern spotted owl.
- **Riparian management areas.** These areas would maintain or promote the development of mature or structurally complex forests and provide for the riparian and aquatic conditions that supply streams with shade, sediment filtering, leaf litter and large wood, and root masses that stabilize stream banks.

All streams, except for intermittent non-fish-bearing streams, would have a 100 foot nonharvesting and shade retention area on each side of the stream. Intermittent non-fish-bearing streams that have a high risk of debris flows (a source of large wood) would also have a 100 foot nonharvesting and shade retention area on each side of the stream. Other intermittent non-fish-bearing streams would retain a 25 foot area with noncommercial vegetation on each side of the stream and 12 conifer trees per acre.

- **Timber management areas.** These areas would be managed to achieve a high level of continuous timber production that could be sustained through a balance

of growth and harvesting and an allowable sale quantity of timber. The rotation age would be approximately 80 to 100 years and there would be no green tree retention after regeneration harvesting.

Alternative 3

The key land use allocations for this alternative are:

- **General landscape areas.** These areas would provide for the habitat conditions that are required for late-successional species, would maintain and promote the development of mature or structurally complex forests, would provide continuous timber production that could be sustained through a balance of growth and harvesting, and would offer an allowable sale quantity of timber. The rotation age would approximate natural stand-replacement disturbances (generally, 360 years north of Grants Pass and 240 years south of Grants Pass).

There would be a deferral of regeneration harvests until 50% of an assessment area is older than the threshold stand age of 90 years north of Grants Pass and 140 years south of Grants Pass. In the meantime, partial harvesting and commercial thinning would be applied to stands that are at or beyond the partial harvest interval age (60 to 120 years, depending on the vegetation series).

There would be 6 to 9 green trees retained after harvesting depending on the vegetation series, and salvaging for economic purposes would be allowed after a disturbance (with legacy retention requirements).

- **Riparian management areas.** These areas would maintain or promote the development of mature or structurally complex forests and provide for the riparian and aquatic conditions that supply streams with shade, sediment filtering, leaf litter and large wood, and root masses that stabilize stream banks.

All streams, except for intermittent non-fish-bearing streams, would have a 100 foot nonharvesting and shade retention area on each side of the stream. Intermittent non-fish-bearing streams would allow no harvesting within 25 feet of the stream.

Comparing the Alternatives

The areas included within the land use allocations vary significantly under the alternatives. See *Figure 1 (Land use allocations under the alternatives)*. Note that Alternative 3 contains a land use allocation called general landscape area that covers much of the landscape and provides habitat for late-successional species as well as timber production.

Figure 1. Land use allocations under the alternatives

Table 1. Limited comparison of the key features of the four alternatives (for a complete comparison of the key features of the four alternatives, see the comparison table in *Chapter 2*)

Features	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Late-Successional Vegetation	- Maintains the Northwest Forest Plan's late-successional reserves (LSRs) - Allows no treatment of stands that are older than 80 years	- Establishes late-successional management areas (LSMAs) - Treats LSMAs to promote the development of structurally complex forests	- Establishes late-successional management areas (LSMAs) - Treats LSMAs to promote the development of suitable habitat	Creates a landscape target for regeneration harvesting that requires 50% or more of the acres in an assessment area be of the required age for harvesting, which is 90 years north of Grants Pass and 140 years south of Grants Pass
Critical Habitat Units (CHUs) for the Northern Spotted Owl and the Marbled Murrelet	- CHUs for the marbled murrelet completely match with the LSRs - CHUs for the northern spotted owl partially match the LSRs	- CHUs for the marbled murrelet completely match with the LSMAs - CHUs for the northern spotted owl partially match the LSMAs	- CHUs for the marbled murrelet partially match with the LSMAs - CHUs for the northern spotted owl partially match the LSMAs	No special management
Northern Spotted Owl Activity Centers	Retains the owl activity centers that were known as of January 1994	Retains no owl activity centers in the timber management areas (TMAs)	Retains no owl activity centers in the timber management areas (TMAs)	- Retains 215 acre owl activity centers in the general landscape areas - Manages the owl activity centers until the landscape target is reached
Green Tree Retention	- North of Grants Pass: 6 to 8 trees per acre - South of Grants Pass: 18 to 25 trees per acre - In connectivity diversity blocks: 12 to 18 trees per acre	None	None	6 to 9 trees per acre depending on the vegetation series
Snag Retention	1.1 snags per acre	- In the LSMAs: 2 to 6 snags per acre depending on the vegetation series - In the TMAs: Noncommercial only	- In the LSMAs: 2 to 6 snags per acre depending on the vegetation series - In the TMAs: Noncommercial only	2 to 4 snags per acre depending on the vegetation series
Down Wood	120 to 240 ft./ac.	- In the LSMAs: 120 to 240 ft./ac. for stands with QMD > 14 in. 60 to 120 ft./ac. for stands with QMD ≤ 14 in. - In the TMAs: Noncommercial only	- In the LSMAs: 40 to 240 ft./ac. for stands with QMD > 14 in. 20 to 120 ft./ac. for stands with QMD ≤ 14 in. - In the TMAs: Noncommercial only	- In the western hemlock zone: 240 ft./ac. - In the Douglas fir/true fire and tanoak zones: 120 ft./ac.
Salvaging	- Allows salvaging in the LSR reserves when a disturbance is greater than 10 acres - Allows salvaging in the matrix land use allocations for economic purposes	- Allows no salvaging in the LSMAs, except to reduce hazards in the wildland urban interface areas - Allows salvaging in the wildland urban interface areas to reduce hazards - Allows salvaging in the TMAs for economic purposes	- Allows salvaging in the LSMAs for economic purposes with retention of legacy - Allows salvaging in the wildland urban interface areas to reduce hazards - Allows salvaging in the TMAs for economic purposes	Allows salvaging for economic purposes with retention of legacy

Features	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Zones for Riparian Management Areas	For all fish-bearing streams: 2 site potential tree ht.	For all but intermittent non-fish-bearing streams: 1 site potential tree ht.	For all but intermittent non-fish-bearing streams: • 0 to 25 ft. no harvest • 25 to 60 ft. 80% shade retention • 60 to 100 ft. 50% canopy retention	For all but intermittent non-fish-bearing streams: • 0 to 25 ft. no harvest • 25 to 60 ft. 80% shade retention • 60 to 100 ft. 50% canopy retention
	For all non-fish-bearing streams: 1 site potential tree ht.	For intermittent non-fish- bearing streams: 1/2 site potential tree ht.	For non-debris-flow prone intermittent non-fish- bearing streams: 0 to 25 ft. noncommercial vegetation +12 tpa For debris-flow prone intermittent streams: • 0 to 25 ft. no harvest • 25 to 100 ft. managing for mature or structurally complex forests	For all intermittent non-fish- bearing streams: 0 to 25 ft. no harvest
LSMA (late-successional management area) LSR (late-successional reserve) QMD (quadratic mean diameter) TMA (timber management area)				

What are the environmental consequences of the alternatives?

The following sections summarize the environmental consequences that are described in detail in *Chapter 4*. The consequences vary between the alternatives for the different resources and programs. See *Table 40 (Comparison of the key impacts by alternative)* in *Chapter 2* for which resources and programs do and do not vary, and the amount of variance for those that do vary.

Note that the preciseness of the analyses for this draft environmental impact statement has improved due to the increased quality and quantity of the data and the increased sophistication of the forest vegetation and habitat modeling that is now available as opposed to when the current resource management plans were first analyzed in 1995.

Ecology

Forests are classified in the analysis of this draft environmental impact statement by the following four-stage structural classification system:

- **Stand establishment.** Forests that approximate the early-successional conditions that follow disturbances, such as timber harvesting or wildfires. This classification is subdivided based on whether or not the stand establishment forest includes trees (structural legacies) from the previous forest.
- **Young.** Forests that approximate the small conifer forests that are described in the FEMAT Report and Northwest Forest Plan. This classification is subdivided, like stand establishment, based on whether or not the young forest includes trees (structural legacies) from the previous forest.
- **Mature.** Forests that are defined similarly to the mature forests that are described in the FEMAT Report and Northwest Forest Plan. This classification is subdivided based on whether the forest has a single canopy layer or multiple canopy layers.
- **Structurally complex.** Forests that approximate the old-growth forests that are described in many analyses (e.g., the medium/large conifer multi-story forests of the FEMAT Report and the large, multi-storied older forests of the *Late-Successional Forest Monitoring Report*).

Together, the mature and structurally complex forests approximate the late-successional forests that are described in the FEMAT Report, the Northwest Forest Plan, and the resource management plans of the six western Oregon BLM districts that are within the planning area.

The abundance and spatial patterns of the forest structural stages (stand establishment, young, mature, and structurally complex) that would exist under the alternatives for the BLM-administered lands, as well as across all ownerships compared to average historic conditions, would be as follows:

- Across all ownerships, the abundance of the structural stages would not return to the average historic conditions within 100 years, even if there was no timber harvesting on the BLM-administered lands.
- The differences in the alternatives would result in only a 1% shift in the structural stage abundances across all ownerships within 100 years.
- On BLM-administered lands, only the No Action Alternative would result in a structural stage abundance that would be consistent with the average historic conditions. However, all four alternatives would decrease the abundance of young forests and increase the abundance of mature&structurally complex forests from current amounts.
- The retention of structural legacies in regeneration harvested areas, which would occur in the No Action Alternative and Alternative 3, would result in

structurally complex forests that develop almost twice as fast after harvesting as in Alternatives 1 and 2.

- The No Action Alternative would reduce fragmentation in most physiographic provinces. Alternatives 1 and 2 would increase fragmentation in most provinces. Alternative 3 would increase fragmentation in all provinces.

Socioeconomics

As shown in *Figure 2 (BLM projected county payments compared to historic payments)*, none of the alternatives would produce timber receipts sufficient to bring payments to the O&C counties to the level provided by the BLM portion of the Secure Rural Schools payments. Alternative 2 would produce the highest payments to the counties at 94% of the O&C portion of the 2005 Secure Rural Schools payments, while the No Action Alternative would produce the lowest payments at 37% of the O&C portion of the 2005 payment.

Figure 2. BLM projected county payments compared to historic payments

Effects vary widely by county. The BLM plays the greatest role in the Douglas County budget, where it accounts for 20% of the total budget and 70% of the discretionary budget.

Alternative 2 would have the most favorable impact on local economies and would result in a net increase of 3,442 jobs and \$136.5 million of earnings (wages). The No Action Alternative would have the least favorable impact on local economies and would result in a net decrease of 3,770 jobs and \$125.5 million of earnings. Under all four alternatives, economic losses would be greatest in southwestern Oregon where the O&C lands are concentrated. *Table 2 (Total economic impacts by alternative)* shows that under all, but Alternative 2, the loss of Secure Rural Schools funding, coupled with the reduction in

the plywood industry, would be greater than the increased employment and earnings that would be linked to increased BLM harvest levels.

Table 2. Total economic impacts by alternative

Totals	Current Condition	O&C County Totals by Alternative (change compared to current)			
		No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Jobs (number of)	8,948	-3,770	-516	3,442	-1,275
Earnings (\$millions)	319.4	-125.5	-7.3	136.5	-34.7

Present net value is a measure of economic return. Future revenues and costs over a 50-year period are discounted back to the present using a 5% discount rate. As shown in *Table 3 (First decade revenues and costs and the present net value over 50 years)*, the present net value of the BLM timber harvest would range from \$46.1 million under Alternative 3 to \$962.3 million under Alternative 2.

Table 3. First decade revenues and costs and the present net value over 50 years

Alternative	Decade 1			Present Net Value (over 50 years) (\$ million)
	Total Revenues (\$ million)	Total Costs (\$ million)	Net Revenues (\$ million)	
No Action	83.9	-78.7	5.2	107.5
Alternative 1	137.5	-117.7	19.8	342.8
Alternative 2	215.8	-166.9	48.9	962.3
Alternative 3	103.3	-103.8	-0.4	46.1

Environmental Justice

No high or adverse human health or environmental consequences have been identified for any of the alternatives. The consequences of the alternatives are not expected to fall disproportionately on minority or low-income populations.

Timber

As shown in Figure 3 (*Percentage of BLM-administered lands in the harvest land base by alternative*), the harvest land base varies between the alternatives from a high of 1.4 million acres, which is 65% of the forested acres, under Alternative 3 to a low of 607,000 acres, which is 27% of the forested acres, under the No Action Alternative.

Figure 3. Percentage of BLM-administered lands in the harvest land base by alternative

Figure 4 (Total allowable sale quantity by alternative for the planning area) shows that the annual allowable sale quantity would range from a high of 727 mmbf under Alternative 2 to a low of 268 mmbf under the No Action Alternative.

Figure 4. Total allowable sale quantity by alternative for the planning area

Figure 5 (Nonharvest land base volume over time) shows that over the next 10 years the volume from thinnings in the nonharvest land base would range from a high of 87 mmbf under the No Action Alternative to virtually no volume under Alternative 3. Figure 5 also shows that the volume from thinnings would gradually decrease over time and would cease by the eighth decade.

Figure 5. Nonharvest land base volume over time

The different types of harvesting that occur under the alternatives include thinning, partial harvesting, uneven-aged management, and regeneration harvesting. Thinning can occur in both the harvest land base and the nonharvest land base. On an annual basis, the timber harvest acres of all harvest types would range from approximately 16,000 acres for the No Action Alternative to 29,000 acres for Alternative 3.

Special Forest Products

The location of specific special forest products moves with the location of management activities. As in the past, special forest products would be harvested from common and abundant plant and fungi species.

All four alternatives would maintain similar levels of availability and quantity of special forest products. Special forest products would generally be abundant relative to demand over the long term for all four alternatives.

Botany

There are 134 (nonfederally listed) special status plant and fungi species that occur on BLM-administered lands within the planning area. These species are not evenly distributed or predictable across the landscape, even when good potential habitat exists.

The risk of population loss varies with the number of populations, the patch size (density of known populations) of populations, and the location of management activities. The risk of population loss is higher where the patch size per population is smaller, where management activity includes regeneration or partial harvesting, and where there would be multiple treatments over 10 to 15 years (timber harvest, fuels, and silviculture).

Under the No Action Alternative and on the public domain lands under the three action alternatives, there would be little risk of loss of populations and extirpation or extinction of bureau sensitive species or bureau assessment species.

Under the three action alternatives, some populations on O&C lands would be lost and the risk of local extirpation or extinction to bureau sensitive species and bureau assessment species would increase compared to the No Action Alternative.

The ranking of the alternatives for the risk of loss is as follows:

The three action alternatives would cause a low-moderate risk of local extirpation or extinction for the conifer-related species that are known from 20 or fewer sites on BLM-administered lands.

There are 13 federally listed species that are found within the planning area. Only five of the thirteen federally listed species occur on BLM-administered lands. Under all four alternatives, populations of species listed under the Endangered Species Act would be maintained and all four alternatives would contribute to the recovery of these species.

Invasive Plants

The greatest risk for the introduction of invasive plants would be in areas where they are abundant and when management activity results in increased light and soil disturbance, and when activities are proximate to riparian areas.

Alternative 2 would have the greatest risk of introduction based on levels of timber harvesting and associated roads. Alternative 2 also has the greatest risk of introduction into riparian areas based on riparian management widths, prescriptions, and levels of timber harvesting activities. The No Action Alternative would have the lowest risk of invasive plant introduction.

The greatest risk for the spread of invasive plants would be when management activities are dispersed and proximate to riparian areas.

Alternative 3 would have the highest risk of spread, since harvesting under Alternative 3 would be the most dispersed and occur on a larger proportion of lands. The No Action Alternative would have the lowest risk of spread.

Wildlife

For special status wildlife species, the habitat needs of aquatic- and riparian-associated species would be met for perennial and fish-bearing streams under all four alternatives. The habitat needs of aquatic- and riparian-associated species along intermittent streams would be met under the No Action Alternative and Alternative 1, but would not be met under Alternatives 2 and 3.

The habitat needs of forest-floor-associated species that are highly endemic to one or several locations would be at risk of decline in abundance and distribution under the three action alternatives.

Marbled Murrelet

The nesting habitat for the marbled murrelet on BLM-administered lands would increase under all four alternatives within 100 years. There are 891,000 acres of BLM-administered lands capable of growing nesting habitat for the marbled murrelet. Marbled murrelet habitat exists in stands that are classified as mature with multilayered canopies forest or structurally complex forest. By the year 2106, the habitat would increase from the current condition of 373,000 acres to:

- 715,000 acres under the No Action Alternative
- 620,000 acres under Alternative 1
- 439,000 acres under Alternative 2
- 493,000 acres under Alternative 3

In the short term (50 years), there would be a 16% decrease from the current condition in the quantity of marbled murrelet nesting habitat under Alternative 2 and a 14% decrease under Alternative 3.

Under the No Action Alternative and Alternative 1 in the Coast Range province, and the No Action Alternative in the Klamath province, there would be an increase in the mean patch and core area size and an increase in the edge density from the current condition. Under Alternatives 2 and 3, there would be a decrease in the mean patch and core area size and an increase in the edge density.

Northern Spotted Owl

For the northern spotted owl, the No Action Alternative and Alternative 1 would steadily increase the total amount of suitable habitat. Alternative 2 would maintain approximately the current amount of suitable habitat over time. Alternative 3 would maintain approximately the current amount of suitable habitat for the first 20 years, and then increase the amount of habitat to more than it would under Alternative 1 by 2106.

As shown in *Table 4 (Suitable habitat within the late-successional reserves and the late-successional management areas)* and *Figure 6 (Northern spotted owl suitable habitat on BLM-administered lands by alternative and reference analysis)*, the No Action Alternative, Alternative 1, and Alternative 2 would contribute to large blocks of suitable habitat to support clusters of reproducing owls. However, the BLM contribution to large blocks would require 50 to 100 years to develop into almost all suitable habitat. Alternative 3 would not contribute to large blocks of suitable habitat to support clusters of reproducing owls, because it would fragment suitable habitat from the current condition.

Figure 6. Northern spotted owl suitable habitat on BLM-administered lands by alternative and reference analysis

Table 4. Suitable habitat within the late-successional reserves and the late-successional management areas

Alternatives	Total Habitat-Capable Acres	% of Habitat-Capable Acres									
		2006		2016		2026		2056		2106	
		acres	%	acres	%	acres	%	acres	%	acres	%
No Action Alternative	809,400	458,900	57	490,400	61	535,300	66	693,100	86	797,300	99
Alternative 1	807,400	456,800	57	485,600	60	528,000	65	682,000	84	796,500	99
Alternative 2	521,500	281,300	54	300,400	58	334,800	64	452,400	87	515,000	99

Note: Alternative 3 is not included, because it would not allocate late-successional management areas.

The development of suitable habitat outside of large blocks is important because owl populations would need to rely on it until habitat within the blocks is capable of supporting clusters of reproducing owls. The development of suitable habitat outside of the large blocks would differ widely among the alternatives as a result of differing amounts of riparian management area acres and the differing management direction within the harvest land base.

As shown in *Table 5 (Acres of suitable habitat outside of the late-successional reserves and the late-successional management areas)*, during the first 50 years after implementation, while large blocks would be developing into suitable habitat, the No Action Alternative would increase the amount of suitable habitat outside of the large blocks. Alternative 1 would maintain and Alternative 2 would decrease the current amount of suitable habitat.

Table 5. Acres of suitable habitat outside of the late-successional reserves and the late-successional management areas

Alternatives	Total Habitat- Capable Acres	% of Habitat-Capable Acres									
		2006		2016		2026		2056		2106	
		acres	%	acres	%	acres	%	acres	%	acres	%
No Action Alternative	1,404,000	661,300	47	706,100	50	755,000	54	854,700	61	877,500	62
Alternative 1	1,406,000	637,900	45	653,200	46	670,400	48	701,700	50	661,400	47
Alternative 2	1,675,000	808,100	48	774,900	46	767,900	46	731,800	44	615,900	37
Alternative 3	2,196,700	1,085,800	49	1,092,000	50	1,119,200	51	1,329,000	60	1,512,000	69

Note: For Alternative 3, this table presents the amount of suitable habitat on all BLM-administered lands, because Alternative 3 does not allocate late-successional management areas.

Dispersal habitat conditions within and between the large blocks of suitable habitat would facilitate owl movement between the blocks. The No Action Alternative and Alternative 1 would maintain the current total quantity of dispersal habitat and would increase the quality of the dispersal habitat from the current condition. Alternative 2 would decrease the total quantity of dispersal habitat and would not increase the quality of dispersal habitat. Alternative 3 would decrease the total quantity of dispersal habitat, but would increase the quality of the dispersal habitat over time.

Fish

The abundance and survival of salmonids is closely linked to the abundance of large woody debris in streams.

The No Action Alternative would have almost twice the acreage in riparian management areas as Alternative 1, four times the acreage as Alternative 2, and more than three times the acreage as Alternative 3. Despite this difference in the size of the riparian management areas, large wood contributions would increase and nearly reach the maximum potential under every alternative; though slightly less under Alternatives 2 and 3.

This is because:

- all areas in the watershed (not just the riparian management areas) serve as source areas that can deliver large wood to streams; and
- the riparian management areas under all four alternatives incorporate some portion of large wood source areas.

There would be slight differences in the contribution of large wood in three of the five representative watersheds that were modeled. The differences are greater in the watersheds where a greater amount of debris-flow prone channels and fish-bearing streams is coupled with higher land ownership. The No Action Alternative and Alternative 1 would have similar levels of large wood contribution and Alternatives 2 and 3 would have slightly lower contributions.

The differences among the alternatives, in terms of fish productivity, would be less than 3%.

Increases in fine sediment delivery under all four alternatives would be less than 1% of the baseline sediment rates, and therefore would not degrade fish habitat under any of the alternatives.

None of the alternatives would result in increases in peak flows in fifth-field watersheds to a level that would affect fish habitat.

None of the alternatives would result in increases in stream temperature that would affect fish habitat or populations, except that under Alternatives 2 and 3 there would be some localized increases in stream temperature in the management area adjacent to the Coquille Forest land use allocation.

Water

Timber harvesting influences peak flows where a large proportion of the timber has been harvested in a watershed. The magnitude of the effect is affected by the type of harvesting (thinning or regeneration harvesting), amount, and distribution of harvesting within watersheds. For all four alternatives, there would be four sixth-field subwatersheds (out of 1,071) susceptible to increased peak flows from timber management.

Subwatersheds are more sensitive to extremes in environmental conditions than alternative variations of harvest levels. Regeneration harvesting under the alternatives is not great enough to increase susceptibility to increased peak flows.

Effective shade is the total solar radiation blocked from reaching a stream over a 24-hour period. All four alternatives would maintain effective stream shade that would limit the increase of stream temperature within the range of natural variability.

Roads near streams are primary sites where mobilization of chronic fine sediment would take place. Most new roads would be located outside of a stream influence zone where possible, and therefore these miles would mostly likely not deliver fine sediment to streams channels. Between 8 and 37 miles of permanent new roads with a natural or aggregate surface would be constructed within a distance that could deliver sediment to streams over the next 10 years under the all four alternatives.

Under all four alternatives over the next 10 years, the increase in the amount of fine sediment delivered to streams from new permanent roads would be less than three-tenths of 1% of the amount delivered from the existing road network. Road improvements and the decommissioning of roads near streams would be of greater importance to decreasing fine sediment delivery than the effect of new roads.

Under all four alternatives, best management practices would be applied and are assumed to maintain or improve water quality. Best management practices include methods that limit the delivery of sediment to streams.

Fire and Fuels

The analysis of fire and fuels divides the planning area into two areas:

- the Salem, Eugene, Roseburg, and Coos Bay districts (north of Grants Pass), which generally have a low-frequency and high-severity fire regime; and
- the Medford District and Klamath Falls Resource Area of the Lakeview District (south of Grants Pass), which generally have a high-frequency and low-severity fire regime.

Fire severity, hazard, and resiliency can generally be equated to broad descriptions of vegetation conditions. Under moderate and extreme conditions, the primary source of high-severity fire would be in stand establishment and young forests that consist of even-aged stands.

All four alternatives would reduce fire severity and hazards north of Grants Pass, because all four alternatives would reduce the combined abundance of stand establishment and young forests. The No Action Alternative and Alternative 1 would result in the largest decrease and Alternative 2 would result in the smallest decrease.

All four alternatives would reduce fire severity and hazard in the Medford District, but the amount of decrease would vary widely among the alternatives. The amount of decrease is relative to the reduction in acreage of stand establishment and young forests compared to the current condition. The No Action Alternative would result in the most decrease and Alternative 2 would have the least decrease.

Alternatives 1 and 2 would increase fire severity and hazards in the Klamath Fall Resource Area of the Lakeview District while the No Action Alternative and Alternative 3 would decrease fire severity and hazards at approximately the current levels.

Alternatives 1 and 2 would decrease the acreage of fire-resilient forests from current conditions, because they would create forests without green tree structural legacies, which have a lower fire resiliency compared to forests with such structural legacies.

In both the Medford District and Klamath Falls Resource Area, the No Action Alternative and Alternative 3 would increase the acreage of fire-resilient forests from current conditions, because they would create forests with structural legacies.

Air

Under all four alternatives, emissions from prescribed burning would occur at the local level, but all burning would follow the Oregon Smoke Management Plan. This would result in the protection of all air quality, Class 1 visibility areas, and air quality maintenance areas.

Recreation

All four alternatives meet recreational demand and improve the quality of visitor experiences.

The off-highway vehicle designations would be the same under the three action alternatives. See *Table 6 (Off-highway vehicle designations under the alternatives)*. Additionally, in the Medford District, the number of off-highway vehicle emphasis areas would vary from 0 to 10 under all four alternatives.

Table 6. Off-highway vehicle designations under the alternatives

Off-highway Vehicle Designation	No Action Alternative (acres)	All Action Alternatives (acres)
Open	330,000	77
Closed	84,600	98,800
Limited to Existing Roads and Trails	950,000	0
Limited to Designated Roads and Trails	1,100,000	2,400,000

Under the three action alternatives, the redesignation of off-highway vehicle areas, and the designation of 10 new emphasis areas in the Medford District (under Alternative 2), would reduce visitor conflicts and increase off-highway vehicle opportunities. This would improve public safety and visitor experiences compared to the No Action Alternative.

Harvesting and associated roads can change the remoteness and naturalness of an area, which in turn can cause changes in the recreational settings used by the public. Remoteness would be little changed under all four alternatives since there are relatively few new permanent roads. The naturalness of BLM areas would also be little changed overall. The alternatives would maintain a mix of naturalness settings that provide a variety of opportunities and experiences for visitors.

Wilderness Characteristics

The BLM evaluated 146 public wilderness proposals that were received during scoping. It was determined that nine of these areas (26,123 acres) contained wilderness characteristics. Under the three action alternatives, there would be special management (no harvesting) to maintain the wilderness characteristics on five of these areas.

It was assumed that timber harvesting would not maintain wilderness characteristics. *Table 7 (Acres of wilderness characteristics maintained under the alternatives)* shows that each of the four alternatives would maintain 52 to 63% of the 26,123 acres that have wilderness characteristics.

Table 7. Acres of wilderness characteristics maintained under the alternatives

Wilderness Characteristics Maintained	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Acres	16,485	15,610	13,637	13,918
Percentage	63	60	52	53

Visual Resources

Visual resource quality is determined through the visual resource inventory process, which is based on a combination of scenic quality, sensitivity levels, and distance zones. The results of this inventory process classified all BLM lands within the planning area as Class I, II, III, or IV. Class I areas are determined to have the highest level of visual resource quality, while Class IV areas have the lowest level (see *Chapter 3*).

The BLM also designates visual resource management classes through the land use planning process. These classes also range from Class I through IV. Class I areas are managed to preserve visual resource quality, while Class IV areas allow for major modifications. Management classes can vary from the original inventory classes to be consistent with the goals and objectives of resource management plans.

Areas inventoried as Class I and IV would be maintained under all four alternatives. Regeneration harvests would diminish existing visual resource quality within Class II and III areas. Alternative 1 would maintain existing visual resource quality on the greatest portion of BLM lands within the planning area compared to the other two action alternatives.

National Landscape Conservation System

The three action alternatives would continue to protect all National Landscape Conservation System designated lands.

Soils

The same or improved practices would be used to minimize the loss of soil productivity under the three action alternatives as under the No Action Alternative.

Despite some residual detrimental soil disturbance, overall soil productivity would be maintained or improved under all four alternatives.

Grazing

Under the three action alternatives, the acres of livestock grazing authorizations would decrease from 560,000 acres to 418,500 acres. This decrease is largely in the Medford District and Klamath Falls Resource Area of the Lakeview District, where the acres are vacant and not currently grazed.

Under all four alternatives, there would be an increase in forage production in the Medford District and the western portion of the Klamath Falls Resource Area of the Lakeview District. The highest increase under the three action alternatives would occur under Alternative 3. None of the alternatives would substantially change the quantity of forage production in the eastern portion of the Klamath Falls Resource Area, since little regeneration or partial harvesting would occur there.

Wild Horses

The Pokegama Herd Management Area is located partially (84%) within the planning area. Forage production in support of the herd would be affected by changes to vegetation due to management activity. Stand establishment forests, where regeneration or partial harvesting would occur, provides the best forage.

All four alternatives would increase forage production with the highest increase being under Alternative 3. All four alternatives would maintain the current appropriate herd management level of 30 to 50 head.

Areas of Critical Environmental Concern and Research Natural Areas

During the planning process, the status of 94 existing and 38 proposed areas of critical environmental concern were reviewed. There were 124 that met the designation criteria and that were carried forward under the three action alternatives.

Relevant and important values are the unique values for which an area of critical environmental concern is managed. Some land use allocations may provide for these values, so there would be no need for designation. Under the three action alternatives, areas of critical environmental concern were analyzed for designation, and if areas were not viable without O&C lands they were not designated.

See Table 8 (*Total existing and potential ACECs designated by alternative*) for the number of areas of critical environmental concern under the alternatives.

Table 8. Total existing and potential ACECs designated by alternative

Designated	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Number of ACECs	94	92	93	82

It was assumed that if an area of critical environmental concern was not designated due to the loss of O&C lands, the relevant and important values would be degraded or lost. See *Table 9 (Relevant and important value categories that would receive no special management attention)* for the action alternatives that would not maintain 25 to 35% of the relevant and important values. Note that an area of critical environmental concern can have more than one relevant and important value.

Table 9. Relevant and important value categories that would receive no special management attention

Value Category	Alternatives							
	No Action		Alternative 1		Alternative 2		Alternative 3	
	number	%	number	%	number	%	number	%
Cultural, historic, and scenic	0	0	5	16	4	13	7	22
Fish and wildlife	0	0	19	34	15	27	24	43
Natural process or system			34	28	33	28	43	36
Natural hazard	0	0	0	0	0	0	0	0
Totals	0	0	58	27	52	25	74	35

Note: See Appendix M, *Areas of Critical Environmental Concern and Research Natural Areas* for information about the specific important and relevant values for each area of critical environmental concern.

Cultural Resources

Impacts to sites would be largely reduced or eliminated due to predisturbance site discovery and avoidance or protection measures. However, there would be some residual incidental or inadvertent loss of sites. Damage to cultural, paleontological, and traditional use sites would vary little between the alternatives. For all four alternatives, 2% or less of the number of sites would be damaged per decade.

Energy and Minerals

All four alternatives would maintain similar levels of availability and quantity of energy and mineral resources. Opportunities to explore for energy and mineral resources on public land within the planning area would generally be abundant relative to the demand under all four alternatives.

Under all four alternatives, those portions of the Coos Bay District that are in the Coos geologic basin would be of special interest for exploration and development of coal bed natural gas, as an extension of development already under way. As many as 77 wells may be drilled on federal land, which would result in approximately 525 acres of disturbance.

Chapter 1 – Purpose and Need

Chapter 1 describes the purpose and need for the action that is proposed, and identifies the factors that will be used when choosing among the alternatives at the time of the decision. This chapter also describes the boundaries of the planning area, the planning process – including scoping, the collaborative efforts the BLM has made with the many agencies and organizations that have an interest in BLM-administered lands in western Oregon, and the relationship these revised resource management plans have to other plans and programs.

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Chapter 1 - Purpose and Need

Chapter 1 describes the purpose and need for the action that is proposed and identifies the factors that will be used to evaluate the proposed action. The chapter also describes the relationship of the proposed action to the planning process and the planning process itself. The chapter also describes the relationship of the proposed action to the planning process and the planning process itself.

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Introduction

The Bureau of Land Management (BLM) is revising the resource management plans (RMPs) for the Coos Bay District, Eugene District, Medford District, Roseburg District, Salem District, and the Klamath Falls Resource Area of the Lakeview District. The Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act (O&C Act) is the statutory authority that provides primary direction to the BLM for managing most of the lands it administers in western Oregon.

O&C Act

The lands that are managed by the O&C Act include the Oregon and California Railroad grant lands that were reverted in 1916 and the Coos Bay Wagon Road lands that were reconveyed in 1919.

The existing RMPs are consistent with the 1994 Northwest Forest Plan, adopted by the Department of the Interior and the Department of Agriculture for federal forests within the range of the northern spotted owl as an “ecosystem management plan for managing habitat for late-successional and old-growth forest related species.” The proposed action is to revise the RMPs with land use allocations and management direction that best meet the purpose and need.

The BLM is proposing to revise existing plans to replace the Northwest Forest Plan land use allocations and management direction because (1) the BLM’s plan evaluations found harvest levels have not been achieving the timber harvest levels directed by existing plans, and the BLM now has more detailed and accurate information than was available in 1995 on the effects of sustained yield management on other resources, (2) there is an opportunity to coordinate the BLM management plans with new recovery plans and re-designations of critical habitat currently under development and (3) the BLM has re-focused the goal for management of the BLM-administered lands to the objectives of its statutory mandate to utilize the principles of sustained yield management on the timber lands covered under the O&C Act of contributing to the economic stability of local communities and industries, and other benefits from such management to watersheds, stream flows, and recreation.

Purpose and Need for the Plan Revisions

The goals for the Northwest Forest Plan were broader than the specific requirements of the Endangered Species Act and Clean Water Act and sought to provide more consistent management of federally-managed lands by applying National Forest Management Act requirements to BLM-administered lands. The selected alternative for the Northwest Forest Plan was selected because it would “maintain the late-successional and old-growth forest ecosystem and provide a predictable and sustainable supply of timber, recreational opportunities and other resources at the highest level possible.” The purpose and need for this plan revision is focused on specific legal requirements and intended benefits of the BLM’s unique mandate under the O&C Act, distinct from the mandate to the U.S. Forest Service under National Forest Management Act.

The purpose and need for this proposed action is to manage the BLM-administered lands for permanent forest production in conformity with the principles of sustained yield, consistent with the O&C Act.¹ The plans will also comply with all other applicable laws including, but

¹ The Ninth Circuit in *Headwaters v. BLM*, 914 F.2d 1174 (9th Cir. 1990) confirmed that in the O&C Act Congress mandated timber production as the dominant use of these BLM-administered lands.

not limited to, the Endangered Species Act, the Clean Water Act, and, to the extent that it is not in conflict with the O&C Act, the Federal Land Policy and Management Act. In accord with the Endangered Species Act, the plans will use the BLM's authorities for managing the lands it administers in the planning area to conserve habitat needed from these lands for the survival and recovery of species listed as threatened or endangered under the Endangered Species Act.²

Reasons for Revising the RMPs Now

Plan evaluations showed the BLM's timber harvest levels as directed by existing plans were not being achieved, and the BLM now has more detailed and accurate information on the effects of sustained yield timber management on other resources.

RMP revisions are necessary where monitoring and evaluation findings, new data, new or revised policy, or changes in circumstances indicate decisions in a plan (an entire plan or a major portion of a plan) no longer serve as a useful guide for resource management (43 CFR 1610.5-6). Failure to meet some plan objectives and new information that increases opportunities to improve the performance of other plan objectives necessitates revisions to resource management plans.

The BLM completed evaluations for the six western Oregon RMPs in 2004 and found departures from objectives, management actions, and assumptions in the timber resources program. The BLM determined the annual productive capacity and declared an allowable sale quantity of 211 million board feet (mmbf) in the 1995 records of decision for the RMPs for western Oregon.³ Except for the Klamath Falls Resource Area of the Lakeview District, evaluations for the other districts documented that regeneration harvest was 30 to 60 percent of the levels anticipated. Even when thinning volume was added, except for the Klamath Falls Resource Area of the Lakeview District, plan evaluations showed that the timber offered from the harvest land base was still only 40 to 70 percent of the anticipated allowable sale quantity. This failure to meet the harvest levels is largely due to unanticipated legal and practical implementation issues involved in managing designated critical habitat for the northern spotted owl that was different than the land use allocations in the Northwest Forest Plan, and court decisions regarding the survey and manage mitigation measure and Aquatic Conservation Strategy.

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² This revision process will satisfy a settlement agreement resolving long-standing litigation of the Northwest Forest Plan (*AFRC v. Clarke*, Civil No. 94-1031-TPJ (D.D.C.)) that alleged the current RMPs violate the O&C Act. The settlement agreement requires BLM to consider revisions to the RMPs by the end of the year 2008, and include at least one alternative that "will provide permanent forest production across the O&C lands without reserves except as required to avoid jeopardy under the Endangered Species Act." See *Appendix A* for more discussion.

³ Currently, due to subsequent adjustments through plan amendments and maintenance, the declared allowable sale quantity for the BLM lands in western Oregon is 203 million board feet (mmbf).

The departures from the expectations and assumptions of the RMPs regarding the ability of the BLM to supply timber at a predictable and sustained level under the Northwest Forest Plan have created substantial uncertainty as to whether the objective under the O&C Act (managing O&C lands for permanent forest production and contributing to the stability of the local economy and industry) can be met in the short or long term. Even though the purpose of the O&C Act in providing a stable source of revenue to the county governments has been supplanted in recent years through temporary Congressional funding, the source of this revenue in the long term is uncertain. To the extent the BLM can provide a substantial stream of revenue to the counties through the revenue sharing provisions of the O&C Act, the ability of county governments dependent on these revenues to provide services will be improved. Furthermore, the revenue sharing provision is primarily in support of the local governments, whereas the intended benefits of sustained yield timber management under the O&C Act also include contribution to the local economies and industries, not just to governments.

These plan evaluations generally found that other resource programs were functioning as anticipated in achieving most goals, but identified potential for improvements. For example, the evaluations indicated opportunities to adjust the off highway vehicle designations for some districts, to add a new policy (the National Fire Plan) for some districts, to address the latest science and more recent listings on threatened and endangered species for all of the districts. These items in themselves may not have justified a revision of the current RMPs, but will be considered in this revision of the RMPs.

In 1995, the Northwest Forest Plan analysis used a geographical information database that was limited to a resolution of units of 40 acres in size. The current database has a resolution many times finer than this: i.e., 10 square meters in resolution rather than 40 acres. Additionally the hydrological map data, among others, was incomplete at that time and has now been completed and updated. As a consequence, the BLM is now able to perform analysis on such resources as aquatic habitat in much finer detail with more precision using analytical models that were unavailable in 1993. In part due to the limitations of the available information database, the 1995 RMPs erred on the side of caution regarding resources used by species considered rare, threatened, or endangered. That margin of error is no longer justified. Making this adjustment in light of advances in the analytical ability, data, and knowledge of the resources is consistent with the principles of adaptive management articulated in the Northwest Forest Plan in 1994.

There is an opportunity to coordinate the BLM's management plans with new recovery plans and redesignations of critical habitat currently under development.

The National Marine Fisheries Service and Fish and Wildlife Service are currently reviewing, revising or drafting recovery plans and critical habitat for some listed species in the planning area. These revisions will also allow the BLM to coordinate its RMPs with decisions on the recovery plans and any re-designation of critical habitats.

The late-successional reserves in the Northwest Forest Plan do not coincide completely with the critical habitat that was designated for the northern spotted owl by the Fish and Wildlife Service in 1992. This resulted in an uncertainty for those matrix lands that are overlain with the critical habitat designation, because the matrix land use allocation was where the majority of timber harvesting to meet the declared allowable sale quantity was expected to occur.

Some Fish and Wildlife Service biological opinions on timber sales within critical habitat have been litigated and found invalid. In the *Gifford Pinchot Task Force*⁴ decision, the Ninth Circuit made it clear that effects to critical habitat must be considered regardless of whether the Northwest Forest Plan would be expected to recover the species. As a result, the ability of the BLM to implement timber sales in the portions of the matrix and adaptive management area that are within designated critical habitat is more limited than anticipated in the current RMPs.

The existing management uncertainty resulting from the differences between the designated critical habitat and the reserves established in the Northwest Forest Plan could be reduced by harmonizing the BLM RMPs with designated critical habitat. The Fish and Wildlife Service is concurrently writing a recovery plan and reexamining the designation of critical habitat for the northern spotted owl. Thus, the BLM, at this time, has an opportunity to integrate the recovery plans of the Fish and Wildlife Service and National Marine Fisheries Service, and any redesignation of critical habitat, into the revision of the BLM's resource management plans.

The BLM has re-focused the goal for management of the BLM-administered lands to the statutory mandates specifically applicable to these lands.

The statutory requirements of the O&C Act, which governs most BLM-administered lands in western Oregon, include, but are not limited to, managing the O&C lands for permanent forest production by selling, cutting, and removing timber in conformance with the principles of sustained yield; determining the annual productive capacity of the lands managed under the O&C Act; and offering that determined capacity annually under normal market conditions. The statute states that the purpose of sustained yield management of these lands is to provide a permanent source of timber, contribute to the economic stability of local communities and industries, as well as benefit watersheds, regulate stream flows, and provide recreational use.⁵ The statutory requirements of the O&C Act are limited by other statutes providing for the need to conserve listed species and the habitat they depend on, not jeopardizing listed species and not adversely modifying critical habitat, and the protection of the chemical, biological and physical properties of the water of the United States. As long as the requirements of these other statutes are met, increasing the level of timber production consistent with the principles of sustained yield would further the objectives set by Congress for managing these lands under the O&C Act.

Land use allocations

For details about the Northwest Forest Plan and its land use allocation designations, search for the phrase Northwest Forest Plan at <http://www.blm.gov/search>.

⁴ *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service*, 378 F.3d 1059 (9th Cir. 2004)

⁵ The BLM interprets this language of the O&C Act as explaining the rationale for sustained yield forest management, rather than enumerating additional objectives for management.

Selecting a Preferred Alternative

In selecting among the alternatives in this plan revision, the BLM will evaluate which alternative or combination of alternatives best meets the Purpose and Need. In addition, the BLM will consider the environmental consequences related to the issues identified below and the cost of implementation.

Background

The following background summarizes the major resource plans, and laws that affect the BLM's management of the O&C lands of western Oregon.

Northwest Forest Plan

The management direction contained in the 1994 Northwest Forest Plan (NWFP) was designed to respond to the need for both forest habitat and forest products (NWFP ROD, p. 25). In selecting Alternative 9 (which became the NWFP), the secretaries of the Interior and Agriculture stated that “[t]o balance these sometimes conflicting purposes and plan for management of ecosystems that cross the administrative boundaries ... we adopt the alternative that will both maintain the late-successional and old-growth forest ecosystem and provide a predictable and sustainable supply of timber” (NWFP ROD, p. 26).

Northwest Forest Plan

For documents relating to the Northwest Forest Plan, including the record of decision (ROD), visit <http://www.blm.gov/plans/nwfpnepa/index.htm> or <http://www.reo.gov/library>.

The decision to select Alternative 9 was an attempt to balance the two purposes of forest habitat and forest products. The balancing was primarily accomplished through land allocations between lands designated as reserved lands (congressionally reserved areas, administratively withdrawn, late-successional reserves, and riparian reserves) that were declared “incompatible with programmed, sustained timber harvest” (NWFP SEIS, p. 3&4-263) and the lands not reserved for conservation purposes were left as “matrix” or “adaptive management areas” land allocations on which programmed timber harvest could take place. These remaining unreserved lands constituted 23 percent of the BLM-administered lands. Timber harvesting on the matrix lands and in the adaptive management areas was restricted by the standards and guidelines that were designed to achieve conservation objectives on these lands (NWFP ROD, p. 1-2).

The conservation strategy of the Northwest Forest Plan addressed not only the Endangered Species Act, but also the National Forest Management Act of 1976 (NFMA) and its requirement that the United States Forest Service “provide for diversity of plant and animal communities ... to meet overall multiple-use objectives” (16 U.S.C. §1604). The Northwest Forest Plan applied the same criteria for the management of habitat on both United States Forest Service and BLM-administered lands. The discussion regarding the legal and regulatory compliance of Alternative 9 (as it relates to the National Forest Management Act) in the 1994 record of decision for the Northwest Forest Plan states that:

NFMA

The National Forest Management Act of 1976 was an amendment to the Forest and Rangeland Renewable Resources Planning Act of 1974 that reorganized and expanded the 1974 act. For the complete act and its regulations, search for Title 16 and all sections starting with Section 1600 at <http://uscode.house.gov>.

Although NFMA regulations apply to lands administered by the Forest Service, the fish and wildlife regulation was used as a criterion in the development of the alternative we select today, which includes direction for management of BLM lands. Use of the regulation's goals in developing alternatives applicable to BLM lands serves the important policy goal of protecting the long-term health and sustainability of all of the federal forests within the range of the owl and the species that inhabit them." (NWFP ROD, p. 44)

Major Laws Affecting Management of O&C Lands

How the various laws affect the management of the O&C lands is discussed in this section. In addition to the laws presented here, there are a multitude of other legal authorities that affect the management of the O&C lands. For those, see *Appendix A*.

The O&C Act has been the statutory authority for the management of the O&C lands since 1937. Subsequent laws affect the management of the O&C lands to varying degrees. Laws, such as the Endangered Species Act and Clean Water Act, are directly applicable to how the BLM exercises its statutory authorities in managing the O&C lands, but none of these laws repealed the underlying primary direction and authority for the O&C lands. Thus, the BLM has a duty to find a way to concurrently implement all these laws, in a manner that harmonizes any seeming conflict between them, unless Congress has provided that one law would override another law. This is the situation in the Federal Land Policy and Management Act where Congress provided that in any conflict between that law and the O&C Act, the O&C Act would prevail. Thus, the O&C Act takes precedence over FLPMA with regard to timber management and receipts distribution.

O&C Act

The 1937 act that administers the O&C lands is untitled, but, through the title given to the codified regulations that administers the act, it is now known as the Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act (O&C Act).

Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act (43 U.S.C. §1181a et seq.)

The 1937 Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act (O&C Act) provides the legal authority to the Secretary of the Interior for the management of the O&C lands. The O&C Act was intended to provide forest management that would generate revenue to the local counties and halt previous practices of clearcutting without reforestation and the "boom and bust" cycles caused by logging in excess of the forest's sustained yield capacity. The O&C Act limited timber harvest to a level that could be continued without

O&C Act

For the complete act and its regulations, search for Title 43 and all sections starting with Section 1181a at <http://uscode.house.gov>.

exceeding the amount of forest growth to avoid depletion of timber resources and provide other benefits.⁶

The O&C Act requires that the O&C lands be managed “for permanent forest production, and the timber thereon shall be sold, cut, and removed in conformity with the principal of sustained yield for the purpose of providing a permanent source of timber supply, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries, and providing recreational facilities” (43 U.S.C. §1181a).

The O&C Act goes on to state that “[t]he annual productive capacity for such lands shall be determined and declared ... [p]rovided, [t]hat timber from said lands ... not less than the annual sustained yield capacity ... shall be sold annually, or so much thereof as can be sold at reasonable prices on a normal market” (43 U.S.C. §1181a).

When monetary receipts from the sale of timber from the O&C lands are distributed, 50% is distributed to the counties in which the revested lands are located. That 50% is distributed to the counties according to their proportion of the total assessed value of the revested lands that existed in each of the counties in 1915. Those percentages range from 0.36% to 25.05% for the 18 O&C counties. It does not matter in which counties the timber is harvested. All counties get their assigned percentage of whatever receipts are available each year.

In meeting the various requirements for managing the O&C lands, the Secretary of the Interior has discretion under the O&C Act to determine how to manage the forest to provide for permanent forest production on a sustained yield basis. While the O&C Act does state that “the timber thereon shall be sold, cut, and removed in conformity with the principal [sic] of sustained yield,” it does not specify the harvest methods, rotation length, or silviculture regimes under which these forests would be managed. Nor does it establish a minimum level of harvest or a minimum level of receipts.

Federal Land Policy and Management Act (43 U.S.C. §1701 et seq.)

The Federal Land Policy and Management Act of 1976 (FLPMA) provides the legal authority to the Secretary of the Interior for the management of public domain lands. The act requires, in part, that “the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and

FLPMA

For the complete act and its regulations, search for Title 43 and all sections starting with Section 1701 at <http://uscode.house.gov>.

⁶ H.R. Report, No. 1119, 75th Cong., 1st Sess. 2 (1937).

use” (43 U.S.C. §1701 [Sec. 102.a.8]). In addition, the act requires that “the public lands be managed in a manner which recognizes the Nation’s need for domestic sources of minerals, food, timber, and fiber from the public lands” (43 U.S.C. §1701 [Sec. 102.a.12]).

However, the Federal Land Policy and Management Act specifically provides that if there is any conflict between its provisions and the O&C Act related to the management of timber resources or the disposition of revenues from the O&C lands and resources, the O&C Act prevails (i.e., takes precedence) (43 U.S.C. §1701). Thus, the multiple-use management direction of this act does not apply to the O&C lands that are suitable for timber production. On the other hand, the planning process established by this act is applicable to the O&C lands, since it is not in conflict with the O&C Act’s management direction for those lands.

Note that the multiple-use management direction of this act does apply to other public lands (e.g., the public domain lands) that are managed by the BLM in western Oregon.

Endangered Species Act (as amended) (16 U.S.C. §1531 et seq.)

Section 7 of the Endangered Species Act (ESA) requires federal agencies to use their legal authorities to promote the conservation purposes of the act. This section also requires federal agencies to consult with the United States Fish and Wildlife Service or the National Marine Fisheries Service to ensure that actions they authorize, fund, or carry out will not jeopardize species listed as threatened or endangered under the ESA or cause destruction or adverse modification to designated critical habitat for such species. Critical habitat is defined, in part, as geographic areas occupied by the species that contain the physical or biological features essential to the conservation of a species listed under the act and that may need special management or protection. (U.S. Fish and Wildlife Service, Endangered Species Program. *ESA Basics - 30 Years of Protecting Endangered Species*. May 2006. URL: http://www.fws.gov/Endangered/pubs/ESA%20BASICS_050806.pdf (accessed October 2006))

Endangered Species Act

For the complete act and its regulations, search for Title 16 and all sections starting with Section 1531 at <http://uscode.house.gov>.

Clean Water Act (as amended) (33 U.S.C. §1251 et seq.)

The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the nation’s waters. To accomplish this objective, the statute requires that: water quality standards consistent with the statutory goals of the Clean Water Act be established; water bodies be monitored to determine whether the water quality standards are being met; and, if all of the water quality standards are being met, then antidegradation policies and programs, including ambient monitoring, be employed to keep the water quality

at acceptable levels.

If a water body is not meeting the applicable water quality standards for a beneficial use, a strategy for meeting the required standards must be developed by the administering agency, typically the state water quality agency. For example, section 303(d) of the Clean Water Act directs states and tribes to develop a list of waters that fail to meet water quality standards and develop total maximum daily loads (TMDLs) for the individual pollutants (e.g., sediment, bacteria, elevated instream temperature) causing the water quality standards violations. TMDLs determine what level of pollutant load would be consistent with meeting the water quality standards and allocate acceptable loads among sources of the relevant pollutants. Necessary reductions in pollutant loading are achieved by implementing strategies that are authorized by the Clean Water Act, along with other tools that are available from federal, state, and local governments and nongovernmental organizations. (U.S. Environmental Protection Agency, Watershed Academy Web. *Introduction to the Clean Water Act*. March 13, 2003. URL: <http://www.epa.gov/watertrain/cwa/rightindex.htm> (accessed October 2006))

Clean Water Act

For the complete act and its regulations, search for Title 33 and all sections starting with Section 1251 at <http://uscode.house.gov>.

Sections 303(d) and 319 of the Clean Water Act most directly apply to the BLM. Section 303(d) (codified as 33 U.S.C. §1313(d)) directs states and tribes to develop a list of waters that fail to meet water quality standards for various constituents including, among others, sediment, temperature, and bacteria. Section 303(d) requires states and tribes to develop total maximum daily loads that apportion a load of pollutants that can be discharged into the waters of a state. Section 319 (codified as 33 U.S.C. §1329) established management programs to control water pollution from nonpoint sources, such as sediment.

The BLM's Application of the O&C Act

Based on the language of the O&C Act, the O&C Act's legislative history, and the decision by the Ninth Circuit in *Headwaters v. BLM*, (914 F.2d 1174 (9th Cir. 1990)), it is clear that the management of timber (including harvesting) is the dominant use of the O&C lands in western Oregon. That dominant use, however, must be implemented in full compliance with a number of subsequent laws that direct how the BLM accomplishes that statutory direction. See *Appendix A* for a discussion of court rulings most relevant to the decisions which must be made in revising the RMPs for the BLM lands in western Oregon.

The following sections discuss the laws that affect the management of areas of critical environmental concern, wilderness study areas, scenic values, and listed species.

Areas of Critical Environmental Concern

The Federal Land Policy and Management Act provides the authority for the designation of areas of critical environmental concern (43 U.S.C. §1712 [Sec. 202.c.3]). However, the O&C Act prevails over the Federal Land Policy and Management Act with regard to the management of timber resources on O&C lands. With these two laws, the BLM:

- Would manage areas of critical environmental concern to protect their relevant and important features on O&C lands where management of the area of critical environmental concern would not conflict with sustained yield forest management in areas dedicated to timber production .
- Would manage areas of critical environmental concern to protect their relevant and important features on public domain lands.
- Would designate research natural areas, a type of area of critical environmental concern, on O&C lands when the scientific value of the research is relevant to sustained yield forest management.
- Would not designate other areas of critical environmental concern on O&C lands where management of the area of critical environmental concern would conflict with sustained yield forest management in areas dedicated to timber production.

Wilderness Study Areas

The Federal Land Policy and Management Act provided the authority for the designation of wilderness study areas (43 U.S.C. §1782 [Sec. 603]), but that authority expired in 1993. Moreover, the O&C Act prevails over the Federal Land Policy and Management Act with regard to the management of timber resources on O&C lands. With these two laws, the BLM:

- Cannot designate additional wilderness study areas due to the expiration of that designation authority under the Federal Land Policy and Management Act.
- Can manage lands outside of the existing wilderness study areas for wilderness characteristics on O&C lands where management for wilderness characteristics would not conflict with sustained yield forest management in areas dedicated to timber production.
- Can manage lands outside of the existing wilderness study areas for wilderness characteristics on public domain lands.

Visual Resources

The Federal Land Policy and Management Act provides the authority for the protection of scenic values (43 U.S.C. §1701 [Sec. 102.a.8]). However, the O&C Act prevails over the Federal Land Policy and Management Act with regard to the management of timber resources on O&C lands. With these two laws, the BLM:

- Would protect scenic values as identified through a visual resource management inventory where the protection is required as part of the management specified by Congress in subsequent legislation, such as the Wild and Scenic Rivers Act.
- Can protect scenic values as identified through a visual resource management inventory on O&C lands where protection would not conflict with sustained yield forest management in areas dedicated to timber production.
- Can protect scenic values as identified through a visual resource management inventory on public domain lands.

Special Status Species

Special status species includes those species that are listed by the Endangered Species Act as threatened or endangered (including proposed and candidate species), listed by a state as being of special concern, and listed by the BLM as sensitive or needing assessment. The *BLM Manual 6840 – Special Status Species Management* provides the direction for the management of species that are listed as having special status. The Endangered Species Act provides the authority for the management of species that are listed as threatened or endangered. The Sikes Act provides the authority for the management of species that are listed by a state as being of special concern. The Federal Land Policy and Management Act provides the authority for the management of species that are listed by the BLM as sensitive or assessment species. The O&C Act, however, prevails over the Federal Land Policy and Management Act with regard to the management of timber resources on O&C lands. With these four laws and BLM policy, the BLM:

BLM Manual 6840

For this policy manual, search for 6840 at <http://www.blm.gov/search/>.

- Must, as a federal agency, follow certain procedures to assure that the exercise of its authorities would not likely jeopardize a listed species or adversely modify the critical habitat of a listed species on all BLM-administered lands.
- Must utilize its authorities to further the purposes of the Endangered Species Act by managing BLM-administered lands in a manner that aids the recovery of threatened and endangered species.

- Would accord specific protection to a state listed species under the O&C Act where the state and the BLM have entered into a cooperative management agreement for a species.
- Would accord specific protection to BLM sensitive or assessment species on O&C lands where protection would not conflict with sustained yield forest management in areas dedicated to timber production, or where such protection is necessary to prevent extinction of a species, even if it is not yet listed under the Endangered Species Act.
- Would accord specific protection to BLM sensitive or assessment species on public domain lands.

Management of the Public Domain Lands in Relation to the O&C Lands

Out of the 2,557,800 acres of the BLM lands that are in the planning area, approximately 394,600 acres are public domain lands. About half of those public domain lands are small parcels that are widely scattered and intermingled with the O&C lands. While the Federal Land Policy and Management Act requires that the public domain lands be managed for a multitude of values, the act does not require that every parcel be managed for every value. As in previous resource management plans, these public domain parcels will be managed in accordance with the 1975 Public Land Order (PLO) No. 5490, which reserves these intermingled public domain lands for multiple-use management, including the sustained yield of forest resources in connection with the intermingled revested Oregon and California Railroad Grant lands and reconveyed Coos Bay Wagon Road Grant lands.

PLO No. 5490

For the complete subject heading and FR citation, search for PLO 5490 at <http://blm.gov/nhp/what/plo>.

Planning Area

The entire planning area includes all lands (private, local, state, and federal) in western Oregon (Figure 7). The resource management plan revisions will affect the lands that are administered by the BLM in the BLM districts and counties of western Oregon that are listed in Table 10.

Figure 7. Entire planning area of the resource management plan revisions

Table 10. The BLM districts and Oregon counties included in the planning area of the resource management plan revisions

BLM Districts	Oregon Counties	
Coos Bay	Benton	Lane
Eugene	Clackamas	Lincoln
Lakeview (Klamath Falls Resource Area only)	Columbia	Linn
Medford	Coos	Marion
Roseburg	Curry	Multnomah
Salem	Douglas	Polk
	Jackson	Tillamook
	Josephine	Washington
	Klamath	Yamhill

The BLM's current resource management plans provide the procedures and requirements for the management of approximately 2,557,800 acres of federal land within the planning area. These acres are the orange blocks in *Figure 7*. These BLM-managed lands are widely scattered and represent only about 11% of the planning area. Of the approximately 2,557,800 acres that are managed by the BLM, approximately 2,151,200 acres are managed primarily under the O&C Act and are commonly referred to as the O&C lands. The remaining 406,600 acres are public domain (394,600 acres) and other (12,000 acres) lands that are managed primarily under the Federal Land Policy and Management Act. See *Table 11* for the status of all federal lands in the planning area per district.

Note: The BLM's resource management plans also apply to an additional 69,000 acres that are split-estate lands for which the BLM manages only the subsurface mineral estate.

Table 11. Legal status of lands managed by the BLM in western Oregon

BLM Districts	O&C and Coos Bay Wagon Road Lands (acres)	Public Domain (acres)	Other (acres)	Total (acres)
Salem	349,300	51,600	2,100	403,000
Eugene	304,200	10,500	400	315,100
Roseburg	406,500	19,800	0	426,300
Coos Bay	279,400	41,800	1,500	322,700
Medford	764,900	96,100	4,800	865,800
Klamath Falls Resource Area (Lakeview District)	46,900	174,800	3,200	224,900
Total	2,151,200	394,600	12,000	2,557,800

Much of the O&C lands have retained the checkerboard character of the original railroad land grants of the 1800s with the BLM managing the odd-numbered sections. Because of this ownership pattern, activities on adjacent private lands have implications for the management of the federal lands. The BLM typically manages less than half, and often only a small percentage, of the land in any particular fifth-field watershed.

Checkerboard

A land ownership pattern in which square-mile sections of federal lands are intermixed with and surrounded by private lands.

Planning Process

Preparing a resource management plan involves a series of explicit steps. See *Figure 8*. The following tasks have been completed as of the release of this draft environmental impact statement:

- Scoping was conducted from September through October 2005. The BLM attended or hosted about 75 meetings with community groups, special interest groups, elected officials, and others. About 3,000 communications were received with public comments and suggestions.
- Analysis of the management situation was released in October 2005.
- The planning criteria and the scoping report were released in February 2006.

Figure 8. Steps in the planning process (highlighted boxes indicate public involvement)

Collaboration

The Federal Land Policy and Management Act and the National Environmental Policy Act (NEPA) provide direction regarding the coordination and cooperation of federal agencies with other agencies and also local and state governments. The Federal Land Policy and Management Act specifically emphasizes the need to ensure the coordination and consistency of a federal agency’s proposed actions with the plans and policies of other relevant jurisdictions. The National Environmental Policy Act specifically requires cooperative relationships between lead and cooperating agencies.

NEPA

For the complete act and its regulations, search for Title 42 and all sections starting with Section 4321 at <http://uscode.house.gov>.

Formal Cooperators

Cooperating agency status provides a formal framework for governmental units—local, state, or federal—to engage in active collaboration with a lead federal agency to implement the requirements of the National Environmental Policy Act. Within the constraints of time and resources, cooperating agency staff members are encouraged to participate fully with the BLM as members of the planning and environmental impact statement team.

For these resource management plan revisions, the BLM has worked with cooperators from a multitude of agencies. Cooperators have provided expertise in much of the subject matter being analyzed and have provided advice based on experiences with similar planning efforts. See *Table 12* for a list of the formal cooperators for the western Oregon resource management plan revisions.

Table 12. Formal cooperators

Federal Agencies	State Agencies	Oregon Counties	
	Office of the Governor		
	Department of Forestry		
	Department of Fish and Wildlife	Benton*	Lane
United States Forest Service	Department of Environmental Quality	Clackamas	Lincoln
United States Fish and Wildlife Service	Department of Transportation	Columbia	Linn
	Department of Geology and Mineral Industries	Coos	Marion
National Marine Fisheries Service	Department of Agriculture	Curry	Polk
Environmental Protection Agency	Department of Parks and Recreation	Douglas	Tillamook
	Department of State Lands	Jackson	Washington
	State Marine Board	Josephine	Yamhill
	Water Resources Department	Klamath	

*Not represented by the Association of O&C Counties.

Government-to-Government Relationships

There are seven recognized tribes within the planning area. *Table 13* lists these tribes. All of the tribes have stated that they want government-to-government relationships rather than cooperator relationships. The Coquille Tribe is directly engaged in the planning process because, by law (25 U.S.C. §715c), the management of their tribal lands must be consistent with the management of the surrounding federal lands.

Coquille Restoration Act

For the complete act and its regulations, search for Title 25 and all sections starting with Section 715 at <http://uscode.house.gov>.

Table 13. Recognized tribes within the planning area

Tribes
Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians
Coquille Indian Tribe
Cow Creek Band of Umpqua Tribe of Indians
Confederated Tribes of Grand Ronde
Confederated Tribes of Siletz
Confederated Tribes of the Warm Springs Reservation
The Klamath Tribes

Title V of the Oregon Resource Conservation Act of 1996 (Public Law 104-333) created the Coquille Forest. The act states that the Coquille Forest shall be managed “under applicable State and Federal forestry and environmental protection laws, and subject to critical habitat designations under the Endangered Species Act, and subject to the standards and guidelines of Federal forest plans on adjacent or nearby Federal lands, now and in the future.” The Coquille Indian Tribe and the BLM are considering entering into an agreement to collaborate and coordinate management on the BLM lands that are adjacent to the Coquille Forest to further the management described in the act.

Formal Scoping

Scoping is a public involvement process. Its purpose is to identify issues early in the planning process that the planning process needs to address and to provide opportunities for the public to provide comments. These public comments determine the scope of the issues to be addressed and help identify the significant issues related to the proposed actions.

Summary of the Scoping Process

The formal scoping period started with the printing of a notice of intent in the Federal Register on September 7, 2005 and concluded on October 21, 2005. The first edition of the BLM planning newsletter (*Western Oregon Plan Revisions News, Scoping for Issues, Issue No. 1, August 2005*) was mailed in early September to approximately 11,000 postal addresses. The addresses

were collected from interested parties who had contacted the six BLM districts regarding the resource management plan revisions or the 2004 survey and manage environmental impact statement. Approximately 75 meetings were conducted with interested parties in western Oregon. These public meetings included one-on-one meetings with key stakeholders, presentations to organized groups and agencies, tours, and advertised public meetings. Several newspaper articles reported on the scoping process and advertised the public meetings.

The BLM also requested that an outside organization conduct an independent assessment of the interests and concerns of the stakeholders. The Public Policy Research Institute at the University of Montana was retained to solicit ideas on how to involve the public throughout the planning process. The Institute conducted this assessment with the assistance of RESOLVE and the Consensus Building Institute, which are two nationally recognized public involvement organizations. Their report and recommendations were considered in designing the public involvement activities.

About 3,000 communications were received during the scoping period. Comments included e-mail messages, written correspondence, face-to-face discussions, and meeting notes. The results of the scoping are available in the *Western Oregon Plan Revisions, Scoping Report, February 2006*. This public input greatly assisted the BLM in formulating this draft environmental impact statement.

Issues Identified

An issue, in the context of an environmental impact statement, is a matter of concern about resource management activities or land use that is well-defined or topically discrete. Identification of issues contributes to the development of the objectives which any reasonable alternative must achieve and/or factors that will be considered in choosing among the reasonable alternatives. The issues identified during scoping for these resource management plan revisions were:

- **Vegetation.** How should the BLM provide a sustainable supply of wood and other forest products, as mandated by the O&C Act, while also meeting all of the applicable laws and regulations?
- **Habitat for species listed under the Endangered Species Act.** How should the BLM manage federal lands in a manner that is consistent with the Endangered Species Act in order to contribute to the conservation of species?
- **Watershed management and water quality.** How should the BLM manage federal lands to contribute to the goals of the Clean Water Act and the Safe Drinking Water Act?
- **Wildland fire and fuels.** How should the BLM manage federal lands to reduce the risk of wildfires and integrate fire back into the ecosystem?

- **Off-highway vehicle management (particularly in the Medford District).** How should the BLM administer federal lands to meet the demand for off-highway vehicle use while protecting other resources?

Relationship of the RMPs to Other Plans, and Programs

The April 1994 record of decision for the Northwest Forest Plan, signed jointly by the Secretary of the Interior and the Secretary of Agriculture, required the BLM to incorporate the Northwest Forest Plan's land use allocations and its standards and guidelines into the resource management plans for western Oregon. The resource management plans were subsequently amended by the following interagency plan amendments:

- *January 2001, Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl*

Note: The survey and manage categorizations for the red tree vole were established in this record of decision. The Ninth Circuit Court decision in *Klamath-Siskiyou Wildlands Center v. Boody*, 468 F.3d 549 (9th Cir., 2006), found that the changes to those survey and manage categorizations for the red tree vole would constitute plan amendments that need to be analyzed with National Environmental Policy Act (NEPA) procedures. The court then invalidated the re-categorizations regarding the red tree vole, because the BLM had not prepared a NEPA document to "amend" the plans. Whether other re-categorizations made through the annual species review process would constitute plan amendments has not been addressed in litigation.

- *March 2004, Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl*

Note: The United States District Court for the Western District of Washington found this record of decision invalid since it relied on a supplemental environmental impact statement that the Court found deficient in certain respects. (See *Northwest Ecosystem Alliance v. Rey*, 380 F. Supp. 2d 1175 (W.D. Wash. 2005). The Court issued an order of relief on January 9, 2006. That order was later modified by another order dated October 11, 2006, which allowed the decision to eliminate the survey and manage requirement to take effect for four specified activities. Another supplemental environmental impact statement has been prepared to address the deficiencies in the 2004 environmental impact statement found by the Court.

- *March 2004, Record of Decision, Amending Resource Management Plans for Seven Bureau of Land Management Districts and Land and Resource Management Plans for Nineteen National Forests Within the Range of the Northern Spotted Owl, Decision to Clarify Provisions Relating to the Aquatic Conservation Strategy*

Note: The United States District Court for the Western District of Washington found this record of decision invalid since it relied on a supplemental environmental impact statement and a biological opinion that the Court found deficient in certain respects. (See *Pacific Coast Federation of Fishermens' Associations v. NMFS*, No. 04-1299-RSM (W.D. Wash. March 30, 2007). The Court, as of this writing, has not yet issued an order of relief.

The Northwest Forest Plan is not a statute or regulation. It was a coordinated, multi-agency amendment to then current resource management plans of the BLM and forest plans of the Forest Service. The Secretaries and the agencies retained authority provided by statutes and regulations to revise these plans in the future. The only provision the Northwest Forest Plan made concerning future amendments to these plans was that they would be “coordinated” through the “Regional Interagency Executive Committee and the Regional Ecosystem Office.” (See NW Forest Plan ROD, p. 58). This plan revision does not seek to amend the Northwest Forest Plan, but to replace the Northwest Forest Plan land use allocation and management direction through plan revision. Nevertheless, the BLM has briefed the Regional Interagency Executive Committee on this plan revision. Furthermore, many of the agencies that were signatories to the Memorandum of Understanding that created the Regional Interagency Executive Committee and the Regional Ecosystem Office are cooperating agencies in this revision.

Endangered Species Act, Section 7, Consultation

Pursuant to the Endangered Species Act, the BLM, as a federal agency, consults with NOAA's National Marine Fisheries Service and the United States Fish and Wildlife Service on all actions that it proposes that may affect listed species. Federal land management plans are considered to be equivalent to conservation plans wherever habitat is being managed for endangered species and as such, require consultation under Section 7 of the Endangered Species Act. (See *Lane County Audubon Society v. Jamison*, 958 F.2d 290 (9th Cir., 1992))

Consultation under the Endangered Species Act for the resource management plans will look broadly at the total landscape management approach. Since no specific on-the-ground activity is actually proposed in the resource management plans, no specific level of incidental take can be identified or exempted in biological opinions for the plans. As subsequent actions are proposed to implement approved resource management plans, those actions will undergo project-level consultation, either formally or informally (as appropriate).

Additionally, species recovery plans and consideration of revisions to critical habitat are currently in progress for several threatened and endangered species. The BLM anticipates that these recovery plans will be completed within the current planning period for the western Oregon resource management plan revisions. If the recovery plans become available before the revisions are completed, they will be incorporated into the revisions.

Recovery planning

For details about the recovery planning for the northern spotted owl and other species that is being led by the U.S. Fish and Wildlife Service, visit <http://www.fws.gov/pacific/ecoservices/endangered/recovery/NSORecoveryPlanning.htm>

Water and Air Quality Management

As part of the revisions for the western Oregon resource management plans, the BLM will concurrently coordinate with various agencies on water and air quality management. The BLM will coordinate with the Environmental Protection Agency and the Oregon Department of Environmental Quality (the federally designated management agency) on water quality standards and other requirements of the federally designated management agency as authorized by the Clean Water Act. Similarly, the BLM will coordinate with the Environmental Protection Agency, the Oregon Department of Environmental Quality, and the United States Forest Service to minimize the impacts of the emissions from prescribed burns.

Other Plans

The BLM collaborates with many other agencies in the development and coordination of their plans for areas that are within and surrounding the BLM's planning area. *Table 14* identifies the various plans of these other agencies and their resources that are in common, dependent, or interdependent with the BLM's resource management plans.

Table 14. Other plan and resource coordination opportunities

Entity	Plan/Program	Common Resources or Dependencies
County/City		
Counties	- Land use plans - Wildfire plans	Timber, fuels management, and payments in lieu of taxes
Cities	- Land use plans - Community wildfire protection plans	Fuels management and communities at risk
State		
Office of the Governor	Statewide planning goals	Soil, timber, water, fish, wildlife, and habitat
Department of Environmental Quality	- BLM water quality restoration plans - Water quality management plans - Total maximum daily loads (TMDLs) - Smoke management plans	Streams, watersheds, air and water quality standards, beneficial uses, and BLM water quality restoration plans
Department of Forestry	- State forest management plans - Fire plans - Rules of the Oregon Forest Practices Act	Watersheds and timber
Department of Fish and Wildlife	- Comprehensive Wildlife Conservation Strategy (Oregon Conservation Strategy) - Oregon Plan for Salmon and Watersheds	Wildlife, habitat, and fisheries
Division of State Lands, Natural Heritage Program	- Rare and Endangered Invertebrate Program (Oregon) - Oregon Natural Heritage Program	Special status species and natural areas
Department of Human Resources	Public water system standards	Surface water
Department of Agriculture	State listed endangered species Noxious Weed	Botanical species Noxious weed list and control
Department of Parks and Recreation	Off-highway vehicle (OHV) plans	Off-highway vehicle (OHV) trails
Federal		
United States Forest Service	Land and resource management plans	Wildlife, fisheries, habitat, streams, watersheds, timber, fuels management, and communities at risk
National Marine Fisheries Service	- Recovery plans for threatened and endangered species - ESA, Section 7 (Consultation)	Threatened and endangered fish species and habitat
United States Fish and Wildlife Service	- Recovery plans for threatened and endangered species - ESA, Section 7 (Consultation)	Threatened and endangered wildlife species and habitat
Environmental Protection Agency	Clean Water Act	Streams, watersheds, total maximum daily loads (TMDLs)
National Resources Conservation Service	Watershed plans	Streams and watersheds
Tribes		
Coquille Indian Tribe	Coquille Forest	Soil, timber, water, fish, wildlife, and habitat

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Chapter 2 – Alternatives

Chapter 2 of this draft environmental impact statement defines the alternatives that were developed for the six resource management plans of the planning area that are being revised.

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Introduction

This chapter describes the No Action Alternative and three action alternatives. The No Action Alternative would continue the management of the current resource management plans, which were approved in 1995 and subsequently amended. The three action alternatives consist of a range of management strategies that are designed to meet the purpose and need discussed in *Chapter 1*. These management strategies encompass management objectives, management actions, and land use allocations.

- **Management objectives.** Descriptions that specifically describe the desired outcomes from the management of particular resources, which are usually expressed in terms that are quantifiable and measurable.
- **Management actions.** Proactive measures that will be applied to activities to achieve the management objectives for resources.
- **Land use allocations.** Identifiers that designate which activities are allowed, restricted, or excluded in all or part of a planning area.

Some management objectives, management actions, and land use allocations are common to all three action alternatives and some vary by action alternative. These differences would result in a variance in the degree or rate in which they achieve the identified purpose and needs for the proposed action.

Management Common to All Action Alternatives

This section identifies the management objectives and management actions that would apply under the three action alternatives. The next section identifies what is unique between the individual alternatives.

Management actions would be used only where and when necessary and practical to achieve management objectives. For example, the BLM may decide not to take a management action when:

- Site-specific circumstances would make the application of the management action unnecessary to achieve resource management plan objectives.
- Site-specific circumstances would make the application of the management action impractical.
- The application of the management action would be inconsistent with other resource management plan decisions.

Activities that are not specifically mentioned in the management actions would be permitted if they are consistent with management objectives.

Air

Management Objective

Prevent impacts to air quality in areas designated as Class I for air quality and nonattainment areas.

Management Actions

- Prescribed burns would be implemented in accordance with the Oregon Smoke Management Plan to reduce emissions, to avoid smoke intrusions into designated areas, and to avoid degrading the visibility in Class I areas.
- Dust palliatives would be used, as necessary, during timber hauling operations to reduce dust.

Cultural and Paleontological Resources including Native American Traditional Uses

Management Objective

Conserve scientific, traditional use, heritage, educational, public, and recreational values of cultural and paleontological resource sites.

Management Actions

- Ground-disturbing actions would avoid sites that are listed (or eligible for listing) on the National Register of Historic Places. If avoidance would not be practical, prior to disturbance the sites with scientific value would be salvaged through practices such as data recovery, which include excavation, relocation, or documentation.
- Cultural properties that are determined to be available for consideration as the subject of scientific or historical study would be classified as scientific use sites or experimental use sites.
- Unusual cultural properties that are not currently available for scientific or historical study, because of scarcity, a research potential that surpasses the current state of the art, singular historic importance, cultural importance, tribal importance, architectural interest, or comparable reasons, would be classified as *conservation for future use sites*. Sites would be selected for the purpose of retaining a representative sample of site types from those available in areas where conflicts with other resource management activities are not anticipated. These sites would be preserved.

- Cultural properties that are found to be appropriate for use as interpretive exhibits at their original location (i.e., in place) or found to be appropriate for related educational and recreational uses would be classified as *public use sites*. Priority locations for these interpretive exhibits would include developed recreation sites, recreation corridors, and locations where recreation is being promoted. These sites would be preserved.
- Cultural properties that are only important for their scientific values and whose research potential is effectively exhausted (ones where the salient information has been collected and preserved or has been destroyed by natural or human activity) would receive no special management.
- Significant cultural resource properties would be acquired for public, cultural heritage, and scientific purposes when such properties are adjacent to or inholdings of BLM-administered land.
- Cultural and paleontological resources that are threatened by natural processes or human activity would be excavated and the data would be recovered where warranted by the scientific importance of the site.

Use sites

For complete descriptions of the use site classifications, search for 8110 (BLM Manual H-8110) at <http://www.blm.gov>.

Energy and Minerals

Management Objective

Maintain existing opportunities and develop new opportunities for the exploration and development of locatable, leasable, and saleable energy and mineral resources, and for casual mineral prospecting.

Management Actions

- Areas would be available for energy and mineral resource exploration and development.
- Biomass would be recovered from harvesting actions, silvicultural treatments, and forest health and fuels treatments.
- New and existing quarry and pit sites would be used to provide economical sources of rock and aggregate. Existing quarry and pit sites, along with the areas involved in their incremental expansion, would be managed as existing facilities and would not be available for other management uses.

See *Table 15 (Areas open or closed to energy and mineral developments)* for the areas that would be open or closed to energy and mineral developments. See *Appendix P. Energy and Minerals* for a reasonably

foreseeable development scenario for the BLM units within the planning area and the stipulation that would be applied to the developments.

Table 15. Areas open or closed to energy and mineral developments

Categories	Subcategories	Acres by BLM District					
		Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath Falls
Federal Surface and Mineral Estate		398,100	318,000	425,600	329,600	866,300	212,000
Federal Minerals/Private Surface		27,800	1,300	1,700	12,200	4,700	21,000
Locatable (e.g., metallics and gemstones)							
Closed	Nondiscretionary	5,900	400	300	1,000	16,800	4,700
Closed	Discretionary	16,200	15,300	4,800	11,500	20,800	700
Open	Standard Restrictions/Stipulations	49,200	290,600	366,200	99,500	536,500	191,600
Open	Additional Restrictions	326,800	10,000	20,800	217,600	293,400	37,900
Salable (e.g., sand, gravel, stone, clays, pumice)							
Closed	Nondiscretionary	5,900	100	30	600	--	300
Closed	Discretionary	220,400	9,100	8,400	14,700	--	14,500
Open	Standard Restrictions/Stipulations	49,200	200	381,700	84,600	864,800	--
Open	Additional Restrictions	122,600	307,000	29,200	229,700	--	222,500
Leasable (e.g., oil, gas, geothermal, coal, chemical minerals)							
Closed	Nondiscretionary	5,900	100,000	30	1,600	22,000	300
Open	Standard Restrictions/Stipulations	49,200	--	356,300	101,400	232,500	--
Open	Additional Restrictions	122,000	138,000	53,300	56,300	539,700	197,600
Open	No Surface Occupancy	221,000	177,000	9,700	170,300	73,300	40,800

Fire and Fuels Management

Management Objectives

- Promote ecosystem function and resiliency.
- Reduce the fire hazards to communities that are at risk from uncharacteristic wildfires.
- Decrease the risk of large wildfires, and reduce the cost and associated hazard of fire suppression.
- Reduce the risk of resource damage due to uncharacteristic wildfires.

Management Actions

- Prescribed burns would be used to emulate natural fire occurrences and processes.
- Ecosystems with the highest risk of uncharacteristic wildfires and the greatest potential for risk reduction would receive priority for fuels treatments.
- Silvicultural treatments would be applied in oak woodlands to create open conditions with large fire-resistant oaks.
- Silvicultural treatments would treat hazardous fuels, particularly in wildland urban interface areas. See *Map 6 (Wildland urban interface)*.
- Immediate action to control and suppress all wildfires would be taken in all areas, except in the large contiguous blocks of BLM lands, which are Galice, Wild Rogue Wilderness, Rogue River Wild and Scenic River in the Medford District, and the Gerber Block in the Klamath Falls Field Office, where aggressive initial attack and direct control procedures would be employed.
- Fire-suppression activities in the large contiguous blocks of BLM lands, which are Galice, Wild Rogue Wilderness, Rogue River Wild and Scenic River in the Medford District, and the Gerber Block in the Klamath Falls Field Office, would include direct control, perimeter control, and prescription control. See *Map 6 (Wildland urban interface)*.
- Fuels treatment would be applied to stands of any age in order to reduce the fuel hazards. Fuel treatments would include tree cutting, brush cutting, pruning, reducing crown bulk density, treating activity fuels, and prescribed burning.
- Vegetation removal would occur around ponds that are constructed for fire management for safety or operational reasons.

Fish

Management Objectives

- Restore stream complexity.
- Restore access to stream channels for all life stages of fish species.
- Prevent livestock from causing trampling disturbances to spawning beds where federally listed salmonid fish species occur.

Management Actions

- Priority for restoration activities would be given to projects in streams with a high intrinsic potential for fish and to high-priority fish populations that have been defined in recovery plans.
- Stream complexity would be restored through the placement of large wood and boulders.
- New and replacement stream-crossing structures on fish-bearing streams would be designed to provide access within stream channels for fish.
- For streams with salmonid species listed under the Endangered Species Act, livestock would not be released into riparian areas until 30 days following the emergence of salmonids from spawning beds.

Grazing

Management Objective Pertinent Only to the Coos Bay District, Medford District, and the Klamath Falls Resource Area of the Lakeview District

Provide livestock grazing permits and leases while maintaining or improving public rangelands.

Management Actions Pertinent Only to the Medford District and the Klamath Falls Resource Area of the Lakeview District

- Livestock grazing would be managed in accordance with the *Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the States of Oregon and Washington*. See:
  - Map 7 (Lands available for livestock grazing)
  - Appendix L. Grazing (Grazing Allotments in the Klamath Falls Resource Area and the Medford District)

– *Appendix L. Grazing (Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Oregon and Washington)*

- Grazing levels and management practices would be maintained for the allotments. Adjustments would be made to meet or make progress toward meeting the standards for rangeland health for Oregon and Washington. See *Appendix L. Grazing (Grazing Allotments in the Klamath Falls Resource Area and the Medford District)*
- Areas disturbed by natural and human-induced events, including wildland fire, prescribed burns, timber-management treatments, and juniper cuts, would be rested from livestock grazing, except where grazing would either not impede site recovery or where grazing could be used as a tool to aid in achieving recovery objectives. Livestock grazing would be resumed after soil and vegetation had sufficiently recovered to support livestock grazing.
- Livestock grazing would be authorized through management agreements, temporary nonrenewable grazing permits or leases, or special-use permits on lands that are not available through the issuance of a grazing lease or permit.
- Prescribed livestock grazing would be used to control invasive plants, reduce fire danger, or accomplish other management objectives.

Management Action Pertinent Only to the Coos Bay District

The authorization of livestock grazing through the issuance of grazing leases would be discontinued. However, grazing would be authorized through management agreements, temporary nonrenewable grazing permits or leases, or special-use permits in a manner that is consistent with the grazing regulations.

Management Actions Pertinent Only to the Klamath Falls Resource Area of the Lakeview District

- The authorization of livestock grazing through the issuance of grazing leases would be discontinued, in whole or in part, for the grazing allotments identified in *Table 16 (Allotments not available for livestock grazing in the Klamath Falls Resource Area)*.
- Grazing would not continue to be authorized under Section 15 of the Taylor Grazing Act (43 U.S.C. §315 et seq.) for the allotments listed in *Table 16*. However, grazing would be authorized through management agreements, temporary nonrenewable

Rangeland standards

For the rangeland health standards and livestock grazing guidelines document, search for the document by its complete title at <http://www.blm.gov>.

grazing permits or leases, or special-use permits in a manner that is consistent with the grazing regulations.

Table 16. Allotments not available for livestock grazing in the Klamath Falls Resource Area

Allotment Name	Allotment Number	Acres	Forage Allocation (AUMs)
Edge Creek*	00102	5,950	---
Plum Hills	00813	160	20
Totals		6,110	20

*The portion of the Upper Klamath Scenic River within the Edge Creek Allotment would be closed to grazing. This portion of the allotment was not allocated any AUMs (animal unit months). The remainder of the allotment would be available for grazing as described in Appendix L. Grazing (Grazing Allotments in the Klamath Falls Resource Area and the Medford District).

- Exclosures or other areas, as identified on *Table 17 (Exclosures or other areas closed to grazing in the Klamath Falls Resource Area)*, would be closed to grazing, except as scheduled.
- Range improvements would be developed in the Klamath Falls Resource Area as described in *Appendix L. Grazing and Map 8 (Location of proposed range improvements in the Klamath Falls Resource Area)*.

Table 17. Enclosures or other areas closed to grazing in the Klamath Falls Resource Area

Allotment Name	Allotment Number	Areas Closed within Allotments
Edge Creek	00102	Hayden Creek Enclosures (2) Fox Lake Enclosure
Buck Lake	00104	Tunnel Creek Enclosure Surveyor Campground Enclosure
Dixie	00107	Dixie (Long Prairie Creek) Enclosure
Stukel-O'Neil	00822	Aspen Enclosure
Rodgers	00852	Van Meter Flat Reservoir Enclosure
Yainax	00861	Bull Spring Enclosure Timothy Spring Enclosure
Bear Valley	00876	Holbrook Spring Enclosure
Bumpheads	00877	Bumpheads Reservoir Outlet Enclosure Antelope Creek Enclosure
Horsefly	00882	Long Branch Enclosure Caseview Spring Enclosure Norcross Spring Enclosure (area within the spring enclosure fence) Boundary Spring Enclosure Barnes Valley Riparian Pasture (except as scheduled)
Pankey Basin	00884	Pankey Creek Riparian Enclosure
Dry Prairie	00885	Ben Hall Creek Riparian Pasture (except as scheduled)
Horse Camp Rim	00886	21 Reservoir Enclosure
Pitchlog	00887	Pitchlog Creek Enclosure Willow Spring Enclosure CCC Spring Enclosure
Willow Valley	00890	East Fork Lost River Enclosure Duncan Spring/Antelope Creek Enclosures (2) Antelope Riparian Pasture (except as scheduled)
Wood River	30855	Entire area excluded from regular grazing use, except as a tool to support wetland restoration

Management Actions Pertinent Only to the Medford District

- The authorization of livestock grazing through the issuance of grazing leases would be discontinued, in whole or in part, for the grazing allotments identified in *Table 18* (*Allotments not available for livestock grazing in the Medford District*).
- Grazing would not be authorized under Section 15 of the Taylor Grazing Act (43 U.S.C. §315 et seq.) for the allotments listed in *Table 18*. However, grazing could be authorized through management agreements, temporary nonrenewable grazing permits or leases, or special-use permits in a manner that is consistent with the grazing regulations.
- Range improvements would be implemented to achieve the Oregon standards for rangeland health or other allotment-specific objectives.

Taylor Grazing Act

For the complete act and its regulations, search for Title 43 and all sections starting with Section 315 at <http://uscode.house.gov>.

Table 18. Allotments not available for livestock grazing in the Medford District

Allotment Name	Allotment Number	Acres	Forage Allocation (AUMs)
Trail Creek	10003	12,868	113
Longbranch*	10004	10,844	71
Antioch Road	10005	40	4
Roundtop Evans	10006	27,086	110
West Perry Road	10010	75	10
East Perry Road	10011	40	7
Obenchain Mountain	10014	120	12
Nichols Gap	10018	280	18
Eagle Point Canal	10020	465	55
Shady Branch	10025	320	32
Derby Station	10030	540	36
West Derby	10034	1,120	89
Emigrant Creek	10111	40	7
Baldy	10120	798	87
Lost Creek	10123	80	6
Cartwright	10127	40	4

Table continues on the next page.

Allotment Name	Allotment Number	Acres	Forage Allocation (AUMs)
Bybee Peak	10144	321	36
Stiehl	10210	175	18
Fielder Creek	10211	40	5
Del Rio	10216	40	5
Sugarloaf/Greensprings	20158	2,926	210
Applegate	20201	25,518	294
Tunnel Ridge	20202	2,183	14
Timber Mountain	20204	1,720	70
Sardine and Galls Creek	20205	3,765	158
Sterling Creek	20207	29,209	190
Spencer Gulch	20208	1,935	150
Quartz Gulch	20209	680	9
Burton Butte	20212	5	2
Chapman Creek	20213	3,309	81
Ecker	20217	40	6
Stage Road	20218	40	4
Lomas Road	20222	635	50
Star	20223	118	24
Pickett Mountain	20302	820	30
Jump Off Joe	20303	80	8
Deer Creek*	20308	278	0
Reeves Creek	20309	1,672	95
Q Bar X	20310	15	3
Esterly Lake	20312	4,457	152
Glade Creek	20315	560	17
Cherry Gulch	20316	40	6
Totals		135,337	2,298

*These portions of the Longbranch and Deer Creek Allotments would be closed to grazing. The remainder of the allotments would be available for grazing as described in *Appendix L. Grazing*.

Hazardous Materials

Management Objectives

- Limit the use of hazardous materials.
- Eliminate hazardous wastes.

Management Actions

- Response to hazardous material incidents would include cleanup, proper notifications, criminal investigations, and site assessments.
- Hazardous materials would be stored, treated, and disposed of in accordance with applicable laws and regulations.
- Employees and the public would be protected from known hazardous materials on BLM-administered lands.

Lands, Realty, Access, and Transportation

Management Objectives

- Make land tenure adjustments to facilitate the management of resources.
- Provide legal access to BLM-administered lands and facilities adequate to support resource management programs.
- Provide needed right-of-ways for access to nonfederal lands in a manner that is consistent with federal, state, and local planning goals and rules.
- Provide a road transportation system that serves resource management needs.
- Protect lands that have important resource values or substantial levels of investment by withdrawing them, where necessary, from the implementation of nondiscretionary public land and mineral laws.

Management Actions

- Lands in Zone 1 would be retained under BLM administration. Lands in Zone 1 include:
  - National Landscape Conservation System designated lands
  - areas of critical environmental concern
  - research natural areas
  - outstanding natural areas
  - recreation sites
  - critical habitat for threatened or endangered species
- Lands in Zone 2 would be available for exchange to enhance public resource values, improve management capabilities, and reduce the potential for land use conflict. Zone 2 lands are not specifically listed. They consist of all lands not listed in the description of Zone 1 lands and the lands listed in *Appendix O. Lands*.
- Lands in Zone 3 would be available for disposal. These lands would include:
  - lands that are not practical or are uneconomical to manage (because of their intermingled location and unsuitability for management by another federal agency)
  - survey hiatuses
  - encroachments

Land Zones
Zone 1: Retain for continuing resource development.
Zone 2: Available for exchange to facilitate management.
Zone 3: Available for sale or exchange to facilitate management.
See Table 137 (Acres of land tenure zones by district) in Chapter 3 and Appendix O. Lands.

Survey hiatuses and encroachments that are discovered in the future would be assigned to Zone 3. See *Map 28 (Location of land tenure Zone 3)*.

- The acres of O&C lands of all classifications, and the acres of O&C and public domain lands that are available for harvesting, would not be reduced through disposal, exchange, or purchase. This standard would be met by evaluating the total net change in land tenure in the planning area at 10-year intervals.
- Lands would be acquired or disposed of to facilitate resource management objectives as opportunities occur. See *Appendix O. Lands*.
- Public domain lands that have been under Section 7 of the Taylor Grazing Act would be available for disposal.

- Newly acquired lands would be managed for the purpose for which they were acquired or in a manner that is consistent with the management objectives for adjacent BLM-administered lands.
- Temporary-use permits, as identified under the Federal Land Policy and Management Act (Section 302), would be issued for a variety of uses, such as, but not limited to, stockpile and storage sites and as tools to authorize unintentional trespass situations pending final resolution.
- No leases or permits would be issued for landfills or other disposal facilities.
- Land-use authorizations would be used to resolve agricultural or occupancy trespasses, where appropriate.
- Existing leases and permits would be recognized as valid uses.
- Lands would be withdrawn from the operation of public land and mineral laws, where appropriate, to avoid the damage that would be caused by nondiscretionary activities. See *Appendix O. Lands*.
- Withdrawals would be limited to the area needed and would restrict only those activities needed to accomplish the purposes of the withdrawal.
- Lands would be available for right-of-ways.
- Class I visual resource management areas, such as wild and scenic rivers that are classified as wild, wilderness areas, and wilderness study areas, would be *right-of-way exclusion areas* (i.e., right-of-ways would not be granted).
- Recreation sites, areas of critical environmental concern, research natural areas, wild and scenic rivers that are classified as scenic and recreational rivers, and Class II visual resource management areas would be *right-of-way avoidance areas* (i.e., right-of-ways would be granted where no practicable alternative was available).
- Existing right-of-ways would be recognized as valid uses.
- Access across BLM lands to nonfederal lands would be granted, except within the National Landscape Conservation System designated lands.
- Utility corridors would be the preferred location for energy transmission or distribution facilities. Corridors would generally be 1,000 feet on each side of the centerline unless otherwise designated. No development or management activities would be permitted that would conflict with construction, operation, or maintenance of facilities corresponding to the purpose of the utility corridor. See *Map 9 (Utility corridors)*.
- Communication facilities would be allowed on existing communication sites. See *Map 9 (Utility corridors)* and *Appendix O. Lands*.

- Reasonable expansion of existing communication sites and the development of new sites would be allowed. The priority for accommodating the need for additional capacity would be the use of existing sites.
- Existing roads would be managed to protect resource values, to provide for safety, to protect facility investment, and to provide access for management activities. Trees would be removed along roads for safety or operational reasons.
- New permanent or temporary roads, and stream-crossing structures, would be constructed for the implementation of management actions.
- Roads that are not needed for long-term management would be decommissioned. Roads would be temporarily closed or travel would be restricted for administrative and resource purposes.

National Landscape Conservation System

The National Landscape Conservation System designations on BLM lands in western Oregon include:

- wild and scenic rivers
- wilderness, wilderness study, and wilderness instant study areas
- a national monument
- a national scenic trail
- an outstanding natural area
- a scenic corridor
- a watershed management unit

Management Objective

Conserve, protect, and restore the identified outstanding cultural, ecological, and scientific values of the National Landscape Conservation System designated lands.

Management Actions

Wild and scenic rivers

- Designated wild and scenic river corridors (including those classified as wild, scenic, or recreational) would be managed to protect their outstandingly remarkable values and to enhance the natural integrity of river-related values.

See Table 58 (District-specific designated wild and scenic rivers and river segments).

- Interim protection would be provided to wild and scenic river corridors (including those classified as wild, scenic, or recreational) that are suitable for inclusion as components of the National Wild and Scenic Rivers System.

See Table 59 (District-specific suitable wild and scenic rivers and river segments).

- Interim protection would be provided to wild and scenic river corridors (including those classified as wild, scenic, or recreational) that are eligible but have not yet been studied for suitability as components of the National Wild and Scenic Rivers System.

See Table 60 (District-specific eligible wild and scenic rivers and river segments).

Wilderness Areas

Wilderness areas would be managed to preserve the undisturbed natural integrity of these areas.

See Table 61 (District-specific wilderness areas).

Wilderness Study Areas and Wilderness Instant Study Areas

Wilderness study areas and wilderness instant study areas would be managed to maintain wilderness suitability.

See Table 48 (District-specific wilderness study areas and wilderness instant study areas).

Cascade-Siskiyou National Monument

The Cascade-Siskiyou National Monument (located in the Medford District) would be managed to protect the geophysical, botanical, and other biological features for which the area was designated.

See Table 63 (District-specific miscellaneous National Landscape Conservation System designated lands).

Pacific Crest National Scenic Trail

The portion of the Pacific Crest National Scenic Trail that is located in the Medford District and the Klamath Falls Resource Area of the Lakeview District would be managed for outdoor recreational opportunities while conserving its scenic, historic, natural, and cultural values.

See Table 63 (*District-specific miscellaneous National Landscape Conservation System designated lands*).

Yaquina Head Outstanding Natural Area

The Yaquina Head Outstanding Natural Area (located in the Salem District) would be managed to promote the conservation of scenic, historic, natural, and cultural values, and for educational, scientific, and recreational opportunities.

See Table 63 (*District-specific miscellaneous National Landscape Conservation System designated lands*).

Mt. Hood Corridor

BLM lands within the Mt. Hood Corridor (located in the Salem District) would be managed to protect and enhance scenic quality. Timber harvesting would be excluded, except to maintain safe conditions for the visiting public, to control the continued spread of wildfires, and for activities related to the administration of the corridor.

See Table 63 (*District-specific miscellaneous National Landscape Conservation System designated lands*).

Note: The Oregon Parks and Recreation Department (Oregon State parks), Oregon Department of State Lands, Portland General Electric (PGE), and a mixture of county, local, and private owners administer the remaining lands in this corridor.

Bull Run Watershed Management Unit

BLM lands within the Bull Run Watershed Management Unit (located in the Salem District) would be managed to protect and enhance water quality. Timber harvesting would be excluded, except, as necessary, to protect or enhance water quality, or except, as necessary, for the construction, expansion, protection, or maintenance of facilities for either a municipal water supply or the transmission of energy.

See Table 63 (*District-specific miscellaneous National Landscape Conservation System designated lands*).

Note: This watershed is the source of the Portland metropolitan area's domestic water supply and is congressionally designated and separate from other watersheds that are administratively designated. Also note that the United States Forest Service and the Portland Water Bureau administer the greater portion of the lands in this unit.

Plants, Fungi, and Invasive Species

Management Objective

Provide for the conservation of species that are listed or are candidates for listing under the Endangered Species Act or state listed species where the BLM have entered into a cooperative management agreement for a species.

Management Action

- Management would be consistent with recovery plans and designated critical habitat, including: the protection and restoration of habitat; altering the type, timing, and intensity of actions; and other strategies designed to recover populations of species.
- Species listed under the state of Oregon Endangered Species Act would be managed in accordance with cooperative management agreements.

Plants with recovery plans are listed in *Table 19 (Federally listed plants with recovery plans)*. Also see *Appendix E. Botany (Digest of Actions Contained in Individual Recovery Plans for Plant Species)*.

Table 19. Federally listed plants with recovery plans

Common Name	Scientific Name
Nelson's checker-mallow	<i>Sidalcea nelsonia</i>
Rough popcorn flower	<i>Plagiobothrys hirtus</i>
Gentener's fritillary	<i>Fritillary gentneri</i>
Kincaid's lupine	<i>Lupinus sulphureus</i> spp. <i>kincaidii</i>
Western lily	<i>Lilium occidentale</i>
Bradshaw's lomatium	<i>Lomatium bradshawii</i>
McDonald's rock-cress	<i>Arabis mcdonaldiana</i>
Golden paintbrush	<i>Castilleja levisecta</i>
Applegate's milk-vetch	<i>Astaragalus applegatei</i>
Water howellia	<i>Howellia aquatilis</i>

Management Objective

State listed species where the BLM has not entered into a conservation agreement and species listed by the BLM as sensitive or assessment species will be managed on public domain lands and on O&C lands where protection does not conflict with sustained yield forest management in areas dedicated to timber production. This is so that special status designation would no longer be warranted and so that actions will not contribute to the need to list the species under the Endangered Species Act. Where conflicts with sustained yield management occur, protections on O&C lands will only be applied to prevent extinction of a species even if it is not yet listed under the Endangered Species Act.

Management Actions

- Conservation plans for the following plants would be implemented and are incorporated by reference. Management would be consistent with conservation plans. Plants with conservation plans are listed in Table 20 (*Special status species plants with conservation plans*). Also see Appendix E. Botany (*Digest of Conservation Plans for Special Status Species Plants*).

Table 20. Special status species plants with conservation plans

Common Name	Scientific Name
Large-flowered rush-lily	<i>Hastingsia bracteosa</i>
Purple-flowered rush-lily	<i>Hastingsia atropurpurea</i>
Mendocino gentian	<i>Gentiana setigera</i>
Oregon willow-herb	<i>Epilobium oreganum</i>
Kincaid’s lupine	<i>Lupinus sulphureus</i> spp. <i>kincaidii</i>
Western bog violet	<i>Viola Primulifolia</i> ssp. <i>occidentalis</i>
Umpqua mariposa lily	<i>Calochortus umpquaensis</i>
Green gentian or Umpqua swertia	<i>Frasera umpquaensis</i>
Tall bugbane	<i>Cimicifuga elata</i>
Gormans’s aster	<i>Aster gormanii</i>
Crinite mariposa lily	<i>Calochortus coxii</i>
Silvery phacelia	<i>Phacelia argentea</i>
Columbia cress	<i>Rorippa columbiae</i>

- Special status species plants without conservation plans would be managed to maintain or restore populations and habitat.
- Protections measures include altering the type, timing, and intensity of actions; and other strategies designed to maintain populations of species.

Management Objective

Support natural species composition and vegetation on noncommercial areas, including, noncommercial forests, oak woodlands, shrublands, grasslands, cliffs, rock outcrops, talus slopes, meadows, wetlands, springs, fens, ponds, and vernal pools.

Management Actions

- Natural processes, native species composition, and vegetation structure would be maintained or restored. Management would include the use of prescribed burns, the retention of legacy components (e.g., large trees, snags, and down logs), and the removal of encroaching vegetation in meadows, grasslands, or oak woodlands in a manner that is consistent with natural or historic processes and conditions.

- Degraded or disturbed areas would be revegetated with species appropriate to the native or historic plant communities.
- Road construction, road maintenance, and culvert replacement would be designed to retain or reconnect the hydrologic flows to wetlands, springs, fens, ponds, and vernal pools.

Management Objective

Avoid the introduction of invasive plants or the spread of invasive plant infestations that are preventable.

Management Actions

- Cost-effective measures would be implemented to prevent, detect, and rapidly control new invasive plant infestations.
- Manual, mechanical, cultural, chemical, and biological treatments would be used to manage invasive plant infestations.
- Invasive plants would be controlled in accordance with the final environmental impact statement and record of decisions for the Northwest Area Noxious Weed Control Program. These documents are incorporated by reference.

Special Forest Products

Management Objective

Provide for the harvest and collection of special forest products.

Management Actions

- Special forest product collection would be implemented in a manner that limits adverse impacts to other resources. This would be accomplished by restricting collection amounts and restricting collection activities.
- Stipulations would be included in permits issued for the collection of special forest products to limit adverse impacts to the plant community, individual plants, soil, and water.
- Areas for the collection of individual special forest products would be rotated to maintain the availability of special forest products.

Recreation

Management Objective

Provide a diversity of developed and dispersed outdoor recreational opportunities that contribute to meeting recreational demand and quality visitor experiences.

See the tables and maps at the end of this chapter for district-specific recreation information.

Management Actions

- Legal public access would be obtained to BLM lands that have high recreational potential.
- Special recreation management areas would be managed in accordance with their planning frameworks (see *Appendix J. Recreation* and *Map 18 (Recreation management areas)*). These frameworks describe implementation-level actions that would achieve recreational management objectives for those areas.
- Lands not designated as special recreation management areas would be managed as extensive recreation management areas for dispersed recreational opportunities.
- Recreational developments, including sites, trails, and backcountry byways, would be maintained.
- Potential recreational developments, including sites, trails, and backcountry byways, would be developed in the future depending on recreational demand and feasibility.
- Locatable mineral withdrawals would be obtained for recreational developments that contain mineral development potential.
- Closed or abandoned logging roads would be developed to provide additional trail opportunities.
- Service-oriented and outreach programs, including interpretation and education, would be provided to visitors.
- Environmental education areas would be managed to provide educational opportunities for the public.
- Recreation sites authorized under the Recreation and Public Purposes Act would be managed according to their lease agreements.
- A 77-acre portion of Heceta Dunes on the Eugene District would be designated as open to off-highway vehicle use.
- Areas listed in *Table 54 (District-specific areas closed to off-highway vehicle use)* would be designated as closed to off-highway vehicle use.

See *Map 10 (Off-highway vehicle designations)* and *Map 26 (Proposed Off Highway Vehical designations)*.

- Areas not designated as open or closed would be designated as *limited to existing roads and trails* or *limited to designated roads and trails*. See *Table 53 (District-specific off-highway vehicle area designations)* and *Map 10 (Off-highway vehicle designations)* and *Map 26 (Proposed Off Highway Vehical designations)*.
- Areas listed in *Table 55 (District-specific off-highway vehicle emphasis areas)* would be designated as off-highway vehicle emphasis areas. These designations would be located within areas that are limited to designated roads and trails where off-highway vehicle use is more concentrated and intensively managed. See *Map 11 (Off-highway vehicle emphasis areas)*.
- Potential off-highway vehicle emphasis areas listed in *Table 56 (District-specific potential off-highway vehicle emphasis areas)* would be developed in the future depending recreational demand and feasibility.
- Off-highway vehicle areas and off-highway vehicle emphasis areas would be managed according to interim management guidelines until subsequent comprehensive travel management plans are completed. See *Appendix J. Recreation*. Detailed maps are available to the public at each district office that show proposed off-highway vehicle area designations with a preliminary road and trail network.
- Lands within state scenic waterway corridors (see *Table 57 (District-specific Oregon State scenic waterways)*), excluding portions that occur on O&C lands that are suitable for permanent timber production, would be managed to protect and enhance identified scenic, aesthetic, recreation, scientific, research, fish, and wildlife qualities.

Research

Management Objective

Provide for research to support the management of lands and resources administered by the BLM in western Oregon.

Management Action

Ongoing research projects would be continued according to current or updated study plans. New research projects would require study plans. Management actions on study sites that conflict with research objectives would be deferred until the research is complete.

Soils

Management Objective

Improve or maintain soil productivity.

Management Action

Management activities associated with prescribed burns, wildfire suppression, silviculture, timber harvesting, and grazing would be consistent with maintaining or improving soil productivity.

Timber

Management Objective

Assure the survival of planted trees and enhance the growth of desirable trees in harvested or disturbed areas.

Management Actions

- Newly harvested and inadequately stocked areas would be prepared for the regeneration of desirable tree species.
- Site preparation methods would include mechanical or manual procedures, and prescribed burns.
- Adequate reforestation would be achieved as promptly as practical following timber harvests, as follows:
  - Harvested areas would be planted with indigenous commercial tree species.
  - Identified root disease centers would be planted with indigenous disease-resistant tree species.
  - Genetically selected stock would be used to the extent available.
- The establishment and survival of coniferous seedlings would be promoted through maintenance and protective treatments.

Management Objective

Enhance the health, stability, growth, vigor, and economic value of forest stands in the harvest land base.

Management Actions

- Lands currently growing primarily brush or hardwoods would be converted to the appropriate conifer species, unless the hardwoods would produce a higher net monetary return.
- Precommercial thinning would be applied to forest stands that exceed healthy density levels.
- Fertilizer would be applied to forest stands that are at suitable density levels and where treatment is expected to provide a positive economic return.
- Pruning would be applied to enhance timber value in a manner that is consistent with fuels and disease management.
- Yarding corridors or new roads would be permitted within riparian management areas if no practical alternative exists to access adjacent uplands.
- Uneven-aged management would be applied in the eastern portion of the Klamath Falls Resource Area.
- Incidental harvest of trees associated with implementing management actions would occur from lands that are not in the harvest land base for safety or operational reasons.

Visual Resource Management

See Map 1 (*Visual resource management classes*) and Table 21 (*Acres of visual resource management classes by district*) after the fourth management objective.

Management Objective

Preserve the existing character of the landscape in Class I visual resource management areas.

Management Action

Designated, suitable, and eligible wild and scenic rivers that are classified as wild, wilderness areas, wilderness study areas, and wilderness instant study areas would be designated as Class I visual resource management areas.

These areas would be managed in accordance with natural ecological changes. Some very limited management activities would occur in these areas. The level of change to the characteristic landscape would be very low and would not attract attention. Changes would repeat the basic

elements of form, line, color, texture, and scale found in the predominant natural features of the characteristic landscape.

Management Objective

Retain the existing character of the landscape in Class II visual resource management areas.

Management Action

Designated, suitable, and eligible wild and scenic rivers that are classified as scenic, the Cascade-Siskiyou National Monument, the Pacific Crest National Scenic Trail, the Mt. Hood Corridor, the Bull Run Watershed Management Unit, and the Yaquina Outstanding Natural Area would be designated as Class II visual resource management areas. See *Table 63 (District Specific Miscellaneous National Landscape Conservation System designated lands)*.

These areas would be managed for low levels of change to the characteristic landscape. Management activities would be seen but would not attract the attention of the casual observer. Changes would repeat the basic elements of form, line, color, texture, and scale found in the predominant natural features of the characteristic landscape.

Management Objective

Partially retain the existing character of the landscape in Class III visual resource management areas.

Management Action

Designated, suitable, and eligible wild and scenic rivers that are classified as recreational would be designated as Class III visual resource management areas.

These areas would be managed for moderate levels of change to the characteristic landscape. Management activities would attract attention but would not dominate the view of the casual observer. Changes would repeat the basic elements of form, line, color, texture, and scale found in the predominant natural features of the characteristic landscape.

Management Objective

Allow for major modification of the existing character of the landscape in Class IV visual resource management areas.

Management Action

All lands that are not designated as Class I, Class II, or Class III would be designated as Class IV visual resource management areas.

These lands would be managed for high levels of change to the characteristic landscape. Management activities would dominate the view and would be the major focus of viewer attention.

Table and Map for the Visual Resource Management Classes

Table 21. Acres of visual resource management (VRM) classes by district

Visual Resource Management (VRM) Classes	No Action Alternative (acres)	All Action Alternatives (acres)
Salem District		
VRM Class I	14,100	7,550
VRM Class II	22,800	7,627
VRM Class III	59,600	16,313
VRM Class IV	301,600	371,705
Eugene District		
VRM Class I	0	0
VRM Class II	4,471	0
VRM Class III	33,130	8,183
VRM Class IV	277,499	307,062
Roseburg District		
VRM Class I	28	0
VRM Class II	18,045	0
VRM Class III	4,385	6,409
VRM Class IV	396,546	419,952
Coos Bay District		
VRM Class I	600	592
VRM Class II	6,600	0
VRM Class III	14,700	1,958
VRM Class IV	307,700	319,700
Medford District		
VRM Class I	14,330	51,427
VRM Class II	113,880	51,564
VRM Class III	393,100	27,797
VRM Class IV	337,220	737,370
Klamath Falls Resource Area		
VRM Class I	0	340
VRM Class II	33,500	2,961
VRM Class III	81,800	0
VRM Class IV	96,700	221,600
Totals for all western Oregon BLM lands		
VRM Class I	29,058	59,909
VRM Class II	199,296	62,152
VRM Class III	586,715	60,660
VRM Class IV	1,717,265	2,377,389

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Map 1. Visual resource management classes

Water

Management Objectives

- Maintain and restore water quality.
- Maintain and restore the proper functioning condition of riparian and wetland areas to provide shade, sediment filtering, and surface and stream bank stabilization.

Management Actions

- Priority for restoration, road maintenance, or road decommissioning would be given to projects that reduce chronic sediment inputs along stream channels and floodplains in source water areas.
- Prescribed burns would be applied in riparian management areas to reduce the potential for uncharacteristic wildfires.
- Best management practices (see *Appendix I. Water*) would be implemented to meet water quality standards.

Riparian Management Area Land Use Allocation for the Nonforest Areas of the Medford District and the Klamath Falls Resource Area of the Lakeview District

The following management actions are common to all of the alternatives but are specific to the nonforest areas of the riparian management areas.

Riparian management areas would be delineated by the water influence zone as indicated by hydrophilic vegetation.

Management Objective

Maintain and restore the proper functioning condition of riparian and wetland areas.

Management Actions

- Livestock grazing in riparian management areas would be managed at a level that allows the maintenance or development of the proper functioning condition of riparian and wetland plant communities. Methods would include installing and maintaining livestock exclosures, managing season of use and intensity, and implementing other appropriate techniques.
- Perennial and intermittent streams, wetlands, lakes, and natural ponds would be managed to maintain, improve, or restore floodplain connectivity.
- Conifer encroachment would be removed in riparian management areas unless conifers are an appropriate component of the riparian community type.

Wild Horses

Management Objective

Maintain a healthy population of wild and free-roaming horses in the Pokegama Herd Management Area of the Klamath Falls Resource Area of the Lakeview District. See *Map 12 (Location of Pokegama Herd Management Area)*.

Management Actions

- Horses would be gathered to maintain the established appropriate management level of 30 to 50 head, as follows:
  - During gathers, the number of horses would normally be reduced to the low end of the appropriate management level, and then allowed to increase to the top end of the appropriate management level before another gather occurred.
  - Horses would be removed from private land at private landowner request.
  - Horses straying outside the herd management area would be removed or returned to the herd management area.
- Horses from other herd areas would be periodically introduced to the Pokegama herd to maintain the viable genetic diversity of the herd.
- Water developments would be maintained or established to provide season-long water for wild horses within the herd management area. See *Appendix L. Grazing and Map 8 (Location of proposed range improvements in the Klamath Falls Resource Area)*.
- The appropriate management level would be adjusted when:
  - Monitoring data identified a change in long-term forage availability.
  - Health assessments and evaluations determined that wild horse numbers, or patterns of grazing use, were a contributing factor toward not meeting one or more of the Oregon standards for rangeland health.

Rangeland Standards

For the rangeland health standards and livestock grazing guidelines document, search for the document by its complete title at <http://www.blm.gov>.

Wilderness Characteristics

Management Objective

Maintain wilderness characteristics on designated BLM lands.

Management Action

Wilderness characteristics would be maintained on the BLM lands that are listed in *Table 22 (Lands with wilderness characteristics maintained under special management)* and shown in *Map 27 (Lands with wilderness characteristics)*, excluding the portions of those areas that occur on O&C lands that are suitable for permanent timber production.

Table 22. Lands with wilderness characteristics maintained under special management

BLM Lands	Total (acres)	Identified Wilderness Characteristics		
		Natural- ness	Outstanding Opportunities for Solitude	Outstanding Opportunities for Primitive, Unconfined Recreation
Salem District				
Bull of the Woods/Opal Creek Additions	3,203	X	X	X
South Fork Clackamas River	919	X	X	
Salmon Huckleberry Additions	637	X	X	X
Mount Hebo	81	X	X	X
Eugene District				
No lands were identified with wilderness characteristics				
Roseburg District				
Special management would not apply to lands with wilderness characteristics				
Coos Bay District				
Wasson Creek	3,408	X	X	X
Medford District				
Special management would not apply to lands with wilderness characteristics				
Klamath Falls Resource Area				
No lands were identified with wilderness characteristics				
Total	8,248			

Wildlife

Management Objective

Provide for the conservation of species that are listed or are candidates for listing under the Endangered Species Act or state listed species where the BLM have entered into a cooperative management agreement for a species.

Management Actions

- Management would be consistent with approved recovery plans and designated critical habitat, including the protection and restoration of habitat and other actions designed to recover populations of species.
- Species listed under the state of Oregon Endangered Species Act would be managed in accordance with cooperative management agreements.
- Wildlife species with approved recovery plans include the marbled murrelet, bald eagle, and the Columbia River population of the Columbia white-tailed deer. Management would be consistent with these recovery plans. See *Appendix G. Wildlife*.
- For the western snowy plover, the BLM's contribution to recovery would consist of the following actions:
  - Public use of nesting areas would be managed during the nesting season to reduce activities that would substantially reduce nesting success.
  - Predator controls would be employed when data demonstrates that loss of nests due to predators substantially reduces overall nesting success.
  - Control measures would be implemented if invasive plant species are creating a loss of suitable nesting habitat.
  - Measures would be implemented to support coastal dune processes to sustain suitable western snowy plover nesting habitat.
- Activities would be restricted within threshold distances of active northern spotted owl nest sites identified through consultation from March 1 through September 30. Restrictions on activities would usually not be required for nest sites located near roads or in other areas of permanent human activity.
- Bald eagle management areas would be managed to protect current suitable nesting and winter roosting habitat and to develop replacement habitat for nesting and roosting. Management activities would include prescribed burns and other treatments to reduce fuel loading and to accelerate growth, such as commercial thinning and density management. See *Map 13 (Bald eagle, deer, and elk habitat management areas)*.

Management Objective

State listed species where the BLM has not entered into a conservation agreement and species listed by the BLM as sensitive or assessment species will be managed on public domain lands and on O&C lands where protection does not conflict with sustained yield forest management in areas dedicated to timber production. This is so that special status designation would no longer be warranted and so that actions will not contribute to the need to list the species under the Endangered Species Act. Where conflicts with sustained yield management occur, protections on O&C lands will only be applied to prevent extinction of a species even if it is not yet listed under the Endangered Species Act.

Management Actions

- Management would be consistent with approved conservation plans. See *Appendix G. Wildlife*.
- Protections measures include altering the type, timing, and intensity of actions; and other strategies designed to maintain populations of species.
- For the Columbia white-tailed deer, the record of decision for the North Bank Habitat Management Area would continue to be implemented. The final environmental impact statement and record of decision for the North Bank Habitat Management Area are incorporated by reference.
- For the greater sage grouse, the Greater Sage Grouse Conservation Assessment and Strategy for Oregon would continue to be implemented. It is incorporated by reference.

Management Objective

Assist the Oregon Department of Fish and Wildlife in meeting big game management goals on public domain lands and on O&C lands where the goals are consistent with the O&C Act.

Management Actions

- Roads would be closed to motorized vehicles within the designated deer and elk winter range to achieve a maximum level of 1.5 miles of open road per square mile of federal land between November 1 and April 15. Administrative use of all roads would occur, as needed, on a year-round basis. See *Map 13 (Bald eagle, deer, and elk habitat management areas)*.
- Roads would be closed to motorized vehicles, except for administrative purposes, between November 1 and April 15 in the Klamath Winter Range, which includes the deer-season road closure areas of South Gerber, Willow Valley, Harpold Ridge, Bryant Mountain, North Bryant, Windy Ridge, and Lorella. See *Map 13 (Bald eagle, deer, and elk habitat management areas)*.

- Visual barriers from 25 to 50 feet wide would be maintained, where appropriate, along roads within the designated deer and elk winter range. See *Map 13 (Bald eagle, deer, and elk habitat management areas)*.
- Native forage species would be planted along roadsides, skid trails, and on landings, or forage plots would be created when forage quality is determined to be a limiting factor in achieving the management goals of the Oregon Department of Fish and Wildlife.
- Forage would be included when implementing silvicultural treatments or habitat management activities.
- Encroaching western juniper would be thinned or removed to maintain and improve forage for big game. These treatments would protect old juniper and would consider edge effect, escape cover, and forage.

Administrative Actions

Administrative actions are routine transactions and activities that are required to serve the public and to provide optimum management of resources.

Administrative actions would occur at approximately the same levels as during the past 10 years. These actions would include:

- competitive and commercial recreation activities
- lands and realty actions (including the issuance of grants, leases, and permits)
- resolution of trespasses
- facility maintenance
- improvements to existing facilities
- road maintenance
- issuance of hauling permits
- recreation site maintenance
- recreation site improvement
- hazardous materials removal
- law enforcement
- surveys to determine legal land or mineral estate ownership
- engineering support to assist in mapping
- designing and implementing projects
- sampling (specifically using the *3P fall, buck, and scale* sampling method)
- incidental removal of trees, snags, or logs for safety or operational reasons

Administrative Withdrawal Land Use Allocation

The administrative withdrawal land use allocation includes lands that are withdrawn from the harvest land base for a variety of reasons, including:

- areas dedicated to specific purposes (such as roads, buildings, maintenance yards, quarries, and other facilities and infrastructure);
- areas of critical environmental concern and recreation sites (such as campgrounds, trails, and day use areas); and
- areas that are identified through the timber production capability classification (TPCC) system as withdrawn from sustained yield timber production or identified as nonforest.

Management Objectives and Management Actions

The management objectives and management actions for areas of critical environmental concern and recreation sites/facilities are addressed in the alternatives under the specific programs.

Areas identified as withdrawn from the harvest land base through the timber production capability classification system do not have specific management objectives or management actions. They may be managed similarly to the adjacent or surrounding land use allocations, if those uses are not incompatible with the reason for which the lands were withdrawn (as identified by the timber production capability classification codes). Additional areas would be periodically added to those areas withdrawn through updates to the timber production capability classification system when on-the-ground examinations indicate an area meets the criteria for withdrawal.

Roads, maintenance yards, buildings, quarries, and other facilities also do not have specific management objectives or management actions but would be managed for the purpose for which the facilities were constructed.

The Alternatives

This section describes what is unique between the individual alternatives. The previous section identified the land use allocations, management objectives, and management actions that would apply to the resources, programs, and land use allocations under the three action alternatives.

Management actions would be used only where and when necessary and practical to achieve management objectives. The following would be among the considerations in determining how and where to appropriately implement management actions:

- Site-specific circumstances made the application of the management action unnecessary to achieve resource management plan objectives.
- Site-specific circumstances made the application of the management action impractical.
- The application of the management action would be inconsistent with other resource management plan decisions.

Activities that are not specifically mentioned in management actions would be permitted if they are not inconsistent with management objectives.

Preferred Alternative

The preferred alternative is the alternative that best meets the purpose and need (see *Chapter 1*). Based on the analysis in this draft environmental impact statement, the BLM identifies Alternative 2 as the preferred alternative. Considering the economic, environmental, social, and other selection factors, the BLM believes this alternative would best fulfill its statutory mission and responsibilities. Alternative 2 would:

- contribute to the recovery of species listed under the Endangered Species Act,
- maintain or improve water quality,
- reduce fire hazard risks in most districts,
- meet recreational demand with a variety of recreational settings, and
- produce the highest economic return to local communities from a sustained yield of timber.

Comments from state and federal agencies, local governments, tribes, and the public on this draft environmental impact statement will assist the BLM in preparing the proposed resource management plans and the final environmental impact statement. These comments can be used by the BLM to modify an action alternative to create a proposed decision. Examples of modifications that the BLM will consider in developing the proposed resource management plans are:

- Increasing the fire resiliency of forests in the Medford District and the Klamath Falls Resource Area of the Lakeview District.

- Ways to manage the harvest land base that will increase the rate of recovery of the northern spotted owl and the marbled murrelet in the short term (less than 50 years) while suitable habitat develops in the large blocks managed for long-term recovery.
- Speeding the redevelopment of structurally complex forests after regeneration harvesting.

No Action Alternative

For details about the No Action Alternative, refer to the 1995 resource management plans for the districts of Salem, Eugene, Coos Bay, Roseburg, and Medford, and the Klamath Falls Resource Area of the Lakeview District, as amended. The No Action Alternative, as analyzed in this environmental impact statement, includes Survey and Manage standards and guidelines consistent with the January 2001, Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, but does not include the March 2004, Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl or the March 2004, Record of Decision, Amending Resource Management Plans for Seven Bureau of Land Management Districts and Land and Resource Management Plans for Nineteen National Forests Within the Range of the Northern Spotted Owl, Decision to Clarify Provisions Relating to the Aquatic Conservation Strategy. The two March 2004 Records of Decision have been the subject to litigation, and their implementation is uncertain at this time. Implementation of these two plan amendments would change the effects of the No Action Alternative from the effects analyzed in this environmental impact statement. However, the effects of such a changed No Action Alternative would still be within the range of effects analyzed in this environmental impact statement. That is, these amendments to the No Action alternative would change the effects of the No Action Alternative to be more similar to the action alternatives. For example, an amendment that would remove the Survey and Manage standards and guidelines from the No Action Alternative would result in effects more like the action alternatives, all of which do not include the Survey and Manage standards and guidelines.

Plan maintenance for the 1995 resource management plans is documented in the district annual program summary and monitoring reports that were published from 1996 through 2005. These district annual program summary and monitoring reports are incorporated by reference.

See *Map 2 (Land use allocations under the No Action Alternative)* that follows this discussion. Also see the map packet (*Maps 1, 5, and 9*) for detailed views of the land use allocations.

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Impact Statement

Source: Bureau of Land Management Corporate Data revised for WOPR Analysis. 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.

Township 20 South, Range 8 West, Section 23

0.25 0 0.25 0.5 0.75 1 Mile

Forested Lands
Planning Area

- Forest Excluded from Harvest Land Base
- Forest Included in Harvest Land Base

Upper Smith River Watershed

1 0 1 2 3 4 5 Miles

Map 2. Land use allocations under the No Action Alternative

10 0 10 20 30 40 50 Miles

10 0 10 20 30 40 50 Kilometers

Albers Equal Area Projection
North American Datum of 1983

Legend: No Action Alt.

Land Use Allocations

- Congressionally Withdrawn
- Late-Successional Reserve
- Adaptive Management Area
- Administratively Withdrawn
- Riparian Reserve
- Matrix
- BLM Administrative Boundary
- State Boundary

Alternative 1

This action alternative is described in terms of those land use allocations that vary by alternative, which include:

- late-successional management area
- riparian management area
- timber management area
- areas of critical environmental concern and research natural areas

Late-Successional Management Area

Under Alternative 1, the late-successional management area land use allocation would be established as follows:

- In the areas shown on *Map 3 (Land use allocations under Alternative 1)*. Also see the map packet (*Maps 2, 6, and 10*) for detailed views of the land use allocations.
- In the areas of contiguous marbled murrelet habitat and recruitment habitat (stands capable of becoming habitat for the marbled murrelet within 25 years) that are within 0.5 mile of any occupied site. Occupation would be determined by the presence of an active nest, a fecal ring, eggshell fragments, or birds demonstrating occupying behavior (i.e., flying below the forest canopy within or adjacent to a stand).

Management Objective

Maintain or promote the development of structurally complex forests.

Management Actions

- Thinning would be applied to promote the development of structurally complex forests. Timber from thinning would be available for sale.
- Snags and coarse woody debris would be retained or created when thinning stands of larger trees, which are generally those with a stand average diameter of quadratic mean diameter (QMD) greater than 14 inches.

See Table 23 (Snag and coarse woody debris (CWD) retention or creation for stands of larger trees (stand average diameter of QMD > 14 in.)) and Map 14 (Forest vegetation series).

Table 23. Snag and coarse woody debris (CWD) retention or creation for stands of larger trees (stand average diameter of QMD > 14 in.)

Vegetation Series	Snag Retention or Creation		CWD Retention or Creation		
	Total	Component Diameters	Total	Component Diameters	Component Lengths
Western hemlock	6 tpa	> 14 in. dbh	240 ft./ac.	> 14 in.	> 20 ft.
Douglas fir and true firs	3 tpa	> 14 in. dbh	120 ft./ac.	> 14 in.	> 16 ft.
Tanoak	4 tpa	> 14 in. dbh	120 ft./ac.	> 14 in.	> 16 ft.
dbh (diameter breast height)			ft. (linear feet)		
			tpa (trees per acre)		

- Snags and coarse woody debris would be retained or created in thinning harvests in stands of smaller trees, which are generally those with a stand average diameter of quadratic mean diameter (QMD) less than or equal to 14 inches.

See Table 24 (*Snag and coarse woody debris (CWD) retention or creation for stands of smaller trees (stand average diameter of QMD ≤ 14 in.)*) and Map 14 (*Forest vegetation series*).

Table 24. Snag and coarse woody debris (CWD) retention or creation for stands of smaller trees (stand average diameter of QMD ≤ 14 in.)

Vegetation Series	Snag Retention or Creation		CWD Retention or Creation		
	Total	Component Diameters	Total	Component Diameters	Component Lengths
Western hemlock	3 tpa	> 12 in. dbh	120 ft./ac.	> 12 in.	> 20 ft.
Douglas fir and true firs	2 tpa	> 10 in. dbh	60 ft./ac.	> 10 in.	> 16 ft.
Tanoak	2 tpa	> 10 in. dbh	60 ft./ac.	> 10 in.	> 16 ft.
dbh (diameter breast height)			ft. (linear feet)		
			tpa (trees per acre)		

- Snag and coarse woody debris retention or creation requirements would be met by any combination of new snags and coarse woody debris from live conifer trees and the retention of existing levels of snags (Class I and Class II) and coarse woody debris (Class I and Class II).
- Snag and coarse woody debris retention or creation levels would be met at the scale of the harvest unit. Snag and coarse woody debris levels per acre would be variable within harvest units.
- Salvage would not occur in stands that are disturbed by a fire, windstorm, disease, or insect infestations, except to reduce hazards in wildland urban interface areas.

Riparian Management Area

Under Alternative 1, the riparian management area land use allocation would be established according to *Table 25 (Criteria established for the riparian management area land use allocation under Alternative 1)*. For a representation of those areas, see *Map 3 (Land use allocations under Alternative 1)*. Also see the map packet (*Maps 2, 6, and 10*) for detailed views of the land use allocations.

Note: The *site-potential tree height* for the purposes of determining the riparian management areas would be based on district averages that are measured at a scale that is no finer than the fifth-field watershed.

Table 25. Criteria established for the riparian management area land use allocation under Alternative 1

Riparian Management Areas	Distance
Perennial and Intermittent Fish-Bearing Streams and Perennial Non-Fish-Bearing Streams	One site-potential tree height on each side of a stream extending from the edge of an active stream channel and including its channel migration zone
Intermittent Non-Fish-Bearing Streams	Half of one site-potential tree height on each side of a stream extending from the edge of its active stream channel
Natural Wetlands	Half of one site-potential tree height extending from a body of water or wetland to the outer edge of its riparian vegetation or to the extent of seasonally saturated soil, whichever is greatest
Natural Lakes and Ponds	One site-potential tree height extending from a body of water to the outer edge of its riparian vegetation or to the extent of seasonally saturated soil, whichever is greatest
Constructed Ponds and Wetlands	The body of water and the area to the outer edge of its riparian vegetation
Nonforest Ecosystems on the East Side of the Klamath Falls Resource Area	The extent of the water influence zone as indicated by hydrophilic vegetation

Management Objectives

- Maintain or promote the development of mature or structurally complex forests.
- Provide for the riparian and aquatic conditions that supply stream channels with shade, sediment filtering, leaf litter and large wood, and root masses that stabilize stream banks.

Management Actions

- Thinning and other silvicultural treatments would be applied along smaller-order streams (generally, first-, second-, and third-order streams) to promote the development of mature forests.
- Thinning and other silvicultural treatments would be applied along larger-order streams (generally, fourth-order and larger streams) to promote the development of structurally complex forests.

- Snags and coarse woody debris would be retained in thinning operations, except for safety or operational reasons (e.g., maintaining access to roads and facilities).
- Salvage would not occur in stands that are disturbed by a fire, windstorm, disease, or insect infestations, except to reduce hazards in wildland urban interface areas.
- Timber from thinning and salvage operations would be available for sale.

Timber Management Area

Under Alternative 1, the timber management area land use allocation would be established to consist of the commercial forest lands that are not included in the following land use allocations:

- lands of the National Landscape Conservation System
- late-successional management areas
- riparian management areas
- administratively withdrawn areas

See *Map 3 (Land use allocations under Alternative 1)*. Also see the map packet (*Maps 2, 6, and 10*) for detailed views of the land use allocations.

Management Objectives

- Manage forests to achieve a high level of continuous timber production that could be sustained through a balance of growth and harvest.
- Offer for sale an annual allowable sale quantity.

Management Actions

- Timber would be offered for sale from regeneration harvest units. See *Table 26 (Timber offered for sale from regeneration harvest units)* and *Map 29 (Sustained yield units)*.

Table 26. Timber offered for sale from regeneration harvest units

District	10-Year Volume (mmbf)
Salem	900
Eugene	1,070
Roseburg	570
Coos Bay	590
Medford	952
Klamath Falls Resource Area (Lakeview District)	90

- Timber would be offered for sale from commercial thinning harvest units. See *Table 27 (Timber offered for sale from commercial thinning harvest units)*.

Table 27. Timber offered for sale from commercial thinning harvest units

District	10-Year Volume (mmbf)
Salem	100
Eugene	100
Roseburg	60
Coos Bay	60
Medford	68
Klamath Falls Resource Area (Lakeview District)	0

- Annual offering of the allowable sale quantity would potentially vary up to 10% from the declared allowable sale quantity to allow for variations in yield from different harvest areas and to allow for the preparation and sale of logical, operationally feasible, and economically viable sale areas.
- Cumulative total offering of the allowable sale quantity would be maintained within 5% over two or more years by adjusting annual offerings within the allowed 10% variation.
- Regeneration harvests would be conducted to remove volume and replace slower growing stands with young, rapidly growing stands. Generally, regeneration harvests would be scheduled for stands to maximize potential growth and yield. Regeneration harvests would be applied to younger stands for purposes that include the management of age class distribution, the management of diseased stands, and the management of overstocked stands with poor vigor and low crown ratio. The minimum age of stands that would be considered suitable for regeneration harvesting would be 40 years of age in the western hemlock and the tanoak vegetation series and 60 years of age in the Douglas fir and true firs vegetation series. See *Map 14 (Forest vegetation series)*.
- No merchantable material would be reserved from removal in regeneration harvest units. Noncommercial snags and coarse woody debris would be retained, except for safety or operational reasons.
- Commercial thinning would be applied to recover anticipated mortality; to adjust stand composition or dominance; to reduce stand susceptibility to disturbances such as a fire, windstorm, disease, or insect infestation; and to improve merchantability and value.

- Stand density would be maintained at levels between full occupancy and the onset of density-related mortality to the extent practical.
- Stands with a composition of commercially undesirable tree species or an inadequate stocking of desirable tree species would be converted to stands that are fully stocked with desirable tree species.
- Trees killed from disturbances, such as a fire, windstorm, disease, or insect infestation, would be salvaged to recover volume and economic value within the time necessary to avoid loss of value through deterioration.

Areas of Critical Environmental Concern and Research Natural Areas

Under Alternative 1, 92 areas of critical environmental concern and research natural areas would be designated. At the end of this chapter, see *Map 15 (Areas of critical environmental concern within the planning area)* and *Table 41 (Areas of critical environmental concern under the alternatives)*.

Management Objective

Maintain or restore important and relevant values in areas of critical environmental concern, which include research natural areas and outstanding natural areas.

Management Action

Maintenance or restoration activities would occur to protect important and relevant values.

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Township 20 South, Range 8 West, Section 23

0.25 0 0.25 0.5 0.75 1 Mile

Forested Lands
Planning Area

- Forest Excluded from Harvest Land Base
- Forest Included in Harvest Land Base

Upper Smith River Watershed

1 0 1 2 3 4 5 Miles

Map 3. Land use allocations under Alternative 1

Albers Equal Area Projection
North American Datum of 1983

Legend: Alternative 1

- Land Use Allocations
- National Land Conservation System
  - Administratively Withdrawn
  - Late-Successional Management Area
  - Riparian Management Area
  - Timber Management Area
  - BLM Administrative Boundary
  - State Boundary

Alternative 2

This action alternative is described in terms of those land use allocations that vary by alternative, which include:

- late-successional management area
- riparian management area
- timber management area
- areas of critical environmental concern and research natural areas
- management area adjacent to the Coquille Forest

Late-Successional Management Area

Under Alternative 2, the late-successional management area land use allocation would be established as follows:

- In the areas shown on *Map 4 (Land use allocations under Alternative 2)*. Also see the map packet (*Maps 3, 7, and 11*) for detailed views of the land use allocations.
- In the areas of contiguous marbled murrelet habitat and recruitment habitat (stands capable of becoming habitat for the marbled murrelet within 25 years) that are within 0.5 mile of occupied sites identified as of the end of the 2005 field season. Occupation would be determined by the presence of an active nest, a fecal ring, eggshell fragments, or birds demonstrating occupying behavior (i.e., flying below the forest canopy within or adjacent to a stand).

Management Objectives

- Maintain habitat for the northern spotted owl and the marbled murrelet.
- Promote the development of habitat for the northern spotted owl in stands that do not currently meet suitable habitat criteria.
- Recover economic value from timber harvested after a stand-replacement disturbance, such as a fire, windstorm, disease, or insect infestation.

Management Actions

- Thinning would be applied to promote the development of mature or structurally complex forests, and to promote the development of suitable habitat for the northern spotted owl. Timber from thinning would be offered for sale.

- Snags and coarse woody debris would be retained or created when thinning stands of larger trees, which are generally those with a stand average diameter of quadratic mean diameter (QMD) greater than 14 inches.

See Table 28 (*Snag and coarse woody debris (CWD) retention or creation for stands of larger trees (stand average diameter of QMD > 14 in.)*) and Map 14 (*Forest vegetation series*).

Table 28. Snag and coarse woody debris (CWD) retention or creation for stands of larger trees (stand average diameter of QMD > 14 in.)

Vegetation Series	Snag Retention or Creation		CWD Retention or Creation		
	Total	Component Diameters	Total	Component Diameters	Component Lengths
Western hemlock	6 tpa	> 14 in. dbh	240 ft./ac.	> 14 in.	> 20 ft.
Douglas fir and true firs	3 tpa	> 14 in. dbh	120 ft./ac.	> 14 in.	> 16 ft.
Tanoak	4 tpa	> 14 in. dbh	120 ft./ac.	> 14 in.	> 16 ft.
dbh (diameter breast height) ft. (linear feet) tpa (trees per acre)					

- Snags and coarse woody debris would be retained or created when thinning stands of smaller trees, which are generally those with a stand average diameter of quadratic mean diameter (QMD) less than or equal to 14 inches.

See Table 29 (*Snag and coarse woody debris (CWD) retention or creation for stands of smaller trees (stand average diameter of QMD ≤ 14 in.)*) and Map 14 (*Forest vegetation series*).

Table 29. Snag and coarse woody debris (CWD) retention or creation for stands of smaller trees (stand average diameter of QMD ≤ 14 in.)

Vegetation Series	Snag Retention or Creation		CWD Retention or Creation		
	Total	Component Diameters	Total	Component Diameters	Component Lengths
Western hemlock	3 tpa	> 12 in. dbh	120 ft./ac.	> 12 in.	> 20 ft.
Douglas fir and true firs	2 tpa	> 10 in. dbh	60 ft./ac.	> 10 in.	> 16 ft.
Tanoak	2 tpa	> 10 in. dbh	60 ft./ac.	> 10 in.	> 16 ft.
dbh = diameter breast height ft. = linear feet tpa = trees per acre					

- Snag and coarse woody debris retention or creation requirements would be met by any combination of new snags and coarse woody debris from live conifer trees and the retention of existing levels of snags (Class I and Class II) and coarse woody debris (Class I and Class II).

- Salvage of timber after a stand-replacement disturbance, such as a fire, windstorm, disease, or insect infestation, would occur to recover economic value while retaining snags and coarse woody debris according to *Table 30 (Snag and coarse woody debris (CWD) retention for salvaging of timber after a stand-replacement disturbance)*.

Table 30. Snag and coarse woody debris (CWD) retention for salvaging of timber after a stand-replacement disturbance

Vegetation Series	Snag Retention		CWD Retention		
	Total	Component Diameters	Total	Component Diameters	Component Lengths
Western hemlock	8 tpa	> 20 in. dbh	480 ft./ac.	> 20 in.	> 20 ft.
Douglas fir and true firs	4 tpa	> 16 in. dbh	240 ft./ac.	> 16 in.	> 16 ft.
Tanoak	4 tpa	> 20 in. dbh	240 ft./ac.	> 20 in.	> 20 ft.
dbh (diameter breast height) ft. (linear feet) tpa (trees per acre)					

- Snag and coarse woody debris retention or creation levels would be met at the scale of the harvest unit. Snag and coarse woody debris retention would be variable per acre throughout the area salvaged. If sufficient snags or coarse woody debris of the minimum sizes were not available, an equivalent number of smaller snags or coarse woody debris would be retained. Noncommercial snags and coarse woody debris would be retained, except for safety or operational reasons.

Riparian Management Area

Under Alternative 2, the riparian management area land use allocation would be established according to *Table 31 (Zones and the zone-specific management actions of the riparian management area land use allocation under Alternative 2)*. For a representation of those areas, see *Map 4 (Land use allocations under Alternative 2)*. Also see the map packet (*Maps 3, 7, and 11*) for detailed views of the land use allocations.

Table 31. Zones and the zone-specific management actions of the riparian management area land use allocation under Alternative 2

Zones	Zone-Specific Management Actions
Perennial and Intermittent Fish-Bearing Streams and Perennial Non-Fish-Bearing Streams	
Stream bank zone (0 to 25 ft. ¹)	• Harvesting would not be allowed, except for safety or operational reasons • Ground-based harvesting equipment would not be allowed
Water influence zone (25 to 100 ft.)	• Harvesting where mature or structurally complex forest stands already exist would not be allowed, except for safety or operational reasons • 80% effective shade or potential shade from 25 to 60 ft., whichever is less, would be maintained • At least 50% canopy closure from 60 to 100 ft. would be maintained after harvests • Snag and coarse woody debris would be retained, except for safety or operational reasons • Thinning and other silvicultural treatments would be applied along smaller-order streams (generally, first-, second-, and third-order streams) to promote the development of mature forests • Thinning and other silvicultural treatments would be applied along larger-order streams (generally, fourth-order and larger streams) to promote the development of structurally complex forests
¹ Measured from the edge of the channel migration zone.	
Debris-Flow Prone² Intermittent Streams	
Stream bank zone (0 to 25 ft.)	• Harvesting would not be allowed, except for safety or operational reasons
[extends from the unstable area to the fish-bearing stream]	• Ground-based harvesting equipment would not be allowed

Table continues on the next page.

Zones	Zone-Specific Management Actions
Debris-Flow Prone² Intermittent Streams (cont.)	
Water influence zone (25 to 100 ft.) [extends from the unstable area to the fish-bearing stream]	- Harvesting where mature or structurally complex forest stands already exist would not be allowed, except for safety or operational reasons - Snag and coarse woody debris would be retained, except for safety or operational reasons - Thinning and other silvicultural treatments would be applied along smaller-order streams (generally, first-, second-, and third-order streams) to promote the development of mature forests
² Intermittent streams that are below unstable headwalls (as identified by the timber production capability classification (TPCC) codes indicating significant instability (i.e., FGNW, FPNW, and FGR2)) that would periodically deliver large wood to fish-bearing streams. Intermittent streams that would not deliver large wood to fish-bearing streams because of geomorphic conditions (such as stream junction angle and low stream gradient) or roads would not be included.	
Lakes, Natural Ponds, and Wetlands	
Greater than 1/4 acre (0 to 25 ft. ³)	- Harvesting would not be allowed, except for safety or operational reasons - Ground-based harvesting equipment would not be allowed
Greater than 1/4 acre (25 to 100 ft. ²)	- At least 50% of the existing live tree basal area or 110 sq. ft. of basal area per acre, whichever is greater, would be retained - Retention would favor trees greater than 20 in. dbh
Less than 1/4 acre (0-50 ft. ²)	- At least 50% of the existing live tree basal area or 110 sq. ft. of basal area per acre, whichever is greater, would be retained - Retention would favor trees greater than 20 in. dbh
³ Measured from the high waterline or wetland boundary, whichever is greater.	
Constructed Ponds, Ditches, and Canals	
Stream bank zone (0 to 25 ft.)	- Harvesting would not be allowed, except for safety or operational reasons - Ground-based harvesting equipment would not be allowed
Intermittent Non-Fish-Bearing Streams	
Stream bank zone (0 to 25 ft.)	- Ground-based harvesting equipment would not be allowed 12 conifer trees per acre would be retained - Shrubs, forbs, and noncommercial trees would be retained, except for safety or operational reasons

Management Objectives

- Maintain or promote the development of mature or structurally complex forests.
- Provide for the riparian and aquatic conditions that supply stream channels with shade, sediment filtering, leaf litter and large wood, and root masses that stabilize stream banks.

Management Actions Common to All Zones of the Riparian Management Areas

- Snags and coarse woody debris would be retained in thinning operations, except for safety or operational reasons.
- Salvage would not occur in stands that are disturbed by a fire, windstorm, disease, or insect infestations, except to reduce hazards in wildland urban interface areas.
- Timber from thinning and salvage operations would be available for sale.

Timber Management Area

Under Alternative 2, the timber management area land use allocation would be established to consist of the commercial forest lands that are not included in the following land use allocations:

- lands of the National Landscape Conservation System
- late-successional management area
- riparian management area
- administratively withdrawn areas
- management area adjacent to the Coquille Forest

See *Map 4 (Land use allocations under Alternative 2)*. Also see the map packet (*Maps 3, 7, and 11*) for detailed views of the land use allocations.

Management Objectives

- Manage forests to achieve a high level of continuous timber production that could be sustained through a balance of growth and harvest.
- Offer for sale an annual allowable sale quantity.

Management Actions

- Timber would be offered for sale from regeneration harvest units. See *Table 32 (Timber offered for sale from regeneration harvest units)* and *Map 29 (Sustained yield units)*.

Table 32. Timber offered for sale from regeneration harvest units

District	10-Year Volume (mmbf)
Salem	1,610
Eugene	1,520
Roseburg	990
Coos Bay	1,320
Medford	1,296
Klamath Falls Resource Area (Lakeview District)	90

- Timber would be offered for sale from commercial thinning harvest units. See *Table 33 (Timber offered for sale from commercial thinning harvest units)*.

Table 33. Timber offered for sale from commercial thinning harvest units

District	10-Year Volume (mmbf)
Salem	110
Eugene	130
Roseburg	80
Coos Bay	110
Medford	14
Klamath Falls Resource Area (Lakeview District)	0

- Annual offering of the allowable sale quantity would potentially vary up to 10% from the declared allowable sale quantity to allow for variations in yield from different harvest areas and to allow for the preparation and sale of logical, operationally feasible, and economically viable sale areas.
- Cumulative total offering of the allowable sale quantity would be maintained within 5% over two or more years by adjusting annual offerings within the allowed 10% variation.
- Regeneration harvests would be conducted to remove volume and replace slower-growing stands with young, rapidly growing stands. Generally, regeneration harvests would be scheduled for stands to maximize potential growth and yield. Regeneration harvests would be applied to younger stands for purposes that include the management of age class distribution, the management of diseased stands, and the management of overstocked stands with poor vigor and low crown ratio. The minimum age of stands that would be considered suitable for regeneration harvesting would be 40 years

of age in the western hemlock and the tanoak vegetation series and 60 years of age in Douglas fir and true firs vegetation series.

- Commercial thinning would be applied to recover anticipated mortality; to adjust stand composition or dominance; to reduce stand susceptibility to disturbances such as a fire, windstorm, disease, or insect infestation; and to improve merchantability and value.
- Stand density would be maintained at levels between full occupancy and the onset of density-related mortality to the extent practical.
- Stands with a composition of commercially undesirable tree species or an inadequate stocking of desirable tree species would be converted to stands that are fully stocked by desirable tree species.
- Trees killed from disturbances, such as a fire, windstorm, disease, or insect infestation, would be salvaged to recover volume and economic value within the time necessary to avoid loss of value through deterioration.

Areas of Critical Environmental Concern and Research Natural Areas (Land Use Allocations)

Under Alternative 2, 93 areas of critical environmental concern and research natural areas would be designated. At the end of this chapter, see Map 15 (Areas of critical environmental concern within the planning area) and Table 41 (*Existing and potential areas of critical environmental concern (ACECs) designated by alternative*).

Management Objective

Maintain or restore important and relevant values in areas of critical environmental concern, which include research natural areas and outstanding natural areas.

Management Action

Maintenance or restoration activities would occur to protect important and relevant values.

Management Area Adjacent to the Coquille Forest Land Use Allocation

Under Alternative 2, a management area adjacent to the Coquille Forest would be established. See *Map 16 (BLM management area adjacent to the Coquille Forest)*.

Management Objective

Coordinate the management of the adjacent BLM-administered lands with the Coquille Forest lands.

Management Actions

The Coquille Tribe's September 2006 *Management Direction for Tribal Cooperative Management Areas (TCMAs)* document provides the management direction for the Coquille Forest. The management of the 15,000 acres of BLM-administered lands that are adjacent to the Coquille Forest would adopt the management directions in this tribal plan for managing the comparable resources in this adjacent area. Those management directions are incorporated by reference. Since the management in this adjacent area would be in a manner that is consistent with the tribal plan, the tribal plan would be considered by the BLM to conform to the BLM's resource management plans in its entirety.

See *Map 16 (BLM management area adjacent to the Coquille Forest)*.

Riparian Management Areas

Note: The following management actions would apply only to the BLM-administered lands that are adjacent to the Coquille Forest.

Table 34. Criteria established for the riparian management areas of the lands that are adjacent to the Coquille Forest as part of Alternative 2

Perennial and Intermittent Fish-Bearing Streams	
0 to 25 ft.	• Avoid harvesting, except for restoration purposes • Require full suspension during cable logging • Leave any trees damaged or felled during logging activities
25 to 50 ft.	• Manage for mature forest conditions; maintain a minimum of 80% effective stream shade • Retain no less than 50% canopy cover • Actively manage, where necessary, to achieve desired future conditions in a timely manner • Allow no harvesting where mature forest conditions exist or when mature forest is achieved • Require full suspension during cable logging, whenever feasible, or else require one-ended suspension • Limit ground-based equipment, when possible • Retain all dead and downed material that is present prior to an operation
50 to 100 ft.	• Retain 10 to 45 conifer trees per acre or per 35 to 157 sq. ft. of basal area, which is 20 to 90 trees/1,000 ft. • Retain all snags if safety allows • Retain all dead and downed material that is present prior to an operation
Perennial Non-Fish-Bearing Streams	
0 to 25 ft.	• Avoid harvesting, except for restoration purposes • Require full suspension during cable logging • Leave any trees damaged or felled during logging activities
Perennial Non-Fish-Bearing Streams (cont.)	
25 to 50 ft.	• Manage for mature forest conditions; maintain a minimum of 80% effective stream shade • Retain no less than 50% canopy cover • Actively manage, where necessary, to achieve desired future conditions in a timely manner • Allow no harvesting where mature forest conditions exist or when mature forest is achieved • Require full suspension during cable logging, whenever feasible • Retain all dead and downed material that is present prior to an operation
Intermittent Non-Fish-Bearing Streams	
	• Maintain the integrity of the stream channel • Retain 10 to 15 conifer trees per acre or per 35 to 45 sq. ft. of basal area, which is 20 to 30 trees/1,000 ft., where operationally feasible • Retain all snags if safety allows • Retain all dead and downed material that is present prior to the operation

Forest Management

Note: The following management actions would apply only to the BLM-administered lands that are adjacent to the Coquille Forest.

- A well-distributed pattern of early and mid-seral stands would be maintained.
- A minimum of 120 linear feet of logs per acre in a cutting area (comprised of logs that are at least 16 inches in diameter at the large end and at least 16 feet in length) would be retained.
- From 0 to 6 green conifer trees would be retained after regeneration harvests to provide a source of snag recruitment.
- Stands would be managed under an average rotation age of 80 years, but regeneration harvests would be allowed in stands as young as 60 years of age to develop the desired age class distribution across the landscape and to provide for some commodity output.

Soils and Water

Note: This management action would apply only to the BLM-administered lands that are adjacent to the Coquille Forest.

The best management practices set forth in the plan for the tribal cooperative management area would be applied during all ground and vegetation disturbing activities.

Federally Listed Species under the Endangered Species Act

Note: The following management actions would apply only to the BLM-administered lands that are adjacent to the Coquille Forest.

- Field surveys would be conducted, according to protocols and other established procedures, unless surveys are deemed unnecessary through project planning and environmental assessment.
- Consideration would be given to modifying, relocating, or abandoning proposed actions to avoid contributing to the need to list a federal candidate species based on consultation with the appropriate regulatory agency.

Roads

Note: The following management actions would apply only to the BLM-administered lands that are adjacent to the Coquille Forest.

- New stream-crossing structures would be designed to accommodate at least a 100 year flood, including the associated bedload and debris.
- Fish passage would be provided and maintained at all road crossings of existing and potential fish-bearing streams.

Draft Environmental
Impact Statement

Source: Bureau of Land Management Corporate Data revised for WOPR Analysis. 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.

Township 20 South, Range 8 West, Section 23

0.25 0 0.25 0.5 0.75 1 Mile

Forested Lands
Planning Area

- Forest Excluded from Harvest Land Base
- Forest Included in Harvest Land Base

Upper Smith River Watershed

1 0 1 2 3 4 5 Miles

Map 4. Land use allocations under Alternative 2

10 0 10 20 30 40 50 Miles

10 0 10 20 30 40 50 Kilometers

Albers Equal Area Projection
North American Datum of 1983

Legend: Alternative 2

Land Use Allocations

- National Land Conservation System
- BLM Management Area Adjacent to Coquille Tribal Forest Land
- Administratively Withdrawn
- Late-Successional Management Area
- Riparian Management Area
- Timber Management Area
- BLM Administrative Boundary
- State Boundary

Alternative 3

This action alternative is described in terms of those land use allocations that vary by alternative, which include:

- general landscape area
- riparian management area
- areas of critical environmental concern and research natural areas
- management area adjacent to the Coquille Forest

General Landscape Area

Under Alternative 3, the general landscape area land use allocation would consist of all lands other than the:

- lands of the National Landscape Conservation System
- riparian management areas
- administratively withdrawn areas
- lands adjacent to the Coquille Forest

See *Map 5 (Land use allocations under Alternative 3)*. Also see the map packet (*Maps 4, 8, and 12*) for detailed views of the land use allocations.

Management Objectives

- Provide for the habitat conditions that are required for late-successional species.
- Maintain or promote the development of mature or structurally complex forests.
- Achieve continuous timber production that could be sustained through a balance of growth and harvest.
- Offer for sale an annual allowable sale quantity.

Management Actions

- Annual offering of the allowable sale quantity would potentially vary up to 10% from the declared allowable sale quantity to allow for variations in yield from different harvest areas and to allow for the preparation and sale of logical, operationally feasible, and economically viable sale areas.
- Cumulative total offering of the allowable sale quantity would be maintained within 5% over two or more years by adjusting annual offerings within the allowed 10% variation.

- Regeneration harvests would be applied as shown in *Table 35* (*Harvest interval, green tree retention, and snag and coarse woody debris (CWD) retention or creation levels per vegetation series for regeneration harvests under Alternative 3*).

Table 35. Harvest interval, green tree retention, and snag and coarse woody debris (CWD) retention or creation levels per vegetation series for regeneration harvests under Alternative 3

Vegetation Series	Harvest Interval (years)	Green Tree Retention		Snag Retention or Creation		CWD Retention or Creation		
		Total	Component Diameters	Total	Component Diameters	Total	Component Diameters	Component Lengths
Western hemlock	360	6 tpa	> 20 in. dbh	4 tpa	> 20 in. dbh	240 ft./ac.	> 20 in.	> 20 ft.
Douglas fir and true firs	240	9 tpa	> 16 in. dbh	2 tpa	> 16 in. dbh	120 ft./ac.	> 16 in.	> 16 ft.
Tanoak		6 tpa	> 20 in. dbh	2 tpa	> 20 in. dbh	120 ft./ac.	> 20 in.	> 20 ft.
dbh (diameter breast height)		ft. (linear feet)		tpa (trees per acre)				

- Regeneration harvests would not be applied in the areas that are generally south of Grants Pass in the Medford District and in the Klamath Falls Resource Area of the Lakeview District.
- Forest stands would be salvaged after disturbances where economically feasible within the time necessary to avoid loss of value through deterioration. Salvage would emulate a partial harvest or a regeneration harvest depending on the nature and extent of the disturbance.
- Regeneration harvests would be applied to stands that are at or beyond the harvest interval for regeneration harvesting if 50% or more of the acres in an assessment area (defined as a physiographic province within a sustained yield unit) are older than the following threshold stand ages:
  - 90 years of age in the assessment areas of Salem/Coast Range, Salem/West Cascades, Eugene/Coast Range, Eugene/West Cascades, Coos Bay/Coast Range, Coos Bay/Klamath, Roseburg/Coast Range, and Roseburg/West Cascades
  - 140 years of age in the assessment areas of Roseburg/Klamath and Medford/West Cascades (outside of the uneven-aged management area)

See *Map 17* (*Location of assessment areas (physiographic provinces within sustained yield units) under Alternative 3*). Also see the map packet (*Maps 4, 8, and 12*) for detailed views of the land use allocations.

- Partial harvests and commercial thinning would be applied to stands that are at or beyond the harvest interval for partial harvesting if less than 50% of the acres in an assessment area (defined as a

physiographic province within a sustained yield unit) are older than the following threshold stand ages:

- 90 years of age in the assessment areas of Salem/Coast Range, Salem/West Cascades, Eugene/Coast Range, Eugene/West Cascades, Coos Bay/Coast Range, Coos Bay/Klamath, Roseburg/Coast Range, and Roseburg/West Cascades
- 140 years of age in the assessment areas of Roseburg/Klamath and Medford/West Cascades (outside of the uneven-aged management area)

See *Map 17 (Location of assessment areas (physiographic provinces within sustained yield units) under Alternative 3)*. Also see the map packet (*Maps 4, 8, and 12*) for detailed views of the land use allocations.

- Partial harvests would be applied as shown in *Table 36 (Harvest interval, green tree retention, and snag and coarse woody debris (CWD) retention or creation levels per vegetation series for partial harvests under Alternative 3)*.

Table 36. Harvest interval, green tree retention, and snag and coarse woody debris (CWD) retention or creation levels per vegetation series for partial harvests under Alternative 3

Vegetation Series	Harvest Interval (years)	Green Tree Retention		Snag Retention or Creation		CWD Retention or Creation		
		Total	Component Diameters	Total	Component Diameters	Total	Component Diameters	Component Lengths
Western hemlock	120	30 tpa	> 16 in. dbh	4 tpa	> 20 in. dbh	240 ft./ac.	> 20 in.	> 20 ft.
Douglas fir and true firs	80	20 tpa	> 12 in. dbh	2 tpa	> 12 in. dbh	120 ft./ac.	> 12 in.	> 12 ft.
Tanoak	60	20 tpa	> 16 in. dbh	2 tpa	> 16 in. dbh	120 ft./ac.	> 16 in.	> 16 ft.

dbh (diameter breast height)   ft. (linear feet)   tpa (trees per acre)

- The harvest intervals for regeneration harvests and partial harvests in *Table 35* and *Table 36* are approximate schedules for harvesting timber stands, not minimum ages of trees to be cut. Individual or clumps of trees may be harvested for operational reasons. Harvests may occur at stand ages above the described harvest intervals because of the current age-class distribution as well as operational and planning constraints. Regardless of a stand's age at the time of harvest, the same stand would not be harvested again until after the harvest interval.
- Green tree retention levels would be met from conifer trees.
- Green tree, snag, and coarse woody debris retention or creation levels in *Table 35* and *Table 36* are averages that would be met at the scale of the harvest unit, and levels would be highly variable within harvest units.

- Existing snags and coarse woody debris would be supplemented with created snags and coarse woody debris to meet the levels in *Table 35* and *Table 36*.
- Commercial thinning would be applied, as needed, to a stand of any age to maintain the growth and vigor of the stand, and to adjust the species composition of the stand.
- Trees killed from disturbances, such as a fire, windstorm, disease, or insect infestation, would be salvaged to recover volume and economic value within the time necessary to avoid loss of value through deterioration.
- When salvaging after disturbances such as a fire, windstorm, disease, or insect infestation that approximate a regeneration harvest (i.e., the density of surviving trees that is comparable to the green tree retention levels given in *Table 35*), green trees, snags, and coarse woody debris would be retained, if they are available, in the quantities shown in *Table 35* in this chapter.
- When salvaging after disturbances such as a fire, windstorm, disease, or insect infestation that approximate a partial harvest (i.e., the density of surviving trees that is comparable to the green tree retention levels given in *Table 36*), green trees, snags, and coarse woody debris would be retained, if they are available, in the quantities shown in *Table 36* in this chapter.
- Stands with a composition of commercially undesirable tree species or an inadequate stocking of desirable tree species would be converted to stands that are fully stocked by desirable tree species. In converting hardwood stands to the desired conifer species, green tree, snag, and coarse woody debris retention or creation requirements for stand-replacement harvests would be applied with the following exception: hardwood trees may be substituted for conifer trees for green tree, snag, and coarse woody debris retention or creation.
- Owl activity centers of 215 acres of suitable nesting, roosting, and foraging habitat would be retained within 5/8 of a mile of each known northern spotted owl center of activity as identified in the Northern Spotted Owl Database. If 215 acres of habitat are not available within 5/8 of a mile of an owl center of activity, no further acres would be retained. This habitat would be retained until 50% or more of the acres in an assessment area (defined as a physiographic province within a sustained yield unit) are older than the following threshold stand ages:
  - 90 years of age in the areas that are generally north of Grants Pass, which include the assessment areas of Salem/Coast Range, Salem/West Cascades, Eugene/Coast Range, Eugene/

West Cascades, Coos Bay/Coast Range, Coos Bay/Klamath, Roseburg/Coast Range, and Roseburg/West Cascades

- 140 years of age in the areas that are generally south of Grants Pass, which include the assessment areas of Roseburg/Klamath and Medford/West Cascades (outside of the uneven-aged management area)

For the uneven-aged management areas, 215 acres of suitable nesting, roosting, and foraging habitat would be retained for 5 decades, which is 50 years.

- Contiguous marbled murrelet habitat and recruitment habitat (stands capable of becoming habitat for the marbled murrelet within 25 years) would be retained within 0.5 mile of any occupied site. Occupation would be determined by the presence of an active nest, a fecal ring, eggshell fragments, or birds demonstrating occupying behavior (i.e., flying below the forest canopy within or adjacent to a stand). This habitat would be retained until 50% or more of the acres in an assessment area (defined as a physiographic province within a sustained yield unit) are older than the following threshold stand ages:
  - 90 years of age in the areas that are generally north of Grants Pass, which include the assessment areas of Salem/Coast Range, Salem/West Cascades, Eugene/Coast Range, Eugene/West Cascades, Coos Bay/Coast Range, Coos Bay/Klamath, Roseburg/Coast Range, and Roseburg/West Cascades
  - 140 years of age in the areas that are generally south of Grants Pass, which include the assessment areas of Roseburg/Klamath and Medford/West Cascades (outside of the uneven-aged management area)

Riparian Management Area

Under Alternative 3, the riparian management area land use allocation would be established according to *Table 37 (Zones and the zone-specific management actions of the riparian management area land use allocation under Alternative 3)*. For a representation of those areas, see *Map 5 (Land use allocations under Alternative 3)*. Also see the map packet (*Maps 4, 8, and 12*) for detailed views of the land use allocations.

Table 37. Zones and the zone-specific management actions of the riparian management area land use allocation under Alternative 3

Zones	Zone-Specific Management Actions
Perennial and Intermittent Fish-Bearing Streams and Perennial Non-Fish-Bearing Streams	
Stream bank zone (0 to 25 ft. ¹)	- Harvesting would not be allowed, except for safety or operational reasons - Ground-based harvesting equipment would not be allowed
Water influence zone (25 to 100 ft.)	- Harvesting where mature or structurally complex forest stands already exist would not be allowed, except for safety or operational reasons 80% effective shade or potential shade from 25 to 60 ft., whichever is less, would be maintained - At least 50% canopy closure from 60 to 100 ft. would be maintained after harvests - Snag and coarse woody debris would be retained, except for safety or operational reasons - Thinning and other silvicultural treatments would be applied along smaller-order streams (generally, first-, second-, and third-order streams) to promote the development of mature forests - Thinning and other silvicultural treatments would be applied along larger-order streams (generally, fourth-order and larger streams) to promote the development of structurally complex forests
¹ Measured from the edge of the channel migration zone.	
Lakes, Natural Ponds, and Wetlands	
Greater than 1/4 acre (0 to 25 ft. ²)	- Harvesting would not be allowed, except for safety or operational reasons - Ground-based harvesting equipment would not be allowed
Greater than 1/4 acre (25 to 100 ft. ²)	- At least 50% of the existing live tree basal area or 110 sq. ft. of basal area per acre, whichever is greater, would be retained - Retention would favor trees greater than 20 in. dbh
Lakes, Natural Ponds, and Wetlands (cont.)	
Less than 1/4 acre (0-50 ft. ²)	- At least 50% of the existing live tree basal area or 110 sq. ft. of basal area per acre, whichever is greater, would be retained - Retention would favor trees greater than 20 in. dbh
² Measured from the high waterline or wetland boundary, whichever is greater.	

Zones	Zone-Specific Management Actions
Constructed Ponds, Ditches, and Canals	
Stream bank zone (0 to 25 ft.)	• Harvesting would not be allowed, except for safety or operational reasons • Ground-based harvesting equipment would not be allowed
Intermittent Non-Fish-Bearing Streams	
Stream bank zone (0 to 25 ft.)	• Harvesting would not be allowed, except for safety or operational reasons • Ground-based harvesting equipment would not be allowed

Management Objectives

- Maintain or promote the development of mature or structurally complex forests.
- Provide for the riparian and aquatic conditions that supply stream channels with shade, sediment filtering, leaf litter and large wood, and root masses that stabilize stream banks.

Management Actions

- Snags and coarse woody debris would be retained in thinning operations, except for safety or operational reasons.
- Salvage would not occur in stands that are disturbed by a fire, windstorm, disease, or insect infestations, except to reduce hazards in wildland urban interface areas.
- Timber from thinning and salvage operations would be available for sale.
- Prescribed burns would be used in areas of high fuel loadings to reduce the potential for uncharacteristic wildfires.

Areas of Critical Environmental Concern and Research Natural Areas (Land Use Allocations)

Under Alternative 3, 82 areas of critical environmental concern and research natural areas would be designated. At the end of this chapter, see *Map 15 (Areas of critical environmental concern within the planning area)* and *Table 41 (Areas of critical environmental concern under the alternatives)*.

Management Objective

Maintain or restore important and relevant values in areas of critical environmental concern, which include research natural areas and outstanding natural areas.

Management Action

Maintenance or restoration activities would occur to protect important and relevant values.

Management Area Adjacent to the Coquille Forest Land Use Allocation

Under Alternative 3, a management area adjacent to the Coquille Forest would be established. See *Map 16 (BLM management area adjacent to the Coquille Forest)*.

Management Objective

Coordinate the management of the adjacent BLM-administered lands with the Coquille Forest lands.

Management Actions

The Coquille Tribe's September 2006 *Management Direction for Tribal Cooperative Management Areas (TCMAs)* document provides the management direction for the Coquille Forest. The management of the 15,000 acres of BLM-administered lands that are adjacent to the Coquille Forest would adopt the management directions in this tribal plan for managing the comparable resources in this adjacent area. Those management directions are incorporated by reference. Since the management in this adjacent area would be in a manner that is consistent with the tribal plan, the tribal plan would be considered by the BLM to conform to the BLM's resource management plans in its entirety.

See *Map 16 (BLM management area adjacent to the Coquille Forest)*.

Riparian Management Areas

Note: The following management actions would apply only to the BLM-administered lands that are adjacent to the Coquille Forest.

Table 38. Criteria established for the riparian management areas of the lands that are adjacent to the Coquille Forest as part of Alternative 3

Perennial and Intermittent Fish-Bearing Streams	
0 to 25 ft.	• Avoid harvesting, except for restoration purposes • Require full suspension during cable logging • Leave any trees damaged or felled during logging activities
25 to 50 ft.	• Manage for mature forest conditions; maintain a minimum of 80% effective stream shade • Retain no less than 50% canopy cover • Actively manage, where necessary, to achieve desired future conditions in a timely manner • Allow no harvesting where mature forest conditions exist or when mature forest is achieved • Require full suspension during cable logging, whenever feasible, or else require one-ended suspension • Limit ground-based equipment, when possible • Retain all dead and downed material that is present prior to an operation
50 to 100 ft.	• Retain 10 to 45 conifer trees per acre or per 35 to 157 sq. ft. of basal area, which is 20 to 90 trees/1,000 ft. • Retain all snags if safety allows • Retain all dead and downed material that is present prior to an operation
Perennial Non-Fish-Bearing Streams	
0 to 25 ft.	• Avoid harvesting, except for restoration purposes • Require full suspension during cable logging • Leave any trees damaged or felled during logging activities
Perennial Non-Fish-Bearing Streams (cont.)	
25 to 50 ft.	• Manage for mature forest conditions; maintain a minimum of 80% effective stream shade • Retain no less than 50% canopy cover • Actively manage, where necessary, to achieve desired future conditions in a timely manner • Allow no harvesting where mature forest conditions exist or when mature forest is achieved • Require full suspension during cable logging, whenever feasible • Retain all dead and downed material that is present prior to an operation
Intermittent Non-Fish-Bearing Streams	
	• Maintain the integrity of the stream channel • Retain 10 to 15 conifer trees per acre or per 35 to 45 sq. ft. of basal area, which is 20 to 30 trees/1,000 ft., where operationally feasible • Retain all snags if safety allows • Retain all dead and downed material that is present prior to the operation

Forest Management

Note: The following management actions would apply only to the BLM-administered lands that are adjacent to the Coquille Forest.

- A well-distributed pattern of early and mid-seral stands would be maintained.
- A minimum of 120 linear feet of logs per acre in a cutting area (comprised of logs that are at least 16 inches in diameter at the large end and at least 16 feet in length) would be retained.
- From 0 to 6 green conifer trees would be retained after regeneration harvests to provide a source of snag recruitment.
- Stands would be managed under an average rotation age of 80 years, but regeneration harvests would be allowed in stands as young as 60 years of age to develop the desired age class distribution across the landscape and to provide for some commodity output.

Soils and Water

Note: This management action would apply only to the BLM-administered lands that are adjacent to the Coquille Forest.

The best management practices set forth in the plan for the tribal cooperative management area would be applied during all ground- and vegetation-disturbing activities.

Federally Listed Species under the Endangered Species Act

Note: The following management actions would apply only to the BLM-administered lands that are adjacent to the Coquille Forest.

- Field surveys would be conducted, according to protocols and other established procedures, unless surveys are deemed unnecessary through project planning and environmental assessment.
- Consideration would be given to modifying, relocating, or abandoning proposed actions to avoid contributing to the need to list a federal candidate species based on consultation with the appropriate regulatory agency.

Roads

Note: The following management actions would apply only to the BLM-administered lands that are adjacent to the Coquille Forest.

- New stream-crossing structures would be designed to accommodate at least a 100 year flood, including the associated bedload and debris.
- Fish passage would be provided and maintained at all road crossings of existing and potential fish-bearing streams.

Draft Environmental
Impact Statement

Source: Bureau of Land Management Corporate Data revised for WOPR Analysis. 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.

Township 20 South, Range 8 West, Section 23

Forested Lands
Planning Area

- Forest Excluded from Harvest Land Base
- Forest Included in Harvest Land Base

Upper Smith River Watershed

Map 5. Land use allocations under Alternative 3

10 0 10 20 30 40 50 Miles

10 0 10 20 30 40 50 Kilometers

Albers Equal Area Projection
North American Datum of 1983

Legend: Alternative 3

Land Use Allocations

- National Land Conservation System
- BLM Management Area Adjacent to Coquille Tribal Forest Land
- Administratively Withdrawn
- Riparian Management Area
- General Landscape Area
- BLM Administrative Boundary
- State Boundary

Subalternatives

Subalternatives are variations of an alternative that add, remove, or modify certain management actions. The analysis of subalternatives allows the BLM to examine concepts that were contained in the alternatives. These examinations provide the public and the responsible official with information that is useful to more fully understand the alternatives and to arrive at subsequent decisions.

The analysis of the subalternatives is focused and limited to the specific analytical question that is associated with a subalternative. This is in contrast to the broader analysis that is associated with the No Action Alternative and the three action alternatives. Some subalternatives, however, may be incorporated into or used in modifying an action alternative in the final environmental impact statement analysis.

The following are the subalternatives examined in this draft environmental impact statement.

Alternative	Subalternatives
No Action	None
Alternative 1	1. Allow no harvesting of stands that are older than 80 years of age. 2. Allow no harvesting of stands that are older than 200 years of age. 3. Allow no regeneration harvesting until thinning opportunities are exhausted. 4. Increase the size of the late-successional management area to include all critical habitat of the northern spotted owl.
Alternative 2	Change the rotation to emulate the timber industry's short rotation.
Alternative 3	Apply the landscape target of 50% in late-successional habitat condition to only those areas where the government land ownership (federal, state, and local) is half or more of the total ownership.

Subalternatives Analyzed

Subalternatives for Alternative 1

Allow no harvesting of stands that are older than 80 years of age and allow no harvesting of those that are older than 200 years of age (two analyses)

Analytical Question: What would be the effect on forest structural conditions, habitat, and timber harvest levels if no harvesting was permitted in older forests?

The analysis of these subalternatives is intended to examine the issue of the management of old-growth forests. Some members of the public commented through the scoping process that all old-growth forests should be reserved from timber harvesting. Because there are varied opinions as to what constitutes older forests, these subalternatives examine the reservation of forest stands that are older than 80 years of age and those that are older than 200 years of age. The analysis of these subalternatives is limited to forest ecology, wildlife, and timber.

Allow no regeneration harvesting until thinning opportunities are exhausted

Analytical Question: Is thinning sustainable for meeting the annual allowable sale quantity?

The analysis of this subalternative examines how long a thinning-only approach to harvesting could sustain the allowable sale quantity of the alternative. The analysis will also examine the effect of such a harvesting regime on the value of the timber harvested. The analysis of this subalternative is in response to comments received during scoping that advocated forest management that would use thinning only with no regeneration harvesting. The analysis of this subalternative is limited to timber and economics.

Increase the size of the late-successional management area to include all critical habitat of the northern spotted owl

Analytical Question: How would increasing the size of late-successional management areas to include all northern spotted owl critical habitat affect timber harvest levels?

Although Alternative 1 would create large reserves that incorporate much of the critical habitat for the northern spotted owl, there would be some critical habitat that would not be included in the reserve system. The analysis of this subalternative is limited to timber.

Subalternative for Alternative 2

Change the rotation to emulate the timber industry's short rotation

Analytical Question: What would be the economic gain of using a short rotation and how would such management affect habitat?

This analysis examines what economic benefits would result from increased intensive forest management and how compatible the intensive forest management would be with wildlife objectives. The analysis of this subalternative is limited to timber, economics, and wildlife.

Subalternative for Alternative 3

Apply the landscape target of 50% in late-successional habitat condition to only those areas where the government land ownership (federal, state, and local) is half or more of the total ownership

Analytical Question: How would applying the landscape target to only areas of high government ownership affect harvest levels and habitat?

The analysis of this subalternative examines the sensitivity of timber harvest level and habitat outcomes to the varying of the landscape target. The analysis is intended to provide insight into the ability to achieve habitat objectives by varying management action in areas of high government ownership and low government ownership. This analysis has particular relevance to the uneven checkerboard pattern of the O&C lands. The analysis of this subalternative is limited to timber and wildlife.

Alternatives Considered but Eliminated from Detailed Study

An environmental impact statement must rigorously explore and objectively evaluate all reasonable alternatives. The range of alternatives is limited by the requirement to fulfill the purpose and need, which is the reason or reasons for the agencies to be proposing action. See *Chapter 1* for the purpose and need.

When an alternative is eliminated from detailed study, it is because it was found to be unreasonable in some way. An alternative may be found to be unreasonable when it:

1. Does not meet the purpose and need.
2. Is substantially similar to an alternative being considered in detail or it would have substantially similar effects to an alternative being considered in detail.
3. Would not be feasible or practical to implement.
4. Would be exorbitant to implement.
5. Cannot be analyzed for its effects because of its implementation being remote or speculative.

Eliminated Alternatives

These alternatives, which were considered but eliminated from detailed study, were the result of proposals received from the public through the scoping process or proposed by agency staff during the process of formulating reasonable alternatives that would meet the purpose and need.

Vary Management Based on High versus Low Government Ownership

This alternative would vary management objectives at the landscape level and vary management actions based on the checkerboard ownership pattern of the BLM lands.

Landscape-level areas with greater than 50% state and federal ownership would be managed primarily to develop habitat for late-successional forest-related species. These areas would provide the opportunity for creating large blocks of contiguous habitat in the future.

Where the combined state and federal ownership is below 50%, the BLM's lands would be managed for early and mid-successional forests with structural legacies. A majority of the commercial timber harvesting activities would occur in these areas.

This alternative was eliminated from detailed study because it is a variation of Alternative 3, which sets landscape objectives for the development of late-successional forests. A subalternative of Alternative 3 varies these landscape targets in areas relative to a high or low government ownership pattern. Analysis of this subalternative is intended to provide information regarding the ability of the BLM to achieve management objectives given the checkerboard ownership pattern of the BLM lands.

Use Historic Variability, Retention of All Mature and Old-Growth Stands, and Small Tree Harvesting

This alternative would manage within the historic range of variability, would protect mature and old-growth stands, and would harvest only small-diameter trees. It would focus on restoration, fuels reduction, and maintenance of the protections of the Northwest Forest Plan.

This alternative was eliminated from detailed study because it would not meet the purpose and need, which states that the resource management plan revisions must meet all applicable laws. One of the applicable laws is the O&C Act. The O&C Act requires that the O&C lands that are classified as timberlands are to be managed for permanent forest production following the principles of sustained yield, which includes the selling, cutting, and removing of timber.

However, the alternatives that were analyzed in detail contain the essential elements of this alternative. Alternatives 1, 2, and 3 all provide for restoration, the reduction of fuels, and the protection or development of mature or structurally complex forests. Therefore, a redundant detailed analysis is unnecessary.

Protect All Forests That Are Over 80 Years of Age

This alternative would protect all forests that are over 80 years of age and prohibit logging and the building of new roads in all large unroaded areas. In stands that are less than 80 years of age, active restoration would occur, including thinning, road removal, replacing culverts to improve fish passage, trail maintenance, prescribed burns, and riparian restoration.

This alternative was eliminated from detailed study because it would not meet the purpose and need, which states that the resource management plan revisions must meet all applicable laws. One of the laws is the O&C Act. This alternative would exclude timber harvesting on large acreages of O&C lands and would eventually exclude all harvesting on all O&C lands, once their forests reached the age of 80 years. Therefore, this alternative would not meet the O&C Act's requirement to manage the O&C lands that are classified as timberlands for permanent forest production following the principles of sustained yield, which includes the selling, cutting, and removing of timber. Also note that no law exists that requires the protection of forests that are over the age of 80 years.

However, a subalternative of Alternative 1 analyzed the effects of not allowing the regeneration harvesting of older stands until the appropriate thinning of all available younger stands has been accomplished. Additionally, two analyses were completed to evaluate the impacts of the reservation of older stands (i.e., those that are at ages greater than 80 and those that are at ages greater than 200 years). Since these subalternatives are substantially similar to this alternative, a redundant detailed analysis is unnecessary.

Two-Phased Management Approach

This alternative would focus on the recovery and restoration of habitat for threatened and endangered species. After species recover and are delisted, this alternative would then focus on harvesting.

This alternative was eliminated from detailed study because it would not meet the purpose and need, which states that the resource management plan revisions must meet all applicable laws. Two of the applicable laws are the O&C Act and the Endangered Species Act. The Endangered Species Act does not specifically require that timber harvesting be delayed in the entire classification of older stands in order to allow for the recovery of any one or combination of species. Additionally, it is unknown how long delisting or recovery would take, or even if it would occur for some species. This alternative would indefinitely postpone timber harvesting. Therefore, this alternative would not meet the O&C Act's requirement to manage the O&C lands

that are classified as timberlands for permanent forest production following the principles of sustained yield, which includes the selling, cutting, and removing of timber.

However, a subalternative of Alternative 1 analyzed the effects of not allowing the regeneration harvesting of older stands until the appropriate thinning of all available younger stands has been accomplished. Since this subalternative is substantially similar to this alternative, a redundant detailed analysis is unnecessary.

Harvest Only Naturally Selected Dead and Dying Trees

This alternative would remove only “naturally selected dead and dying trees, conditioned upon meeting the needs of other species.” Timber harvesting of such trees would be accomplished with small equipment from a network of narrow roads.

This alternative was eliminated from detailed study because it would not meet the purpose and need, which states that the resource management plan revisions must meet all applicable laws. One of the applicable laws is the O&C Act. The O&C Act requires that the O&C lands that are classified as timberlands are to be managed for permanent forest production following the principles of sustained yield, which includes determining and declaring the annual productive capacity of such lands with the timber from those lands (not less than the annual sustained yield capacity) being sold annually.

Also, while this management approach may be practical for managing a small woodlot on relatively flat terrain, such an approach is impractical for managing a landscape of the size and ruggedness that is managed by the BLM in western Oregon. The level of roaded access and survey efforts that would be necessary to identify and harvest the trees that die on BLM lands in western Oregon every year would be prohibitively expensive both in financial and environmental terms.

No Old-Growth Harvesting

This alternative would reserve all old-growth stands and focus harvesting on small-diameter trees.

This alternative was eliminated from detailed study because it would not meet the purpose and need, which states that the resource management plan revisions must meet all applicable laws. One of the applicable laws is the O&C Act. In a 1990 opinion by the United States Court of Appeals for the Ninth Circuit (*Headwaters, Inc. v. BLM*), the court ruled that the O&C Act was a dominant use act.

“Nowhere does the legislative history suggest that wildlife habitat conservation or conservation of old growth is a goal on a par with timber production, or indeed that it is a goal of the O&C Act at all.”

Precluding the harvesting of timber from old-growth stands that are not needed to comply with some other law, such as the Endangered Species Act, would violate the O&C Act’s requirement to manage the O&C lands that are classified as timberlands for permanent forest production following the principles of sustained yield, which includes the selling, cutting, and removing of timber.

However, a subalternative of Alternative 1 analyzed the effects of not allowing the regeneration harvesting of older stands until the appropriate thinning of all available younger stands has been accomplished. Additionally, two analyses were completed to evaluate the impacts of the reservation of older stands by using two variations of what is considered an older stand (i.e., 80 years per the Northwest Forest Plan for late-successional/old-growth stands and 200 years per the BLM for old-growth stands). Since these subalternatives are substantially similar to this alternative, a redundant detailed analysis is unnecessary.

No Logging

This alternative would prohibit all timber harvesting and allow only custodial management of the federal forests.

This alternative was eliminated from detailed study because it would not meet the purpose and need, which states that the resource management plan revisions must meet all applicable laws. One of the applicable laws is the O&C Act. The O&C Act requires that the O&C lands that are classified as timberlands are to be managed for permanent forest production following the principles of sustained yield, which includes the selling, cutting, and removing of timber.

However, a reference analysis analyzed the effects of not harvesting. Since this reference analysis is substantially similar to this alternative, a redundant detailed analysis is unnecessary.

Transfer Forested BLM Lands to the USDA Forest Service

This proposal would transfer all BLM lands in the area of the Northwest Forest Plan to the U.S. Forest Service.

This alternative would not be feasible or practical to implement because the BLM does not have the authority to transfer the management of its lands. The transfer of lands from one agency of one federal department to another requires congressional action; in this case, from the BLM under the United States Department of the Interior to the U.S. Forest Service under the Department of Agriculture.

This alternative is also beyond the scope of the resource management plan revisions because it would not address any of the elements of the purpose and need that are given in *Chapter 1*.

Repeal or Change the O&C Act

This alternative would repeal the O&C Act or change it to a multiple-use act from a timber dominant-use act.

This alternative would not be feasible for the BLM to implement because only Congress can repeal or amend laws.

This alternative is also beyond the scope of the resource management plan revisions because it would not address any of the elements of the purpose and need that are given in Chapter 1.

Comparison of the Alternatives

Table 39 provides a comparison of the key features of the alternatives, focusing on features that vary among the action alternatives. *Table 40* provides a comparison of the key impacts of the alternatives. For the explicit details, refer to the management objectives and management actions that are listed for each alternative.

Table 39. Comparison of the key features of the four alternatives

Features	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Late-Successional Vegetation	- Maintains the Northwest Forest Plan's late-successional reserve (LSR) - Allows no treatment of stands that are older than 80 years	- Establishes a late-successional management area (LSMA) - Treats LSMA to promote the development of structurally complex forests	- Establishes a late-successional management area (LSMA) - Treats LSMA to promote the development of suitable habitat	Establishes a landscape target for regeneration harvesting that requires 50% or more of the acres in an assessment area (physiographic province within a sustained yield unit) be of the required age for harvesting.
Critical Habitat Units (CHUs) for the Northern Spotted Owl and the Marbled Murrelet	- CHUs for the marbled murrelet completely match with the LSR - CHUs for the northern spotted owl partially match the LSR	- CHUs for the marbled murrelet completely match with the LSMA - CHUs for the northern spotted owl partially match the LSMA	- CHUs for the marbled murrelet partially match with the LSMA - CHUs for the northern spotted owl partially match the LSMA	No special management
Northern Spotted Owl Activity Centers	Retains the owl activity centers that were known as of January 1994	Retains no owl activity centers in the timber management area (TMA)	Retains no owl activity centers in the timber management area (TMA)	- Retains 215 acre owl activity centers in the general landscape area - Manages the owl activity centers until the landscape target is reached
Marbled Murrelet Sites	Retains sites	Retains sites	Retains known sites as of 10/2005	Retains sites until the landscape target is reached
Rotation Age for Regeneration Harvesting	Approximately 80 to 100 years	Approximately 80 to 100 years	Approximately 80 to 100 years	360 years in the Western hemlock and Douglas fir zones and 240 years in the Tanoak zone
Green Tree Retention	- North of Grants Pass: 6 to 8 trees per acre - South of Grants Pass: 18 to 25 trees per acre - In connectivity diversity blocks: 12 to 18 trees per acre	None	None	6 to 9 trees per acre depending on vegetation series
Snag Retention	1.1 snags per acre	- In the LSMA: 2 to 6 snags per acre depending on vegetation series - In the TMA: Noncommercial only	- In the LSMA: 2 to 6 snags per acre depending on vegetation series - In the TMA: Noncommercial only	2 to 4 snags per acre depending on vegetation series
Down Wood	120 to 240 ft./ac.	- In the LSMA: 120 to 240 ft./ac. for stands with QMD > 14 in. 60 to 120 ft./ac. for stands with QMD ≤ 14 in. - In the TMA: Noncommercial only	- In the LSMA: 40 to 240 ft./ac. for stands with QMD > 14 in. 20 to 120 ft./ac. for stands with QMD ≤ 14 in. - In the TMA: Noncommercial only	- In the Western hemlock zone: 240 ft./ac. - In the Douglas fir/true fire and Tanoak zones: 120 ft./ac.

(ft./ac. = linear feet per acre)

Features	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Salvaging	- Allows salvaging in the LSR reserves when a disturbance is greater than 10 acres - Allows salvaging in the matrix land use allocations for economic purposes	- Allows no salvaging in the LSMA, except to reduce hazards in the wildland urban interface areas - Allows salvaging in the wildland urban interface areas to reduce hazards - Allows salvaging in the TMA for economic purposes	- Allows salvaging in the LSMA for economic purposes with retention of legacy - Allows salvaging in the wildland urban interface areas to reduce hazards - Allows salvaging in the TMA for economic purposes	Allows salvaging for economic purposes with retention of legacy
Zones for Riparian Management Areas	For all fish-bearing streams: 2 site potential tree ht. For all non-fish-bearing streams: 1 site potential tree ht.	For all but intermittent non-fish-bearing streams: 1 site potential tree ht. For intermittent non-fish-bearing streams: 1/2 site potential tree ht.	For all but intermittent non-fish-bearing streams: 0 to 25 ft. no harvest 25 to 60 ft. 80% shade retention 60 to 100 ft. 50% canopy retention For non-debris-flow prone intermittent non-fish-bearing streams: 0 to 25 ft. noncommercial vegetation + 12 tpa For debris-flow prone intermittent streams: 0 to 25 ft. no harvest 25 to 100 ft. managing for mature or structurally complex forests	For all but intermittent non-fish-bearing streams: 0 to 25 ft. no harvest 25 to 60 ft. 80% shade retention 60 to 100 ft. 50% canopy retention For all intermittent non-fish-bearing streams: 0 to 25 ft. no harvest
Timber Management of Riparian Management Areas	Manages timber to meet Aquatic Conservation Strategy objectives	Manages timber to promote the development of mature or structurally complex forests	Manages timber to promote the development of mature or structurally complex forests	Manages timber to promote the development of mature or structurally complex forests
Restoration Priority	Key watersheds	Streams with a high intrinsic potential and high-priority populations (per recovery plans)	Streams with a high intrinsic potential and high-priority populations (per recovery plans)	Streams with a high intrinsic potential and high-priority populations (per recovery plans)
Fire and Fuels	- Suppresses all wildfires - Applies treatments to reduce fuel hazards	- Suppresses all wildfires - Applies treatments to reduce fuel hazards	- Suppresses all wildfires - Applies treatments to reduce fuel hazards	- Suppresses all wildfires - Applies treatments to reduce fuel hazards - South of Grants Pass: applies prescription of partial harvest with no final regeneration harvesting
Areas of Critical Environmental Concern	94	92	93	82
Subalternatives	None	- Allows no harvesting of stands older than 80 years - Allows no harvesting of stands older than 200 years of age - Allows no regeneration harvesting until thinning opportunities are exhausted - Adds all critical habitat of the northern spotted owl to the LSMA	Changes the rotation to emulate the timber industry's practices short rotation	Applies the landscape target of 50% to only those areas where government land ownership (federal, state, and local) is half or more of the total ownership

LSMA = late-successional management area

LSR = late-successional reserve

QMD = quadratic mean diameter

TMA = timber management area

Table 40. Comparison of the key impacts of the four alternatives

Resource		No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Socioeconomics					
Change in Cumulative Jobs (from 8,948 current)		-3,770	-516	3,442	-1,275
Annual County Payment (\$ million)		42	69	108	52
(percentage of 2005 payment) (%)		37	60	94	45
BLM Annual Budget (\$ million)		180	209	246	199
(increase from 2006 Budget) (%)		17	37	60	29
Present Net Value of Timber (in 50 years) (\$ million)		108	343	962	46
Timber					
Annual Sale Quantity (ASQ) (mmbf)		268	456	727	471
Annual Non ASQ Volume (mmbf)		87	81	40	2
10 Year Revenues (\$ billion)		0.84	1.37	2.16	1.03
Special Forest Products					
Availability		Abundant relative to demand			
Invasive Plants					
Risk of Introduction or Spread		Lowest risk for introduction and spread		Highest risk for introduction	Highest risk for spread
Special Status Species					
Botany - Risk of local extirpation of conifer associates		Low	Moderate		
Botany – Risk of extinction		Low			
Wildlife - Risk of local extirpation for forest floor highly endemic		Low	Slight Increase	Slight Increase	Slight Increase
Wildlife - Risk of local extirpation for (riparian associate)		Low	Low	Slight increase	Slight increase
Wildlife – Risk of extinction		Low			
Wildlife					
MAMU Habitat Creation (Coast Range and Klamath Provinces)	100 years	Increases			
	50 years	Increase		Decrease	
NSO Suitable Habitat Creation (>50yrs)		Creates large blocks			No large blocks
Suitable Habitat Outside Blocks (<50 Yrs)		Increases	Maintains	Decreases	N/A
NSO Dispersal Habitat Quantity		Maintains high percentage			
NSO Dispersal Habitat Quality		Increases	Increases	Maintains	Increases

Resource	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Fish				
Large Wood Contribution	Increases to near maximum in long term		Slightly less, but increases to near maximum in long term	
Potential Fish Productivity (steelhead, chinook, coho)	< 3% change across alternatives			
Water				
Peak Flows	Four sixth-field watersheds susceptible (out of 1,106)			
Temperature	Maintains or improves shade		Maintains or improves shade (except Coquille)	
Fine Sediment	Increases < 1,000 tons/year (358,000 tons/year current)			
Fire and Fuels				
Hazard and Severity (All except Klamath Falls RA)	Reduces hazard and severity			
Hazard and Severity (Klamath Falls RA)	Decreases	Increases		Decreases
Resiliency (Medford District and Klamath Falls RA)	Increases resiliency	Reduces resiliency	Reduces resiliency	Increases resiliency
Air				
Quality	Air quality, Class 1 visibility areas, and air quality maintenance areas protected			
Recreation				
Demand and Experiences	Meets recreational demand and improves quality of visitor experiences			
Wilderness Characteristics				
Maintained (%)	63	60	52	53
Visual Resource Management				
Class II Maintained (%)	73	64	55	46
Class III Maintained (%)	69	57	43	39
Soils				
Residual Soil Disturbance in 2016 (acres)	8,400	10,700	10,800	15,300
Soil Productivity	Maintains			
Grazing				
Authorizations (acres)	560,000	418,500 (Reduction: Medford/Klamath Falls = inactive permits/ leases; Coos Bay = 16 acres active leases)		
Forage Production in 2106 (in AUMs)	28,950	19,673	19,867	22,805
Wild Horses				
Herd Management Level	Maintained (and forage increases)			
Areas of Critical Environmental Concern				
Relevant and Important Values Maintained	211 (all)	153	159	137
Cultural				
Number Damaged	≤ 2% of the number of sites damaged per decade			
Energy and Minerals				
Availability and Quantity	Maintains similar levels of availability and quantity of energy and mineral resources			

Tables for Areas of Critical Environmental Concern

The tables in this section provide the number and names of areas of critical environmental concern that would be designated under the alternatives. See *Map 15 (Areas of critical environmental concern within the planning area)* at the end of this chapter. For additional details about the areas of critical environmental concern, see *Appendix M. Areas of Critical Environmental Concern and Research Natural Areas*.

Table 41. Existing and potential areas of critical environmental concern (ACECs) designated by alternative

Designated	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Number of ACECs	94	92	93	82

Table 42. Areas of critical environmental concern under the alternatives

No. on Map	ACEC Name	Status	Total Area (acres)	Alternative 1	Alternative 2	Alternative 3
Salem District						
1	Beaver Creek	Potential	44	no	no	no
2	Crabtree Complex RNA/ONA	Existing	1,231	yes	yes_without_OC	yes_without_OC
3	Elk Creek	Existing	784	no	yes	no
4	Forest Peak RNA	Existing	155	yes	yes	yes
5	Grass Mountain RNA	Existing	930	yes	yes	yes
6	High Peak - Moon Creek RNA	Existing	1,490	yes	yes	yes
7	Jackson Bend	Existing	15	yes_without_OC	yes_without_OC	yes_without_OC
8	Little Grass Mountain	Existing	80			
9	Little North Fork Wilson River	Potential	1,822	yes	yes_without_OC	yes
10	Little Sink	Existing	81	yes	yes	yes
11	Lost Prairie	Existing	61	yes	yes	yes
12	Lower Scappoose Eagle	Potential	179	yes_without_OC	no	no
13	Marys Peak ONA	Existing	353	yes	yes	no
14	Marys Peak B	Potential	75	yes	yes	yes
15	McCully Mountain	Potential	101	no	no	no
16	Middle Santiam Terrace	Existing	182	yes	yes	yes
17	Mill Creek Ridge	Potential	114	yes	yes	no
18	Molalla Meadows	Potential	205	yes_without_OC	yes_without_OC	yes_without_OC
19	Nestucca River	Existing	1,163	no	yes	no
20	North Santiam	Existing	15	no	no	no

No. on Map	ACEC Name	Status	Total Area (acres)	Alternative 1	Alternative 2	Alternative 3
21	Rickreall Ridge	Existing	368	yes	yes	yes_without_OC
22	Saddleback Mountain RNA	Existing	300	yes	yes	yes
23	Sandy River Gorge ONA	Existing	9,780	yes_without_OC	yes_without_OC	yes_without_OC
24	Sheridan Peak	Existing	310			
25	Silt Creek	Potential	140	yes_without_OC	yes_without_OC	yes_without_OC
26	Snow Peak	Potential	1,667	no	no	no
27	Soosap Meadows	Existing	343	yes	no	no
28	The Butte RNA	Existing	39	yes	yes	yes
29	Valley of the Giants ONA	Existing	1,311	yes	yes	no
30	Walker Flat	Existing	11	yes_without_OC	yes_without_OC	yes_without_OC
31	Waterloo	Potential	9	yes	yes	yes
32	Wells Island	Potential	73	no	no	no
33	White Rock Fen	Existing	55	yes	no	no
34	Wilhoit Springs	Existing	133	no	no	no
35	Williams Lake	Existing	90	no	no	no
36	Yampo	Existing	13	yes	yes	yes
37	Yaquina Head ONA	Existing	91	yes	yes	yes
Eugene District						
38	Camas Swale RNA	Existing	308	yes	yes	yes
39	Coburg Hills RFI	Existing	855	no	no	no
40	Cottage Grove Lake RFI	Existing	15	no	yes	no
41	Cottage Grove Old Growth	Existing	80			
42	Cougar Mountain Yew Grove	Existing	90	no	no	no
43	Dorena Lake RFI	Existing	18	no	no	no
44	Dorena Prairie	Potential	8	yes	yes	yes
45	Esmond Lake	Potential	86	no	yes_without_OC	yes_without_OC
46	Fox Hollow RNA	Existing	159	yes	yes	yes
47	Grassy Mountain	Existing	74	yes_without_OC	yes_without_OC	yes_without_OC
48	Heceta Sand Dunes ONA	Existing	210	yes	yes	yes

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No. on Map	ACEC Name	Status	Total Area (acres)	Alternative 1	Alternative 2	Alternative 3
49	Horse Rock Ridge RNA	Existing	378	yes	yes	yes
50	Hult Marsh	Existing	177	yes_without_OC	yes_without_OC	yes_without_OC
51	Lake Creek Falls	Existing	54			
52	Lorane Ponderosa Pine	Potential	104	yes_without_OC	yes_without_OC	yes_without_OC
53	Low Elevation Headwaters of the McKenzie River	Potential	9,765	no	no	no
54	McGowan Meadow	Potential	75	yes_without_OC	yes_without_OC	yes_without_OC
55	Mohawk RNA	Existing	290	yes	yes	yes
56	Oak Basin Prairies	Potential	223	yes_without_OC	yes_without_OC	yes_without_OC
57	Taylor Creek	Potential	155	no	no	no
58	Upper Elk Meadows RNA	Existing	217	yes	yes	yes
59	Willamette Valley Prairie/Oak and Pine Area	Potential	1,486	yes_without_OC	yes_without_OC	yes_without_OC
Roseburg District						
60	Bear Gulch RNA	Existing	351	yes	yes	yes
61	Beatty Creek RNA	Existing	864	yes	yes	yes
62	Bushnell-Irwin Rocks RNA	Existing	1,085	yes	yes	yes
63	Callahan Meadows	Potential	34	yes	yes	yes
64	China Ditch	Potential	60	no	no	no
65	Myrtle Island RNA	Existing	19	yes	yes	yes
66	North Bank	Existing	6,162	yes	yes	yes
67	North Myrtle Creek RNA	Existing	453	yes	yes	yes
68	North Umpqua River	Existing	1,791			
69	Red Pond RNA	Existing	141	yes	yes	yes
70	Stouts Creek	Potential	64	no	no	no
71	Tater Hill RNA	Existing	303	yes	yes	yes
72	Umpqua River Wildlife Area	Existing	855	no	no	no
Coos Bay District						
73	Brownson Ridge	Potential	399	no	no	no
74	Cherry Creek RNA	Existing	592	yes	yes	yes
75	China Wall	Existing	302	yes	yes	yes_without_OC
76	Euphoria Ridge	Potential	241	no	no	no
77	Hunter Creek Bog	Existing	721	yes	yes	yes
78	New River	Existing	876	yes	yes	yes
79	North Fork Chetco	Existing	603	yes	yes	yes

No. on Map	ACEC Name	Status	Total Area (acres)	Alternative 1	Alternative 2	Alternative 3
80	North Fork Coquille River	Existing	311	yes	yes_without_OC	no
81	North Fork Hunter Creek	Existing	1,757	yes	yes	yes
82	North Spit	Existing	682	yes	yes	yes
83	Rocky Peak	Potential	1,827	yes	yes	yes
84	Roman Nose	Potential	205	yes	yes	yes_without_OC
85	Steel Creek	Potential	1,381	yes_without_OC	yes_without_OC	no
86	Tioga Creek	Existing	42	yes	yes	no
87	Upper Rock Creek	Existing	472	yes	no	no
88	Wassen Creek	Existing	3,394	yes	no	no
Medford District						
89	Baker Cypress	Existing	11	no	no	no
90	Bobby Creek RNA	Existing	1,915	yes	yes	yes
91	Brewer Spruce RNA	Existing	1,707	yes	yes	yes
92	Cobleigh Road	Potential	261	yes_without_OC	yes_without_OC	yes_without_OC
93	Crooks Creek	Existing	147	no	yes	no
94	Dakubetede Wildland	Potential	1,796	yes_without_OC	yes_without_OC	yes_without_OC
95	East Fork Whiskey Creek	Potential	3,188	no	yes	no
96	Eight Dollar Mountain	Existing	1,249	yes	yes	yes
97	French Flat	Existing	651	yes_without_OC	yes_without_OC	yes_without_OC
98	Grayback Glades RNA	Existing	1,022	yes	yes	yes
99	Hole-In-The-Rock	Existing	63	no	no	no
100	Holton Creek RNA	Existing	421	yes	yes	yes
101	Hoxie Creek	Existing	255	no	no	no
102	Iron Creek	Existing	286			
103	Jenny Creek	Existing	966			
104	King Mountain Rock Garden	Existing	68	yes_without_OC	yes_without_OC	yes_without_OC
105	Long Gulch	Potential	1,020	no	no	no
106	Lost Lake RNA	Existing	387	yes	yes	yes
107	Moon Prairie	Existing	92	no	no	no
108	North Fork Silver Creek RNA	Existing	499	yes	yes	yes
109	Oregon Gulch RNA	Existing	1,051	yes	yes	yes
110	Pickett Creek	Potential	32	yes	yes	yes
111	Pilot Rock	Existing	544			
112	Pipe Fork RNA	Existing	516	yes	yes	yes
113	Poverty Flat	Existing	29	yes	yes	yes

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No. on Map	ACEC Name	Status	Total Area (acres)	Alternative 1	Alternative 2	Alternative 3
114	Reeves Creek	Potential	117	no	no	no
115	Rough and Ready	Existing	1,189	yes_without_OC	yes_without_OC	yes_without_OC
116	Round Top Butte RNA	Existing	605	yes	yes	yes
117	Scotch Creek RNA	Existing	1,799	yes	yes	yes
118	Sterling Mine Ditch	Existing	143	no	no	no
119	Table Rocks ONA	Existing	1,244	yes	yes	yes
120	Tin Cup	Existing	83	no	no	no
121	Waldo-Takilma	Potential	1,760	yes	yes	yes
122	Woodcock Bog RNA	Existing	265	yes	yes	yes
Klamath Falls Resource Area of the Lakeview District						
123	Bumpheads	Potential	112	yes	yes	yes
124	Four Mile Wetland	Potential	1,173	yes	yes	yes
125	Miller Creek	Existing	939	yes	yes	yes
126	Old Baldy RNA	Existing	355	yes	yes	yes
127	Tunnel Creek	Potential	72	yes_without_OC	yes_without_OC	yes_without_OC
128	Upper Klamath River	Existing	5,092	yes_without_OC	yes_without_OC	yes_without_OC
129	Upper Klamath River Addition	Potential	910	yes_without_OC	yes_without_OC	yes_without_OC
130	Wood River Wetland	Existing	3,225	yes	yes	yes
131	Yainax Butte	Existing	707	yes	yes	yes

Note:

- yes_without_OC means that an area would be designated without including the O&C timber harvest base acres.
- The grayed ACECs are those that were not analyzed further for designation under the action alternatives because they did not meet the relevance and importance criteria or did not need special management attention. The management direction for these areas would be the management direction in the current resource management plans, and would only be applied under the No Action Alternative.

Tables for District-Specific Recreation Management Actions

The tables in this section correspond with individual recreation management actions that were presented earlier in this chapter and are organized in this section as follows:

- Recreation
  - Special recreation management areas
  - Extensive recreation management areas
  - Recreation sites
  - Recreation trails
  - Potential recreation sites
  - Potential recreation trails
  - Backcountry byways
  - Potential backcountry byways
  - Environmental education areas
  - Recreation and public purpose leases
  - Off-highway vehicle area designations
  - Areas closed to off-highway vehicle use
  - Off-highway vehicle emphasis areas
  - Potential off-highway vehicle emphasis areas
  - Oregon State scenic waterways
- National Landscape Conservation System designated lands
  - Wild and scenic rivers
  - Wilderness areas
  - Wilderness study areas and wilderness instant study areas
  - Miscellaneous National Landscape Conservation System designated lands

The information in these tables is presented in the order of Salem, Eugene, Roseburg, Coos Bay, Medford (the five western Oregon BLM districts), and Klamath Falls (one of the resource areas of the Lakeview District). See *Maps 10, 11, and 19 through 26* at the end of this chapter for the location of district-specific recreation areas, sites, and trails.

Note: Some of the names in some of the tables have numbers to their left. These numbers correspond to numbers that are on specified maps that locate the named designations. Only those designations that are common to all of the action alternatives are included on the maps.

Recreation

Special Recreation Management Areas

For the planning frameworks of those special recreation management areas that would be carried forward under all of the action alternatives, see *Appendix J. Recreation*.

Table 43. District-specific special recreation management areas

Special Recreation Management Areas		No Action Alternative (acres)	All Action Alternatives (acres)
Salem District			
1	Alsea Falls	N/A	13,270
2	Fishermen's Bend	177	178
3	Little North Santiam River	3,282	3,282
	Marys Peak (potential)	N/A	--
	Mill Creek (potential)	N/A	--
4	Molalla River/Table Rock	11,875	11,875
	Mt. Hood Corridor	2,681	--
5	Nestucca River	1,074	1,074
	North Fork Siletz (potential)	N/A	--
	Sandy River	756	--
6	Sandy River/Mt. Hood Corridor	N/A	11,568
7	Yaquina Head	100	100
8	Yellowstone	38,257	38,261
Subtotals		57,445	79,608
Eugene District			
	Gilkey Creek (potential)	N/A	--
9	Lower Lake Creek	1,873	1,873
10	McKenzie River	1,525	1,226
11	Row River Trail	15,115	171
12	Shotgun Creek	278	413
	Siuslaw River (potential)	N/A	--
13	Upper Lake Creek	12,675	12,676
Subtotals		31,446	16,359
Roseburg District			
14	Cow Creek	1,809	1,809
15	North Umpqua	1,903	8,512
16	Umpqua	2,240	457
Subtotals		5,952	10,778

Special Recreation Management Areas		No Action Alternative (acres)	All Action Alternatives (acres)
Coos Bay District			
17	Coos Bay Shorelands	1,754	1,754
18	Dean Creek Elk Viewing Area	1,136	1,136
	Gregory Point (potential)	N/A	--
19	Loon Lake	126	126
20	New River	1,133	1,133
21	Sixes River	161	161
22	Tioga	N/A	34,013
Subtotals		4,310	38,324
Medford District			
	Galesville Lake (potential)	N/A	--
23	Hyatt Lake/Howard Prairie Lake	17,765	17,765
	Lost Creek Lake (potential)	N/A	--
24	Pacific Crest National Scenic Trail	7,088	7,088
25	Rogue National Wild and Scenic River	11,510	11,510
Subtotals		36,362	36,362
Klamath Falls Resource Area			
26	Gerber	N/A	104,421
27	Hamaker Mountain	1,286	1,286
28	Pacific Crest National Scenic Trail	500	500
29	Stukel Mountain	11,853	11,853
30	Upper Klamath River	5,766	6,144
31	Wood River Wetland	N/A	3,122
Subtotals		22,526	127,326
Totals		158,041	308,757

Notes:

- N/A denotes that acres or miles for a designated or potential site, trail, area, or byway were not identified under the No Action Alternative.
- Two dashes (--) denote that a designated or potential site, trail, area, or byway either was not identified under the No Action Alternative or would not be carried forward under the action alternatives.

Extensive Recreation Management Areas

Table 44. District-specific extensive recreation management areas

Extensive Recreation Management Areas	No Action Alternative (acres)	All Action Alternatives (acres)
Salem District		
Cascades	113,640	105,509
Marys Peak	115,543	115,126
Tillamook	102,987	102,988
Subtotals	332,170	323,623
Eugene District		
Siuslaw	147,969	147,969
Upper Willamette	137,305	150,888
Subtotals	285,274	298,857
Roseburg District		
South River	201,120	201,119
Swiftwater	221,027	214,419
Subtotals	422,147	415,538
Coos Bay District		
Myrtlewood	122,103	110,763
Umpqua	195,764	173,089
Subtotals	317,867	283,852
Medford District		
Ashland	213,977	213,977
Butte Falls	203,761	203,761
Glendale	186,499	186,499
Grants Pass	227,627	227,627
Subtotals	831,864	831,864
Klamath Falls Resource Area		
Klamath Falls	208,138	97,571
Subtotals	208,138	97,571
Totals	2,397,460	2,251,305

Recreation Sites

Table 45. District-specific recreation sites

Recreation Sites		No Action Alternative (acres)	All Action Alternatives (acres)
Salem District			
1	Alder Glen Campground and Day-Use Area	3	3
2	Alsea Falls Campground and Day-Use Area	25	25
3	Canyon Creek Day-Use Area	4	4
4	Dogwood Day-Use Area	11	11
5	Dovre Campground and Day-Use Area	3	3
6	Elk Bend Campground and Day-Use Area	3	3
7	Elk Flat OHV Staging Area	1	1
8	Elkhorn Valley Campground and Day-Use Area	78	78
9	Fan Creek Campground and Day-Use Area	1	1
10	Fishermen's Bend Campground and Day-Use Area	177	177
11	Grassy Flat OHV Staging Area	1	1
12	Hardy Creek Trail Head	3	3
13	Mill Creek Day-Use Area	5	5
14	Missouri Bend Day-Use Area	2	2
15	Old Miner's Meadow Group Use Area	2	2
16	Sheridan Peak Day-Use Area	1	1
17	Whipup OHV Staging Area	1	1
18	Wildwood Day-Use Area	556	556
19	Yaquina Head Day-Use Area	90	90
20	Yellowbottom Campground and Day-Use Area	13	13
Subtotals		980	980
Eugene District			
21	Clay Creek Campground	48	48
22	Culp Creek Trailhead	1	1
23	Lake Creek Falls Day Use Area	2	2
24	Lake Creek Falls Trailhead	1	1
25	Marten Rapids Day-Use Area	18	18
26	Mosby Creek Trailhead	6	6
27	Rennie Landing	1	1
28	Sharps Creek Campground	27	27
29	Shotgun Creek Day-Use Area	278	278
30	Silver Creek Landing Day Use Area	2	2
31	Taylor Landing Day-Use Area	4	4
32	Whitewater Day-Use Area	10	10
33	Whittaker Creek Campground	16	16
Subtotals		414	414

Recreation Sites		No Action Alternative (acres)	All Action Alternatives (acres)
Roseburg District			
34	Cavitt Creek Falls	16	16
35	Cow Creek BCBW Kiosk	1	1
36	Cow Creek Recreational Gold Panning Area	19	19
37	Cow Creek Salmonid WWS	1	1
38	Eagleview Group Campground	11	11
	E-Mile Recreation Site	15	--
39	Hill Creek Wayside	1	1
40	Island Creek Day-Use Area	40	40
41	Lone Pine Group Campground	23	23
42	Lone Rock Drift Boat Launch	1	1
43	Millpond	33	33
44	Miner-Wolf Watchable Wildlife Site	5	5
45	North Bank Ranch, Jackson Creek Day-Use Area	2	2
46	North Bank Ranch, West Entrance	1	1
47	Osprey Boat Ramp	4	4
48	Rock Creek	21	21
49	Scaredman	13	13
50	Susan Creek Campground	27	27
51	Susan Creek Day-Use Area	19	19
52	Swiftwater Day-Use Area	5	5
53	Swiftwater Trailhead	8	8
54	Tyee	13	13
55	Wolf Creek Falls Trailhead	3	3
Subtotals		282	267
Coos Bay District			
56	Bear Creek Campground	80	80
	Big Tree Recreation Site	18	--
57	Burnt Mountain Campground	38	38
58	Cape Blanco Lighthouse (under permit from the US Coast Guard)	35	35
59	Dean Creek Elk Viewing Area	1,136	1,136
60	East Shore Campground	52	52
61	Edson Creek Campground	46	46
62	Fawn Creek Campground	5	5
63	Loon Lake Campground	76	76
64	North Spit Boat Ramp	24	24
	Palmer Butte	40	--
65	Park Creek Campground	58	58
66	Sixes River Campground	162	162
67	Smith River Falls Campground	47	47
68	Storm Ranch Day-Use Area	240	240
69	Vincent Creek Campground	4	4
Subtotals		2,061	2,003

Recreation Sites		No Action Alternative (acres)	All Action Alternatives (acres)
Medford District			
70	Burma Pond Campground	15	15
71	Eight Dollar Mountain Wayside and Campground	20	20
72	Elderberry Flat Campground and Day-Use Area	80	80
73	Gold Nugget	53	53
74	Hyatt Lake Campground and Day-Use Area (partially within the Cascade Siskiyou National Monument)	745	745
75	Kenney Meadows	40	40
76	Little Hyatt Lake Day-Use Area	2	2
77	Mt. Bolivar Trailhead	2	2
78	Skull Creek Campground and Day-Use Area	5	5
79	Table Mountain Winter Play Area	10	10
80	Tucker Flat Campground and Day-Use Area	20	20
81	Woodrat Mountain Day-Use Area	20	20
Subtotals		1,012	1,012
Klamath Falls Resource Area			
82	Antelope Reservoir Day Use	2	2
83	Barnes Valley Boat Ramp	6	6
84	Basin Camp	11	11
85	Frain Ranch Campsites	310	310
86	Gerber Potholes Campsite	112	112
87	Gerber Recreation Site	496	496
88	Kilgore Reservoir Day Use	2	2
89	Klamath River Campground	33	33
90	Klamath River Spring Island Boat Launch Site	6	6
91	Lower Klamath Hills Day-Use Area	2	2
92	Miller Creek Campsite	9	9
93	Miller Creek Day Use	2	2
94	Pitchlog Creek Campsite	10	10
95	Rock Creek Campsite	1	1
96	Round Valley Day Use	2	2
97	Stan H. Spring Campsite	19	19
98	Stateline Boat Takeout	13	13
99	Surveyor Recreation Site	9	9
100	Topsy Campground	14	14
101	Twenty-One Reservoir Day Use	2	2
102	Upper Midway Campsite	12	12
103	Wildhorse Campsite	7	7
104	Willow Valley Reservoir Boat Ramp	27	27
105	Wood River Wetland Day-Use Area	3,200	3,200
Subtotals		4,307	4,307
Totals		9,056	8,983

Note: Two dashes (--) denote that a designated or potential site, trail, area, or byway either was not identified under the No Action Alternative or would not be carried forward under the action alternatives.

Recreation Trails

Table 46. District-specific recreation trails

Recreation Trails		No Action Alternative (miles)	All Action Alternatives (miles)
Salem District			
1	Alsea Falls Trail	4.0	4.0
2	Baty Butte/Silver King Trail	3.4	3.4
3	Boulder Ridge Trail	0.2	0.2
4	Eagle Creek Trail	0.5	0.5
5	McIntyre Ridge Trail	0.7	0.7
6	Molalla River Trails	24.6	24.6
7	Nasty Rock Trail	0.9	0.9
8	Table Rock Wilderness Trails	20.4	20.4
9	Upper Nestucca OHV Trail System	25.0	25.0
10	Valley-of-the-Giants Trail	0.8	0.8
Subtotals		80.5	80.5
Eugene District			
11	Clay Creek Trail	0.6	0.6
12	Eagles' Rest Trail	0.2	0.2
13	Lake Creek Falls Trail	0.2	0.2
14	Row River Trail	13.5	13.5
15	Shotgun Creek Trails	6.2	6.2
16	Shotgun (OHV) Trails	23.2	23.2
17	Tyrrell Forest Succession Trail	1.0	1.0
18	Whittaker Creek Old Growth National Recreation Trail	1.0	1.0
Subtotals		45.9	45.9
Roseburg District			
19	China Ditch Trail	0.4	0.4
20	Miner-Wolf Creek WW Trail	0.2	0.2
21	North Umpqua Trail	12.3	12.3
22	Sawmill Trail	1.2	1.2
23	Susan Creek Complex Trails	0.8	0.8
24	Susan Creek Day-Use Trail	0.8	0.8
25	Susan Creek Falls Trail	0.8	0.8
26	Susan Creek Indian Mounts Trail	0.3	0.3
27	Wolf Creek Falls Trail	1.2	1.2
Subtotals		18.0	18.0

Table continues on the next page.

Recreation Trails		No Action Alternative (miles)	All Action Alternatives (miles)
Coos Bay District			
28	Blue Ridge	10	10
29	Doerner Fir	0.5	0.5
30	Euphoria Ridge	4	4
31	Floras Lake	1	1
32	Fourmile Creek	0.3	0.3
33	Loon Lake Waterfall	0.5	0.5
34	Lost Lake	1	1
35	New River/Storm Ranch	2	2
36	New River Water Trail	5	5
37	North Fork Hunter Creek	2	2
38	North Spit	9	9
Subtotals		35.3	35.3
Medford District			
39	Armstrong Gulch	1	1
40	Buck Prairie Cross Country Ski/Snowmobile Trails	17	17
41	Grayback Mountain	6.5	6.5
42	Grizzly Peak	5	5
43	Hidden Creek	1	1
44	Jacksonville Historic Landmark	5	5
45	Kelsey Pack	3	3
46	Kerby Peak	8	8
47	Listening Tree	1	1
48	London Peak Accessible	1	1
49	Lower London Peak Trail	2	2
50	Lower Table Rock	2	2
51	Mt. Bolivar	1.5	1.5
52	Mule Creek	3	3
53	Pacific Crest National Scenic Trail	40	40
54	Sterling Mine Ditch	10	10
55	Tunnel Ridge	41	41
56	Upper Table Rock	2	2
57	Wolf Gap	4	4
Subtotals		154	154

Table continues on the next page.

Recreation Trails		No Action Alternative (miles)	All Action Alternatives (miles)
Klamath Falls Resource Area			
58	Gerber-Miller Creek-Potholes Trail	13	13
59	Keno Spencer Snowmobile Trail	6	6
60	Pacific Crest National Scenic Trail	1	1
61	Pederson Snowmobile Trail	7	7
62	Rock Slide Loop Snowmobile Trail	5	5
63	Surveyor Peak Snowmobile Trail	3	3
64	Wood River Wetland Trail	1	1
Subtotals		35	35
Totals		368.7	368.7

Potential Recreation Sites

Table 47. District-specific potential recreation sites

Potential Recreation Sites		No Action Alternative (acres)	All Action Alternatives (acres)
Salem District			
1	Alder Glen Expansion	--	1
2	Alsea Falls Expansion	--	96
3	Barlow	--	115
	Bear Creek	N/A	--
	Dick's Ridge	N/A	--
4	Marmot	--	155
5	Molalla River	--	86
	Parker Creek	N/A	--
	Quartzville Creek	N/A	--
	Valley of the Giants Trailhead	N/A	--
Subtotals		N/A	453
Eugene District			
6	Deer Creek	--	10
	Doe Creek	N/A	--
	Edwards Creek	N/A	--
	Esmond Lake	N/A	--
	Fall Creek	N/A	--
	Fall Creek Reservoir	N/A	--
	Frying Pan	N/A	--
	Haight Creek	N/A	--
7	Heceta Sand Dunes Day-Use Area	N/A	1
	Homestead	N/A	--
8	Hult Pond Campground	N/A	11
9	Hult Pond Day-Use Area	N/A	2
10	Lower Lake Creek Day-Use Area	N/A	3
	North Fork Gate Creek	N/A	--
11	Old Rennie Homestead	--	12
	Overland Trailhead	N/A	--
	Oxbow	N/A	--
	Red Bridge Trailhead	N/A	--
	Saleratus	N/A	--
	Sidog	N/A	--
	Siuslaw Bend	N/A	--
	Wolf Creek Falls	N/A	--
Subtotals		N/A	39

Table continues on the next page.

Potential Recreation Sites		No Action Alternative (acres)	All Action Alternatives (acres)
Roseburg District			
	Brickyard Pond	N/A	--
	Chimney Rock Pond	N/A	--
12	Chimney Rock Viewpoint Wayside	--	2
13	Doc's Landing Day-Use Area and Boat Ramp	--	11
	Hardscrabble	N/A	--
14	Hubbard Creek OHV Staging Area	--	10
15	Iron Mountain Gold Panning Site	--	40
	Lavadoure Boat Ramp	N/A	--
	Michigan Springs	N/A	--
16	North Umpqua Trail Primitive Campsite	--	4
	Olalla-Thompson Creek	N/A	--
17	Pickett Bridge	--	10
	Red Top Pond	N/A	--
18	South River OHV Trailhead	--	5
19	Susan Creek Group Campground	--	10
20	Swiftwater OHV Trailhead	--	5
21	Tioga Bridge / Wayside / Trailhead	--	25
22	Upper Susan Creek Falls Trailhead	--	6
	Weaver Road Pond	N/A	--
Subtotals		N/A	128
Coos Bay District			
23	Big Bend	N/A	200
	East Fairview Boat Ramp	N/A	--
24	Fawn Creek Boat Ramp	N/A	11
25	McKinley Camp	N/A	10
	Smith River Falls Boat Ramp	N/A	--
26	Smith River Log Dump	N/A	5
	South Sisters Rock	N/A	--
27	Spruce Reach Island Day Use Area	--	15
28	Tioga Basin	N/A	30
	Umpqua Lighthouse	N/A	--
	Vincent Creek Boat Ramp	N/A	--
Subtotals		N/A	271

Table continues on the next page.

Potential Recreation Sites		No Action Alternative (acres)	All Action Alternatives (acres)
Medford District			
29	Cold Springs	N/A	10
30	Galesville Reservoir	N/A	40
31	Illinois River Extension	N/A	40
32	Little Applegate Day-Use Area	--	20
33	North Fork Big Butte Creek	N/A	20
34	Riffle Creek	N/A	5
35	Sensinig Falls	N/A	40
36	Shady Branch	N/A	40
37	Skookum Creek Wayside	N/A	5
Subtotals		N/A	220
Klamath Falls Resource Area			
38	Alkali Springs Day Use	--	2
39	Bryant Mountain Horse Camp	2	2
40	Captain Jack Lake Camp	3	2
41	Clover Creek Day Use	30	2
42	Dog Hollow Reservoir Day Use	2	2
	Greensprings Highway Day Use	20	--
43	Hamaker Mountain Snow Park Day Use	30	2
44	Harpold Reservoir Camp	2	2
45	Hogback Mountain Day Use	10	1
46	Horton Rim Trailhead	--	2
47	Klamath River Bypass Reach Fishing Access # 5 and # 6 Day Use	--	4
48	Klamath River Powerhouse Shed Fishing Site Day Use	--	2
49	Malone Dam Day Use	--	2
50	Old Foundations Area Day Use	5	4
51	Smith Reservoir Camp	3	2
52	South Gerber Boat Ramp Day Use	--	1
53	Spencer Creek Day Use	20	1
54	Stukel Mountain Aspen Grove Camp	10	2
55	Stukel Mountain Glider Launch Day Use	5	2
56	Stukel Mountain Target Practice Day Use	20	2
57	Swan Lake Rim Trail Access	5	2
58	Van Meter Reservoir Camp	10	2
Subtotals		177	43
Totals		N/A	1,154

Notes:

- N/A denotes that acres or miles for a designated or potential site, trail, area, or byway were not identified under the No Action Alternative.
- Two dashes (--) denote that a designated or potential site, trail, area, or byway either was not identified under the No Action Alternative or would not be carried forward under the action alternatives.

Potential Recreation Trails

Table 48. District-specific potential recreation trails

Potential Recreation Trails		No Action Alternative (miles)	All Action Alternatives (miles)
Salem District			
1	Baty Butte/Silver King Trail Expansion	--	8.2
2	Corvallis-to-Sea Trail	--	1.6
3	Crabtree Mountain	--	12.8
4	CZ Mainline Linear Trail	--	1.0
5	Dovre Trail	--	0.1
	Elkhorn Creek Trails	N/A	--
6	Equestrian Trail	--	5.3
	Harry Mountain Trail	N/A	--
7	Jane Creek Trail	--	2.8
	Marys Peak Trail	N/A	--
8	Molalla Trails Expansion	--	2.5
9	Nestucca River Trail	--	7.8
	North Fork Alsea River Trail	N/A	--
10	Robb Mill Trail	--	3.1
11	Wilhoit Springs Trails	--	2.6
Subtotals		N/A	47.8
Eugene District			
12	Blue Mountain	N/A	0.8
13	Blue Mountain Trail	--	0.8
14	Hult Pond Equestrian Trails	N/A	7.2
15	Shotgun OHV Additions	N/A	3.1
	Siuslaw River Trail	N/A	--
16	South Bank McKenzie	N/A	5.1
17	Whittaker Creek Falls	N/A	1.5
Subtotals		N/A	18.5

Table continues on the next page.

Potential Recreation Trails		No Action Alternative (miles)	All Action Alternatives (miles)
Roseburg District			
	Alexander Butte Trail	N/A	--
	Ben Irving Reservoir Trail	N/A	--
	Bushnell-Irwin Rocks Trail	N/A	--
	Cougar Creek Trail	N/A	--
	Cow Creek Bluffs Trail	N/A	--
	Deadman Mountain Trail	N/A	--
18	Eagleview to Tyee Trail	--	1
19	Millpond to Rock Creek Trail	--	2
	Red Top Pond Trail	N/A	--
	Salt Creek Trail	N/A	--
	Tyee Mountain Trail	N/A	--
20	Upper Susan Creek Falls Trail	--	1
	Wolf Creek Falls Tr. Extension	N/A	--
Subtotals		N/A	4
Coos Bay District			
21	Bear Creek Extension	--	3
22	Brummit Creek Trail System	--	10
23	Coos Head	N/A	3
24	Coos Head Trail System	--	3
25	Doerner Fir Extension	--	1
26	Hunter Creek Bog	N/A	1
27	McKinley Camp	N/A	1
28	Rocky Peak Trail	--	6
29	Roman Nose/Kentucky Creek	N/A	6
30	Upper Rock Creek	N/A	2
31	Wassen Creek	N/A	5
Subtotals		N/A	41

Table continues on the next page.

Potential Recreation Trails		No Action Alternative (miles)	All Action Alternatives (miles)
Medford District			
32	Bald Ridge	N/A	2.5
33	Buck Rock-Berry Rock Loop	N/A	10
34	Galesville	N/A	8
35	Green top Loop	N/A	10
36	Kelsey Pack Trail Extension	N/A	2.5
37	King Mountain	N/A	1
38	Lake Selmac Loop	N/A	11
39	London Peak-Grave Creek	N/A	3
40	Medco Railroad (Eagle Point-Butte Falls)	N/A	50
41	Round Top Mountain	N/A	5
42	Upper Mule Creek	N/A	2
Subtotals		N/A	105
Klamath Falls Resource Area			
43	Applegate National Historic Trail	2	0.7
	Barnes Valley Creek	3	--
44	Bryant Mountain	16	10.4
45	Chase Mountain	13	6.1
	Clover Creek	0.5	--
46	Gerber-O.C.E. Trail	--	1.7
	Gerber Point	2.5	--
47	Gerber Potholes	4.5	5.4
48	Gerber Reservoir Loop Trail	--	18.2
49	Hamaker Mountain	5	5.1
50	Hogback Mountain Loop Trail	--	8.0
51	Horton Rim Trail	--	16.5
52	J.C. Boyle Reservoir-Keno Trail	--	0.2
	Klamath River Edge Trail	2.5	--
53	Lower Klamath Hills Trail	--	5.0
54	Old Baldy Trail	3.5	2.3
55	Spencer Creek	2	3.4
56	Stukel Mountain	--	6.1
57	Stukel Mountain OHV Trail	9	12.9
58	Surveyor Mountain/Johnson Creek	3	1.4
59	Swan Lake Rim	14	18.2
60	Upper Klamath River Trail (north side)	8.5	1.0
61	Upper Klamath River Trail (south side)	10	14.8
Subtotals		99	137.4
Totals		N/A	353.7

Notes:

- N/A denotes that acres or miles for a designated or potential site, trail, area, or byway were not identified under the No Action Alternative.
- Two dashes (--) denote that a designated or potential site, trail, area, or byway either was not identified under the No Action Alternative or would not be carried forward under the action alternatives.

Backcountry Byways

Table 49. District-specific backcountry byways

Backcountry Byways		No Action Alternative (miles)	All Action Alternatives (miles)
Salem District			
1	Nestucca River	29	29
2	Quartzville	12.5	12.5
3	South Fork Alsea River	11	11
Subtotals		52.5	52.5
Eugene District			
No backcountry byways			
Roseburg District			
4	Cow Creek	20	20
5	North Umpqua National Scenic Byway	8.4	8.4
Subtotals		28.4	28.4
Coos Bay District			
No backcountry byways			
Medford District			
6	Galice-Hellgate	15	15
7	Grave Creek-Marial	33	33
Subtotals		48	48
Klamath Falls Resource Area			
No backcountry byways			
Totals		128.9	128.9

Potential Backcountry Byways

Table 50. District-specific potential backcountry byways

Potential Backcountry Byways		No Action Alternative (miles)	All Action Alternatives (miles)
Salem District			
No potential backcountry byways			
Eugene District			
	Alsea	N/A	--
	Blue Mountain	N/A	--
8	Calapooya Divide	28.0	28.0
9	Coburg Hills	43.4	43.4
10	Lost Creek	19.7	19.7
11	Mill Pond	10.7	10.7
	Oxbow	N/A	--
12	Siuslaw River	25.3	25.3
	Whittaker Creek Area	N/A	--
Subtotals		127.1	127.1
Roseburg District			
	Coos Bay Wagon Road	N/A	--
	Loon Lake	N/A	--
	Smith River	N/A	--
Subtotals		N/A	0
Coos Bay District			
	Coos Bay Wagon Road	N/A	--
	Mill Creek/Loon Lake/Tyee	N/A	--
	Myrtlepoint to Sitkum Road	N/A	--
	Smith River Road	N/A	--
	South Sisters-Oxbow Access Road	N/A	--
Subtotals		N/A	0
Medford District			
13	Cow Creek-West Fork Evans Creek Road	N/A	40
14	Hyatt Lake-Howard Prairie Lake	N/A	10
15	Lower Cow Creek Road	N/A	18
16	McKee Bridge-Anderson Butte	N/A	16
17	Shale City	N/A	10
18	West Fork Cow Creek-Eden Valley	N/A	23
19	Williams-Selma	N/A	20
Subtotals		N/A	137

Table continues on the next page.

Potential Backcountry Byways	No Action Alternative (miles)	All Action Alternatives (miles)
Klamath Falls Resource Area		
* Gerber Area Watchable Wildlife Tour/Modoc Trail	30	28.8
* Topsy Road	15	5.9
Subtotals	45	34.7
Totals	172.1	298.8

- Notes:
- N/A denotes that acres or miles for a designated or potential site, trail, area, or byway were not identified under the No Action Alternative.
  - Two dashes (–) denote that a designated or potential site, trail, area, or byway either was not identified under the No Action Alternative or would not be carried forward under the action alternatives.
  - Asterisk (*) denotes that these potential backcountry byways are not included on the map due to missing GIS spatial data.

Environmental Education Areas

Table 51. District-specific environmental education areas

Environmental Education Areas	No Action Alternative (acres)	All Action Alternatives (acres)
Salem District		
Aquila Vista	178	178
Larch Mountain	183	183
Subtotals	361	361
Eugene District		
Cottage Grove Old Growth	437	437
McGowan Creek	79	79
Subtotals	516	516
Roseburg District		
No environmental education areas		
Coos Bay District		
Dean Creek Elk Viewing Area	--	1,136
New River ACEC	--	1,356
Powers	70	70
Subtotals	70	2,562
Medford District		
Eight Dollar Mountain	20	20
Upper and Lower Table Rocks	80	80
Subtotals	100	100
Klamath Falls Resource Area		
Clover Creek	6	6
Surveyor Forest	192	192
Subtotals	198	198
Totals	1,245	3,737

Note: Two dashes (--) denote that a designated or potential site, trail, area, or byway either was not identified under the No Action Alternative or would not be carried forward under the action alternatives.

Recreation and Public Purpose Leases

Table 52. District-specific recreation and public purpose leases

R&PP Leases	No Action Alternative (acres)	All Action Alternatives (acres)
Salem District		
JJ Collins Memorial Park (Columbia County)	2	2
Little North Fork (Marion County)	11	11
Oxbow (Multnomah County)	279	279
Scaponia (Columbia County)	5	5
Silver Falls State Park (State of Oregon)	230	230
Wells Island (Polk County)	73	73
Subtotals	600	600
Eugene District		
McKercher Park (Linn County)	2	2
Willamette River Greenway (Oregon State Parks)	3	3
Subtotals	5	5
Roseburg District		
E-Mile County Park (Douglas County)	NA	15
Richard Baker County Park (Douglas County)	7.5	7.5
Subtotals	7.5	22.5
Coos Bay* District		
Frona Park (Coos County)	80	80
Judge Hamilton Park (Coos County)	88	88
Laverne County Park (Coos County)	120	120
Middle Creek Park (Coos County)	78	78
Rock Prairie Park (Coos County)	160	160
Subtotals	526	526
*Recreational leases with Coos County were established prior to the R&PP Act as congressional withdrawals to Coos County for recreational purposes and are termed congressionally designated recreation withdrawals.		
Medford District		
Cantrall-Buckley Park (Jackson County)	12.1	12.1
Cathedral Hills (Josephine County)	400	400
Gold Ray Dam (Jackson County)	4.2	4.2
Illinois River Park (Oregon Department of Transportation)	80	80
Pinehurst School (Jackson County School District 94)	11.2	11.2
Subtotals	507.5	507.5
Klamath Falls Resource Area		
No R&PP leases		
Totals	1,646	1,661

Note: N/A denotes that acres or miles for a designated or potential site, trail, area, or byway were not identified under the No Action Alternative.

Off-Highway Vehicle Area Designations

Table 53. District-specific off-highway vehicle area designations

Off-Highway Vehicle Area Designations	No Action Alternative (acres)	All Action Alternatives (acres)
Salem District		
Open	160,614	0
Limited to existing roads and trails	48,771	0
Limited to existing roads and designated trails	87,144	0
Limited to designated roads and trails	16,192	291,969
Limited to designated roads	69,508	85,165
Closed	17,197	26,208
Eugene District		
Open (portion of Heceta Dunes)	0	77
Limited to existing roads and trails	320,883	0
Limited to designated roads and trails	0	308,595
Closed	3,547	5,187
Roseburg District		
Open	0	0
Limited to existing roads and trails	416,560	0
Limited to designated roads and trails	6,731	415,658
Closed	3,283	10,643
Coos Bay District		
Open	0	0
Limited to designated roads and trails	318,676	318,674
Closed	3,489	3,489
Medford District		
Open	139,878	0
Limited to existing roads and trails	26,514	0
Limited to designated roads and trails	661,357	825,188
Closed	46,371	42,298
Klamath Falls Resource Area		
Open	29,902	0
Limited to existing roads and trails	137,154	0
Limited to designated roads and trails	47,222	213,747
Closed	10,702	10,970
All Western Oregon BLM Lands		
Open	330,394	77
Limited to existing roads and trails	949,882	0
Limited to existing roads and designated trails	87,144	0
Limited to designated roads and trails	1,050,178	2,373,831
Limited to designated roads	69,508	85,165
Closed	84,589	98,795

Areas Closed to Off-Highway Vehicle Use

Table 54. District-specific areas closed to off-highway vehicle use

Closed (areas closed to off-highway vehicle use)	No Action Alternative (acres)	All Action Alternatives (acres)
Salem District		
Alsea Falls East Elk Emphasis Areas	0	520
Bummer Ridge Elk Emphasis Areas	0	3,566
Carolyn's Crown ACEC/RNA	229	229
Elk Creek ACEC	1,936	0
Forest Peak ACEC	142	142
Grass Mountain ACEC	698	705
Hunter/Church Creek Area	0	2,267
Larch Mountain EEA	183	0
Little Grass Mountain ACEC	44	44
Little Sink ACEC	80	80
Lost Prairie ACEC	61	0
Middle Santiam ACEC/ONA	94	96
Miscellaneous Recreation Sites (Alter Glen, Dove Creek, and Fan Creek)	7	0
Molalla River Non-Motorized Trail System	3,132	2,692
Moon Creek ACEC	1,582	1,493
Mt. Hood Corridor and Bull Run Watershed Management Unit	0	2,660
North Santiam ACEC	45	15
Pacific City	75	75
Progeny Test Sites	211	793
Raymond Creek Bald Eagle Roost Area	278	0
Rickreall Ridge ACEC	178	179
Saddleback Mountain ACEC	0	153
Sandy River Gorge ACEC/RNA	392	392
Skunk Creek Elk Emphasis Areas	660	690
Soosap Meadows ACEC	343	343
Table Rock Wilderness	6,351	6,613
The Butte ACEC	40	40
Valley of the Giants ACEC	153	55
Valsetz-Luckiamute CTMA Elk Emphasis Areas	0	1,981
White Rock Fen	51	51
Wilhoit Springs ACEC	132	132
Willamette River Parcels	0	89
Williams Lake ACEC	100	100
Yampo ACEC	0	13
Subtotals	17,197	26,208

Table continues on the next page.

Closed (areas closed to off-highway vehicle use)	No Action Alternative (acres)	All Action Alternatives (acres)
Eugene District		
Camas Swale ACEC/RNA	313	0
Cannery Dune	36	40
Coburg Hills Relic Forest Island ACEC	803	857
Collard Dune	40	36
Cottage Grove Lake ACEC	54	16
Cottage Grove Old Growth EEA (portion)	76	0
Cougar Mountain Yew Grove ACEC	90	90
Dorena Lake ACEC	19	19
Dorena Prairie ACEC	8	8
Esmond Lake ACEC	0	86
Fox Hollow RNA	161	161
Grassy Mountain ACEC	74	74
Heceta Sand Dunes ACEC (portion)	210	133
Horse Rock Ridge RNA	378	378
Hult Marsh ACEC	167	177
Lorane Ponderosa Pine ACEC	105	105
McGowan Creek EEA	79	79
McGowan Meadow ACEC	0	75
Mohawk RNA	290	290
Oak Basin ACEC	0	226
Row River Trail	143	0
Shotgun Creek SRMA	278	414
Taylor Creek ACEC	0	157
Upper Elk Meadows RNA	223	223
Willamette Valley Prairie, Oak, and Pine Proposed ACEC	0	1,543
Subtotals	3,547	5,187
Roseburg District		
Bear Gulch ACEC	347	347
Beatty Creek ACEC	172	865
Bushnell-Irwin Rocks ACEC	1,086	1,086
Myrtle Island ACEC	27	27
North Bank Habitat Management Area	0	6,608
North Myrtle Creek ACEC	453	453
Miscellaneous Recreation Trails (North Umpqua, Rock Creek, Susan Creek, and Wolf Creek Falls)	19	19
Progeny Test Sites	729	0
Red Ponds ACEC	146	146
Tater Hill ACEC	303	303
Umpqua River Wildlife Area (Brad's Creek, Cougar Creek, Golden Bar, Lost Creek, Marin Creek, Woodruff Mountain)	0	789
Subtotals	3,282	10,643

Table continues on the next page.

Closed (areas closed to off-highway vehicle use)	No Action Alternative (acres)	All Action Alternatives (acres)
Coos Bay District		
Cherry Creek RNA & ISA	564	564
China Wall ACEC	204	204
Dean Creek Elk Viewing Area (portion)	1,084	1,084
New River ACEC (portion)	897	897
North Spit Snowy Plover Habitat Restoration Areas	68	68
Powers Environmental Education Area	69	69
Progeny Test Sites & Seed Orchards	565	565
Tioga Creek ACEC (portion)	38	38
Subtotals	3,489	3,489
Medford District		
Bobby Creek RNA	1,915	1,915
Brewer Spruce Wilderness Instant Study Area	1,705	1,705
Eight Dollar Mountain EEA	43	43
Grayback Glades RNA	1,019	1,019
Holton Creek RNA	421	421
Lost Lake RNA	0	387
North Fork Silver Creek RNA	499	499
Old Baldy RNA	29	919
Oregon Gulch RNA	1,051	1,051
Pacific Crest National Scenic Trail Corridor	3,199	2,310
Pilot Rock ACEC	320	320
Pipe Fork RNA	517	517
Rogue Wild and Scenic River Corridor (wild and recreational sections)	15,951	11,502
Round Top Butte RNA	606	606
Scotch Creek RNA	1,800	1,800
Soda Mountain Wilderness Study Area	6,107	6,106
Sterling Mine Ditch Trail Corridor	143	143
Table Mountain Winter Snow Play Area	11	11
Table Rocks ACEC	1,244	1,244
Table Rocks EEA	40	40
Wetland areas	880	880
Wild Rogue Wilderness Area	8,607	8,596
Woodcock Bog RNA	264	264
Subtotals	46,371	42,298
Klamath Falls Resource Area		
Clover Creek	27	27
Gerber Reservoir (Barnes Valley, Ben Hall, and Pitch Log creeks)	3,859	3,943
Klamath Hills Wildlife Area	1,636	1,636
Miller Creek ACEC	792	792
Old Baldy RNA/Pacific Crest National Scenic Trail	526	526
Spencer Creek	80	264
Willow Valley/Antelope Creek	582	582

Closed (areas closed to off-highway vehicle use)	No Action Alternative (acres)	All Action Alternatives (acres)
Wood River Wetland	3,200	3,200
Subtotals	10,702	10,970
Totals	84,588	98,795

Notes: Some of the areas of critical environmental concern (ACECs) listed in the table actually vary by alternative. Only those areas carried forward under the selected alternative would be closed to off-highway vehicle use. For those that are not carried forward, off-highway vehicle use would be limited to designated roads and trails.

Off-Highway Vehicle Emphasis Areas

Table 55. District-specific off-highway vehicle emphasis areas

Off-Highway Vehicle Emphasis Areas	No Action Alternative (acres)	Alt. 1 (acres)	Alt. 2 (acres)	Alt. 3 (acres)
Salem District				
1 Upper Nestucca	13,500	9,579	9,579	9,579
Eugene District				
2 Shotgun Creek	6,874	8,090	8,090	8,090
Roseburg District				
3 Hubbard Creek	12,041	12,041	12,041	12,041
Coos Bay District				
4 Blue Ridge	--	1,609	1,609	1,609
Medford District				
5 Anderson Butte	--	--	11,742	--
6 Coyote Creek	--	--	14,597	--
7 East Howard	--	--	6,812	--
8 Elderberry Flats	--	--	3,393	--
9 Elliot Creek	--	--	3,931	--
10 Ferris Gulch	2,200	--	2,222	--
11 Illinois Valley	--	--	4,681	--
12 Lake Creek	--	--	8,561	--
13 Quartz Creek	7,120	--	6,867	--
14 Salt Creek	--	--	4,692	--
15 Spencer Creek	--	--	7,468	--
16 Timber Mountain/ Johns Peak	16,250	--	16,375	--
17 Worthington Road/ Obenchain	--	--	9,410	--
Klamath Falls Resource Area				
No off-highway vehicle emphasis areas				
Totals	57,985	31,319	137,070	31,319

Note: Two dashes (--) denote that a designated or potential site, trail, area, or byway either was not identified under the No Action Alternative or would not be carried forward under the action alternatives.

Potential Off-Highway Vehicle Emphasis Areas

Table 56. District-specific potential off-highway vehicle emphasis areas

Potential Off-Highway Vehicle Emphasis Areas	No Action Alternative (acres)	All Action Alternatives (acres)
Salem District		
Crooked Finger	--	454
Flat Mountain	--	6,892
Tillamook	6,852	6,852
Eugene District		
No potential off-highway vehicle emphasis areas		
Roseburg District		
No potential off-highway vehicle emphasis areas		
Coos Bay District		
No potential off-highway vehicle emphasis areas		
Medford District		
No potential off-highway vehicle emphasis areas		
Klamath Falls Resource Area		
No potential off-highway vehicle emphasis areas		
Totals	6,852	14,198

Note: Two dashes (--) denote that a designated or potential site, trail, area, or byway either was not identified under the No Action Alternative or would not be carried forward under the action alternatives.

Oregon State Scenic Waterways

Table 57. District-specific Oregon State scenic waterways

State Scenic Waterways	Segment Description	Total Miles
Salem District		
Clackamas River*	Recreational segment: Olallie Lake Scenic Area Boundary to North Fork Reservoir	54
Clackamas River	Recreational segment: River Mill Dam to Baker's Bridge at Carver	12
Nestucca River*	Recreational segment: McGuire Dam to the confluence with Ginger Creek Scenic segment: Ginger Creek to East Creek near Blaine	23
North Fork Clackamas River	Scenic segment: From source to North Fork Reservoir	12
Sandy River*	Natural segment: Dodge Park (Bull Run River) to Indian John Island Scenic segment: Indian John Island to Dabney Park	12.5
South Fork Clackamas River	Scenic segment: River mile four to confluence with mainstem of Clackamas River	4
Walker Creek	Recreational segment: Source to confluence with Nestucca River	3
*These river segments have joint state and federal management plans in place.		
Eugene District		
No Oregon State scenic waterways		
Roseburg District		
No Oregon State scenic waterways		
Coos Bay District		
No Oregon State scenic waterways		
Medford District		
No Oregon State scenic waterways		
Klamath Falls Resource Area		
Klamath River	Scenic segment: J. C. Boyle Powerhouse to the Oregon/California State line	11
This river segment has a cooperative management agreement between the Oregon Parks and Recreation Department and the BLM.		
Total		131.5

National Landscape Conservation System Designated Lands

Wild and Scenic Rivers

Designated Wild and Scenic Rivers and River Segments

Table 58. District-specific designated wild and scenic rivers and river segments

Designated	Classification	Outstandingly Remarkable Values	Total Miles	Acres (BLM lands only)
Salem District				
Clackamas (Segment 6)	Recreational	Fish, Recreation	1	143
Elkhorn Creek (Segment 1)	Wild	Scenery, Wildlife	5.8	142
Elkhorn Creek (Segment 2)	Scenic	Scenery, Wildlife	0.6	225
Quartzville Creek	Recreational	Recreation, Scenery	9.7	2,083
Salmon River (Segment 4)	Recreational	Botany, Ecology, Fish, Hydrology, Recreation, Scenery, Wildlife	3.2	0
Salmon River (Segment 5)	Scenic	Botany, Ecology, Fish, Hydrology, Recreation, Scenery, Wildlife	4.8	728
Sandy River (Segment 1)	Scenic	Culture, Fish, Recreation	3.8	445
Sandy River (Segment 2)	Recreational	Culture, Fish, Recreation, Scenery	8.7	279
Subtotals			37.6	4,045
Eugene District				
No designated wild and scenic rivers or river segments				
Roseburg District				
North Umpqua River	Recreational	Culture, Fish, Hydrology, Recreation, Scenery	8.4	2,142
Subtotals			8.4	2,142
Coos Bay District				
No designated wild and scenic rivers or river segments				
Medford District				
Rogue River (Applegate River to Grave Creek)	Recreational	Fish, Recreation, Scenery	27	4,911
Rogue River (Grave Creek to Mule Creek)	Wild	Fish, Recreation, Scenery	20	6,602
Subtotals			47	11,513

Table continues on the next page.

Designated	Classification	Outstandingly Remarkable Values	Total Miles	Acres (BLM lands only)
Klamath Falls Resource Area				
Upper Klamath River	Scenic	Fish, History, Prehistory, Recreation, Scenery, Wildlife	11	2,780
Subtotals			11	2,780
Totals			104	20,480

Note: Mileage calculations include both BLM-administered and non-BLM-administered lands. Acreage calculations are for BLM-administered lands only and based on the amount of BLM-administered lands that are located within a half mile wide river corridor.

Suitable Wild and Scenic Rivers and River Segments

Table 59. District-specific suitable wild and scenic rivers and river segments

Suitable	Potential Classification	Outstandingly Remarkable Values	Total Miles	Acres (BLM lands only)
Salem District				
Molalla River (Segment B)	Recreational	Geology, Recreation, Scenery	13.2	2,988
Nestucca River (Segment A)	Recreational	Fish, Recreation, Scenery, Wildlife	15.5	3,016
Subtotals			28.7	6,004
Eugene District				
McKenzie River (Segment A)	Recreational	Fish, Recreation, Scenery	11	962
Siuslaw River (Segment B)	Recreational	Fish, Wildlife	46	4,518
Siuslaw River (Segment C)	Recreational	Recreation, Wildlife	13	1,211
Subtotals			70	6,691
Roseburg District				
No suitable wild and scenic rivers or river segments				
Coos Bay District				
No suitable wild and scenic rivers or river segments				
Medford District				
Big Windy Creek	Wild	Recreation, Scenery	6.8	1,928
Dulog Creek	Wild	Recreation, Scenery	1.8	480
East Fork Big Windy Creek	Wild	Recreation, Scenery	3.6	923
Howard Creek	Wild	Fish, Recreation, Scenery	7.0	1,752
Subtotals			19.2	5,083
Klamath Falls Resource Area				
No suitable wild and scenic rivers or river segments				
Totals			117.9	17,778

Note: Mileage calculations include both BLM-administered and non-BLM-administered lands. Acreage calculations are for BLM-administered lands only and based on the amount of BLM-administered lands that are located within a half mile wide river corridor.

Eligible Wild and Scenic Rivers and River Segments

Table 60. District-specific eligible wild and scenic rivers and river segments

Eligible	Potential Classification	Outstandingly Remarkable Values	Total Miles	Acres (BLM lands only)
Salem District				
Alsea River	Recreational	Fish, Recreation	16.5	312
Clackamas River	Recreational	Recreation, Scenery	15.4	44
Drift Creek (Segments A and B)	Recreational	Fish	30.1	112
Fall Creek	Recreational	Fish	11.7	642
Kilchis River	Recreational	Fish, Recreation, Wildlife	14.6	56
Little Luckiamute River	Recreational	Ecology	27.1	40
Little North Santiam River	Recreational	Fish, Recreation, Scenery	17.2	1,203
Lobster Creek (Segment B)	Recreational	Fish	16.6	305
Luckiamute River	Recreational	Ecology	61.2	553
Middle Santiam River	Recreational	Culture, Ecology	7.9	175
Nehalem River	Recreational	Recreation, Fish and Wildlife	122.0	36
Nestucca River (Segment B)	Recreational	Fish, Recreation, Scenery, Wildlife	8.0	216
North Fork Clackamas River	Scenic	Fish	14.4	358
North Fork Siletz River	Scenic	Ecology, Fish, Wildlife	10.6	826
North Fork Trask River	Recreational	None identified	11.9	732
North Santiam River (Segment A)	Scenic	Fish, Recreation, Scenery	19.1	217
North Santiam River (Segment B)	Recreational	Fish, Recreation	27.9	132
Sandy River (Segment A)	Recreational	Culture, Fish, Recreation	15.0	627
Sandy River (Segment B)	Recreational	Culture, Fish, Recreation, Scenery	11.8	872
Siletz River	Recreational	Fish, Recreation, Scenery	68.8	38
South Fork Trask River	Recreational	Fish, Wildlife	9.3	30
South Yamhill River	Recreational	Culture, Ecology	62.5	0
Table Rock Fork Molalla River	Recreational	Culture	13.4	1,385
Trask River	Recreational	Fish, Recreation, Wildlife	19.5	333

Table continues on the next page.

Eligible	Potential Classification	Outstandingly Remarkable Values	Total Miles	Acres (BLM lands only)
Salem District (cont.)				
Tualatin River	Recreational	Culture	80.6	312
Willamette River	Recreational	Culture, Ecology, Fish, Recreation, Wildlife	164.4	88
Wilson River	Recreational	Fish, Recreation, Wildlife	29.8	79
Yaquina River	Recreational	Fish	44.6	238
Subtotals			951.9	9,961
Eugene District				
Fall Creek	Recreational	Recreation	6.0	1,126
Lake Creek (Segment B)	Recreational	Fish, Recreation	18.3	482
McKenzie River (Segment B)	Recreational	Fish, Recreation, Scenery, Wildlife	40.0	55
Nelson Creek	Recreational	Fish	7.0	542
North Fork Gate Creek	Recreational	Fish	7.9	201
South Fork Gate Creek	Recreational	Fish	8.9	106
Subtotals			88.1	2,512
Roseburg District				
Cow Creek (West Fork to South Umpqua)	Recreational	Culture, Fish, History, Wildlife	26	744
South Umpqua (Tiller to North Umpqua)	Recreational	Culture, Fish, History, Wildlife	73	746
Umpqua (River Forks to Elkton)	Recreational	Culture, Fish, History, Recreation, Scenery	57	1,891
Subtotals			156	3,381
Coos Bay District				
Sixes	Recreational	Fish, History	28	271
South Fork Coos	Recreational	Fish, Recreation	37	503
South Fork Coquille	Recreational	Fish, Prehistory	35	139
Umpqua (Mouth to Kellogg)	Recreational	Ecology, Fish, Geology, History, Prehistory, Recreation, Scenery	70	1,045
Subtotals			170	1,958

Table continues on the next page.

Eligible	Potential Classification	Outstandingly Remarkable Values	Total Miles	Acres (BLM lands only)
Medford District				
Alder Creek	Wild	Recreation, Scenery	1	259
Anna Creek	Wild	Recreation, Scenery	1.7	915
Antelope Creek	Recreational	Fish	1	662
Applegate River	Recreational	Fish	46.3	629
Ash Creek	Wild	Recreation, Scenery	2.6	545
Bailey Creek	Wild	Recreation, Scenery	2.7	761
Big Butte Creek (including the south fork of Big Butte Creek)	Recreational	Fish	21.1	579
Booze Creek	Wild	Recreation, Scenery	0.9	328
Bronco Creek	Wild	Recreation, Scenery	1.5	383
Bunker Creek	Wild	Recreation, Scenery	6.4	1,619
Centennial Gulch	Wild	Recreation, Scenery	1.8	421
Cheney Creek	Recreational	Fish	4.2	651
Copsey Creek	Wild	Recreation, Scenery	1.1	346
Cow Creek	Recreational	Fish	30	1,219
Cowley Creek	Wild	Recreation, Scenery	0.8	164
Ditch Creek	Wild	Recreation, Scenery	2.1	423
East Fork Elk Valley Creek	Recreational	Fish	2.3	446
East Fork Whisky Creek	Wild	Recreation, Scenery	3.7	1,061
Elk Valley Creek	Recreational	Fish	5.0	370
Grave Creek	Recreational	Fish	10.9	3,402
Hewett Creek	Wild	Recreation, Scenery	2.2	568
Jenny Creek Ashland	Scenic	Fish, History	17.6	2,846
Jenny Creek Grants Pass	Wild	Recreation, Scenery	4.4	1,363
Kelsey Creek	Wild	Fish, Recreation, Scenery	4.8	2,162
Left Fork Foots Creek	Recreational	Fish	1.5	138

Table continues on the next page.

Eligible	Potential Classification	Outstandingly Remarkable Values	Total Miles	Acres (BLM lands only)
Medford District (cont.)				
Little Applegate River	Recreational	Fish	10	1,203
Little Windy Creek	Wild	Recreation, Scenery	2.5	783
Long Gulch Creek	Wild	Recreation, Scenery	2	494
Lost Creek	Wild	Scenery	0.9	1,191
Meadow Creek	Wild	Recreation, Scenery	3.8	1,043
Missouri Creek	Wild	Recreation, Scenery	4.4	1,077
Montgomery Creek	Wild	Recreation, Scenery	1.3	419
Mule Creek	Wild	Fish, Recreation, Scenery	7.6	3,053
Ninemile Creek	Recreational	Fish	1.6	836
North Fork Big Butte Creek	Recreational	Fish	13.4	1,741
North Fork Deer Creek	Recreational	Fish	2.9	615
North Fork Galice Creek	Recreational	Recreation, Scenery	5.5	1,557
North Fork Silver Creek	Recreational	Fish, Recreation, Scenery	6	1,707
Powell Creek	Recreational	Fish, Recreation, Scenery	7.7	1,446
Quail Creek	Wild	Recreation, Scenery	1.8	379
Quartz Creek	Wild	Recreation, Scenery	2.4	790
Quines Creek	Recreational	Fish	4.5	750
Riffle Creek	Recreational	Fish	3.6	651
Rock Creek	Recreational	Fish	6.0	351
Rogue River (Segment 1)	Recreational	Fish, Recreation	12.5	1
Rogue River (Segment 2)	Recreational	Fish, Recreation	18	227
Rogue River (Segment 3)	Recreational	Fish, Recreation	18	395
Rum Creek	Wild	Recreation, Scenery	3.2	978
Russian Creek	Wild	Recreation, Scenery	1.9	653
Sams Creek	Recreational	Fish	5.5	427
Slide Creek	Wild	Recreation, Scenery	1	220
Soda Creek	Recreational	Fish	3.8	705
South Fork Little Butte Creek	Recreational	Fish	16.3	419
Stanley Creek	Recreational	Fish	1.5	226
Star Gulch Creek	Recreational	Fish	8.1	2,321

Table continues on the next page.

Eligible	Potential Classification	Outstandingly Remarkable Values	Total Miles	Acres (BLM lands only)
Medford District (cont.)				
West Fork Illinois River	Scenic	Scenery	19	1,018
West Fork Whisky Creek	Wild	Recreation, Scenery	6	1,256
Whisky Creek (to east and west forks)	Wild	History, Recreation, Scenery	2.4	374
Whitehorse Creek	Recreational	Fish	3.5	600
Wildcat Creek	Wild	Recreation, Scenery	1.7	340
Subtotals			387.9	52,506
Klamath Falls Resource Area				
No eligible wild and scenic rivers or river segments				
Totals			1,753.9	70,318

Note: Mileage calculations include both BLM-administered and non-BLM-administered lands. Acreage calculations are for BLM-administered lands only and based on the amount of BLM-administered lands that are located within a half mile wide river corridor.

Wilderness Areas

Table 61. District-specific wilderness areas

Wilderness Areas	Administered by the BLM (acres)
Salem District	
Table Rock	5,706
Managed according to the 1987 <i>Table Rock Wilderness Management Plan</i> to preserve the area's undisturbed natural integrity.	
Eugene District	
No wilderness areas	
Roseburg District	
No wilderness areas	
Coos Bay District	
No wilderness areas	
Medford District	
Wild Rogue	8,629
This wilderness spans across both BLM and United States Forest Service (USFS) lands. Under a memorandum of understanding, the USFS administers the BLM's portion of this wilderness (the acres stated here).	
Klamath Falls Resource Area	
No wilderness areas	
Total	14,335

Wilderness Study Areas and Wilderness Instant Study Areas

Table 62. District-specific wilderness study and wilderness instant study areas

Wilderness Study and Wilderness Instant Study Areas	Classification	Administered by the BLM (acres)
Salem District		
Little Sink	Instant Study	80
Eugene District		
No wilderness study or wilderness instant study areas		
Roseburg District		
No wilderness study or wilderness instant study areas		
Coos Bay District		
Cherry Creek/Douglas fir	Instant Study	570
Medford District		
Brewer Spruce	Instant Study	1,705
Soda Mountain	Study	6,107
Klamath Falls Resource Area		
Mountain Lakes	Study	340
Total		8,802

Miscellaneous National Landscape Conservation System Designated Lands

Table 63. District-specific miscellaneous National Landscape Conservation System designated lands

Miscellaneous National Landscape Conservation System Designated Lands	Administered by the BLM	
	(acres)	(miles)
Salem District		
Bull Run Watershed Management Unit	658	
Mt. Hood Corridor	4,644	
Yaquina Head Outstanding Natural Area	102	
Eugene District		
No other miscellaneous National Landscape Conservation System designated lands		
Roseburg District		
No other miscellaneous National Landscape Conservation System designated lands		
Coos Bay District		
No other miscellaneous National Landscape Conservation System designated lands		
Medford District		
Cascade-Siskiyou National Monument	52,947	
Pacific Crest National Scenic Trail		40
Klamath Falls Resource Area		
Pacific Crest National Scenic Trail		1
Total	58,351	41

Maps

This section provides the resource and program maps referred to in this chapter.

Map 6. Wildland urban interface

Map 7. Lands available for livestock grazing

Map 8. Location of proposed range improvements in the Klamath Falls Resource Area

Map 9. Utility corridors

Map 10. Off-highway vehicle designations

Map 11. Off-highway vehicle emphasis areas

Map 12. Location of Pokegama Herd Management Area

Map 13. Bald eagle, deer, and elk habitat management areas

Map 14. Forest vegetation series

Map 15. Areas of critical environmental concern within the planning area

Map 16. BLM management area adjacent to the Coquille Forest

Map 17. Location of assessment areas (physiographic provinces within sustained yield units) under Alternative 3

Map 18. Recreation management areas

Map 19. Backcountry byways

Map 20. Designated recreation sites

Map 21. Designated recreation trails

Map 22. Potential recreation sites

Map 23. Potential recreation trails

Map 24. Environmental education sites along with recreation and public purpose lease sites

Map 25. National Landscape Conservation System designated lands

Map 26. Proposed off-highway vehicle designations

Map 27. Lands with wilderness characteristics

Map 28. Location of land tenure Zone 3

Map 29. Sustained yield units

Chapter 3 – Affected Environment

Chapter 3 of this draft environmental impact statement describes the affected environment for the six resource management plans of the planning area that are being revised.

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Introduction

Chapter 3 describes the affected environment. The description of the affected environment is designed to support and facilitate the understanding of the analysis of the environmental consequences that are presented in *Chapter 4*. The amount of information provided in this chapter is proportionate to the importance, scope, and sensitivity of the environmental consequences and is no longer than necessary to understand the analysis.

Planning Area

The planning area for the six resource management plans that are being revised includes the public lands and resources that are administered by the Salem, Eugene, Roseburg, Coos Bay, and Medford districts, and the Klamath Falls Resource Area of the Lakeview District. See *Map 30 (BLM lands within the planning area)*.

The entire planning area includes approximately 22 million acres, but only approximately 2.5 million acres are public lands that are administered by the BLM. The BLM-administered lands, therefore, represent only about 11% of the planning area. The majority of the lands within the planning area are owned and managed by private landowners and other government agencies. See *Figure 9 (Major ownerships within the planning area)*.

Figure 9. Major ownerships within the planning area

Map 30. BLM lands within the planning area

There are five physiographic provinces within the planning area. See *Figure 10 (Physiographic provinces within the planning area)*. Physiographic provinces vary by the type and structure of their vegetation and the differences in their hydrology, geology, and other processes (e.g., fire-return intervals) (FEMAT 1993).

Figure 10. Physiographic provinces within the planning area

Land Ownerships within the planning area

The public lands in Oregon include the O&C lands, public domain lands, and other public lands. See *Table 64 (Legal status of the lands administered by the BLM within planning area)*. The O&C lands in western Oregon are managed differently than the other public and public domain lands of Oregon, which are located mostly in eastern Oregon. The O&C lands are mostly scattered and intermingled with private, industrial forest lands. The public domain lands are about half scattered and intermingled with O&C lands and about half existing as larger blocks in the Salem, Coos Bay, and Lakeview districts (with the majority being concentrated in the Klamath Falls Resource Area of the Lakeview District). See *Figure 11 (BLM surface ownership by legal authority within the planning area)* for the amount of BLM surface ownership by source of administrative authority within the planning area.

Table 64. Legal status of the lands administered by the BLM within the planning area

BLM Districts	O&C Lands (acres)	Public Domain Lands (acres)	Other Public Lands* (acres)	Total (acres)
Salem	349,300	51,600	2,100	403,000
Eugene	304,200	10,500	400	315,100
Roseburg	406,500	19,800	0	426,300
Coos Bay	279,400	41,800	1,500	322,700
Medford	764,900	96,100	4,800	865,800
Klamath Falls Resource Area (Lakeview District)	46,900	174,800	3,200	224,900
Total	2,151,200	394,600	12,000	2,557,800

*Federal lands acquired by purchase or donation under an authorization other than the Federal Land Policy and Management Act.

Figure 11. BLM surface ownership by legal authority within the planning area

The O&C land pattern has a checkerboard character that results from the grid of the Public Land Survey System. O&C land is generally located in the odd-numbered sections with the intermingled private lands being located in the even-numbered sections. A section in the checkerboard is normally one mile on a side and encloses approximately 640 acres. The BLM administers approximately 2.5 million acres of these checkerboard parcels of public land within the approximately 22 million acres that comprise the planning area. The management of the intermingled private lands usually differs from that of the BLM-administered lands. See *Figure 12 (Sample portion of the intermingled checkerboard of private and BLM-administered lands)*.

Public Land Survey System

For details about this system of subdividing and identifying public domain lands, see http://nationalatlas.gov/articles/boundaries/a_plss.html.

Figure 12. Sample portion of the intermingled checkerboard of private and BLM-administered lands

Figure 12 illustrates the intermingled checkerboard pattern of the BLM and private land ownerships. The BLM-administered lands in the figure are within the squares that contain the small polygons. Note that many parcels of BLM-administered lands are smaller than a square mile and are disconnected and isolated from other BLM-administered lands. The dark green areas in the image are older forests while the brown areas are recently harvested units.

Land Management

The existing land management plans for the individual national forests and BLM districts (including the six districts within the planning area) that are west of the Cascade Range in Washington, Oregon, and northern California have incorporated the management direction that is contained in the Northwest Forest Plan. Most, but not all, of the planning area falls within the Northwest Forest Plan area. See *Figure 13 (Areas of the Northwest Forest Plan and the planning area)*.

Figure 13. Areas of the Northwest Forest Plan and the planning area

The current vegetation condition of the private, state, and federal lands within the planning area has been calculated using the 1996 satellite data from the Interagency Vegetation Mapping Project. This data includes the major fire and regeneration harvesting data that is available as of 2002. The vegetative condition of non-BLM lands varies from nonforest to the four forest structural stage classifications (stand establishment, young (or recently harvested), mature, and structurally complex).

The intensity of the land management activities across all ownerships within the planning area is partly indicated by the number of miles of roads that exist per square mile (i.e., road density). See *Figure 14 (Road density across all land ownerships within the planning area)*.

Figure 14. Road density across all land ownerships within the planning area

The BLM has also developed a geospatial database of the lands and resources it administers. This geographic information system contains data regarding various resources, such as forests, streams, roads, recreation, and wildlife. This information was captured from on-the-ground surveys and aerial and satellite photography. See *Figure 15 (Example of geospatial data from the Forest Operations Inventory database)*.

Figure 15. Example of geospatial data from the Forest Operations Inventory database

Figure 15 shows aggregated sections within individual forest stands. Non-BLM lands are not mapped. The areas mapped in the figure represent a somewhat typical BLM landscape, which is a mixture of older stands and younger stands that have been harvested and replanted. These stands are intermixed on a larger landscape of private timber management, agriculture, and urbanization. The BLM manages over 80,000 mapped individual stands.

Watersheds are also useful as a unit of measure for summarizing certain natural resources. There are 260 fifth-field watersheds, which average 87,000 acres in size, located all or partially within the planning area. For a discussion of watersheds, see *Water in Chapter 3*. See Figure 16 (*Fifth-field watersheds within the planning area*) for the size and distribution of these watersheds within the planning area.

Watersheds

To learn more about watersheds in our area, see <http://www.epa.gov/owow/watershed/whatis.html> and <http://cfpub.epa.gov/surf/>

Figure 16. Fifth-field watersheds within the planning area

The BLM in western Oregon is rarely the predominant landowner within a fifth-field watershed. See *Figure 17 (Two example watersheds showing various BLM ownership patterns)*. *Figure 17* shows that BLM ownership at the fifth-field watershed level ranges from a few scattered parcels to large areas. Therefore, activities on adjacent lands have implications for the management of BLM lands. The BLM's ability to influence resource outcomes often depends upon the amount and location of its land ownership in relation to a particular resource.

Figure 17. Two example watersheds showing various BLM ownership patterns

Over half of BLM lands are located within fifth-field watersheds where the BLM-administered lands comprise less than one-third of the watershed. By contrast, most of the lands managed by the Forest Service are in large, contiguous blocks. See *Figure 18 (BLM, Forest Service, and private ownership as a percent of the fifth-field watersheds within the planning area)*, which illustrates the comparative proportion of land ownership at the fifth-field watershed scale for the BLM, Forest Service, and private land owners. In only 8 of the 260 fifth-field watersheds within the planning area does the BLM-administrated lands comprise the majority of the watershed.

Figure 18. BLM, Forest Service, and private ownership as a percent of the fifth-field watersheds within the planning area

Ecology

Key Points

- The abundance of stand establishment forests is above the average for historic conditions.
- Stand establishment forests that are created by timber harvesting usually lack the habitat complexity and legacy components that are typical of stand establishment forests following natural disturbances.
- Stand establishment forests have declined on federally managed forests over the past decade and are becoming restricted to nonfederal lands.
- The abundance of young forests is above the average for historic conditions.
- Young forests on BLM-administered lands are predominately high-density, even-aged stands that are developing along a trajectory that is fundamentally different from that experienced by most of the existing structurally complex forests on BLM-administered lands.
- The abundance of mature and structurally complex forests within the planning area is below the average for historic conditions.
- The growth of forests into a mature and structurally complex forested condition has far outpaced the loss of mature and structurally complex forests from harvesting and wildfires within the planning area over the past 10 years.

This section of Chapter 3 analyzes the ecological condition of conifer forests. Forest stands can be described by their structure, composition, and function. This analysis will focus on forest structure, because structure is the most easily analyzed, responds most predictably and apparently to management actions, and is closely related to many of the issues for analysis.

The structural development of conifer stands in the Pacific Northwest is a complex and continuous process. Pacific Northwest conifer forests are notable for the potential longevity and massive size of live trees, and enormous accumulations of coarse woody debris. Forest structure in the Pacific Northwest continues to develop for tremendously long time spans, perhaps even a millennium in the absence of stand-replacing disturbances (Spies 2004; Franklin et al. 2002). Therefore, there is more complexity in classifying the later stages of structural development in the conifer forests of the Pacific Northwest than in most forested regions.

The report titled *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment* (FEMAT 1993) described ecological conditions throughout the range of the northern spotted owl. The FEMAT report described the history of forest management in the region (p. II-2, II-3), the terrestrial forest ecosystems with an overview of biological communities and ownership patterns (p. IV-3 to IV-8), and the current forest conditions with an emphasis on the structure, composition, and processes of late-successional forests (p. IV-8 to IV-12, IV-27 to IV-31). Those descriptions are incorporated by reference and the following paragraphs summarize them.

FEMAT (Forest Ecosystem Management Assessment Team)

The 1993 presidentially assigned team of scientists, researchers, and technicians from seven federal agencies that created the report that was used as the basis for the Northwest Forest Plan.

The final supplemental environmental impact statement (USDA, USDI 1994) for the Northwest Forest Plan FEIS also analyzed the ecological conditions within the range of the northern spotted owl. The Northwest Forest Plan FSEIS relied partly on the FEMAT report, which was included as an appendix to the Northwest Forest Plan FSEIS. The Northwest Forest Plan FSEIS provided some additional discussion within each of the descriptions incorporated below, and those analyses are incorporated by reference (p. 3&4-11 to 3&4-29).

The FEMAT report and the Northwest Forest Plan focused on “late-successional and old-growth forest” (FSEIS, I-4 to I-6). As defined in the FEMAT report and the Northwest Forest Plan, the concept of late-successional forest included both mature and old-growth forests (FEMAT, IX-19; FSEIS, Glossary 9). The FEMAT report and the Northwest Forest Plan developed a management plan that was “based on returning the federal landscape toward an extent of old-growth forest more in line with what was here before widespread logging on federal lands. The historical extent was assumed to be adequate to sustain the native biological diversity associated with older forest.” (Spies 2006, 83).

Late-successional forests are heterogeneous in structure and diverse in composition and function (FEMAT, IV-28 to IV-31). Since the publication of the FEMAT report in 1993, research has continued to refine scientific understanding of the development of existing late-successional forests. There are multiple developmental pathways to late-successional forest structure and composition across the region (Franklin and Van Pelt 2004; Spies 2004; Franklin et al. 2002). Research reconstructing the stand development of late-successional forests on BLM-administered lands in western Oregon suggests that large, old-growth trees generally developed under low stand densities (Spies 2006; Poage and Tappeiner 2002; Sensenig 2002; Tappeiner et al. 1997). In contrast, research by Winter et al. (2002), reconstructing a late-successional stand in western Washington, concluded that the stand initiated under high-density conditions (Winter et al. 2002). Although the research by Winter et al. (2002) represents only a single stand, its contrasting finding to the above research suggests that there may be strong regional differences in the development of late-successional forest conditions. The large data set from BLM-administered lands within the planning area make the conclusions from Poage and Tappeiner and Tappeiner et al. more relevant to this analysis.

The FEMAT report and the Northwest Forest Plan FSEIS described the role of silviculture, including the use of stand thinning, to accelerate the development of late-successional forest structural characteristics and to reduce the risk of stand-replacing fire (FEMAT, IV-33 to IV-36; FSEIS, 3&4-45, 3&4-47, 3&4-49). The Northwest Forest Plan FSEIS observed that late-successional forest development in young, managed stands may be retarded, or not occur at all, without silvicultural treatment (FSEIS, 3&4-49). Research in the last decade has reinforced the potential roles of silviculture and has provided a more detailed understanding of the effects of thinning on forest resources (Franklin et al. 2006; Spies 2006; Hayes et al. 2003; Muir et al. 2002; Carey 2000). The monitoring report titled *Northwest Forest Plan—The First Ten Years (1994-2003): A Synthesis of Monitoring and Research Results* (commonly known as the *Monitoring Synthesis Report*) affirmed the conclusions in the FEMAT report and the Northwest Forest Plan that thinning would restore ecological diversity and reduce the potential for loss from high-severity fires (Spies 2006, 110-111).

Ecological Conditions at the Regional Scale

The analysis in this section of *Chapter 3 (Ecology)* will not provide a new analysis of forest conditions at the scale of the Northwest Forest Plan, which is the range of the northern spotted owl. The discussions below will summarize previous analyses and monitoring results and provide the context for this analysis, which is conducted at the scale of the planning area and physiographic provinces. The discussions below at the regional scale use the forest stage terminology (e.g., late-successional forest) of the original analyses rather than the structural stage classification terminology that was developed in this analysis.

Physiographic province

A region of the landscape with distinctive geographical features. There are five within the planning area:

- Coast Range
- Eastern Cascades
- Klamath
- Western Cascades
- Willamette Valley

The Northwest Forest Plan FSEIS evaluated the abundance of late-successional forest by comparing abundance under each alternative to estimates of historic conditions (FSEIS, 3&4-36, 3&4-37):

- a “long-term average” of 65% of the region in late-successional forest, and
- a “long-term average low” of 40% of the region in late-successional forest.

The Northwest Forest Plan FSEIS estimated that there were 8.55 million acres of late-successional forest (described as medium and large conifer), which is approximately 35% of the 24.5 million acres of federally managed lands within the range of the northern spotted owl in 1994 (p. 3&4-27). The monitoring report titled *Northwest Forest Plan—The First Ten Years (1994-2003): Status and Trend of Late-Successional and Old-Growth Forest* (commonly known as the *Late-Successional Forest Monitoring Report*), using a similar definition but a remotely sensed data source, concluded that there were 7.87 million acres of late-successional forest on federally managed lands in 1994, and concluded that the plan was founded on valid assumptions about the extent of the remaining older forests (Moeur et al. 2005). The *Late-Successional Forest Monitoring Report* contains detailed descriptions of the abundance and distribution of late-successional forest by different measures, and those descriptions are incorporated by reference (Moeur et al. 2005, 44-110).

Since 1994, there has been a net increase of late-successional forest approximately twice the increase anticipated in the Northwest Forest Plan FSEIS. Growth of forests into the lower size range of late-successional forests has far outpaced losses of late-successional forest from harvesting and wildfire. Harvesting of late-successional forest has been far below the amount anticipated in the Northwest Forest Plan FSEIS. Loss of late-successional forest from wildfire in total has been approximately consistent with the amount anticipated in the Northwest Forest Plan FSEIS, though losses have been higher in the fire-prone forests of the Klamath province. See *Figure 19 (Disturbance map from the Northwest Forest Plan’s Late-Successional Forest Monitoring Report)* (Spies 2006; Moeur et al. 2005, 39, 85-100, 104-106; FSEIS, 3&4-42).

Figure 19. Disturbance map from the Northwest Forest Plan's *Late-Successional Forest Monitoring Report*

At least 1.7 million acres of existing late-successional forests are in fire-adapted vegetation types that are characterized by high fire frequency and low fire severity in the Eastern Cascades and Klamath provinces, and up to 1 million acres are in dry mixed conifer types in the Western Cascades province. The *Late-Successional Forest Monitoring Report* and the *Monitoring Synthesis Report* identified that this large acreage of late-successional forest that is susceptible to catastrophic wildfire may be a concern,

and concluded that the possibility of major losses of late-successional forest in fire-prone ecosystems cannot be ignored (Spies 2006; Moeur et al. 2005, 100-102, 107-108).

Nonfederal forests within the range of the northern spotted owl are predominately young, even-aged, managed stands, and provide mostly early and mid-successional forest habitat. The Northwest Forest Plan FSEIS characterized typical management on nonfederal forest lands as including timber harvesting in a stand's fifth or sixth decade (FSEIS, 3&4-5 to 3&4-8). Since 1994, harvest rotations on forest industry lands have generally shortened (Nonaka and Spies 2005; Kennedy 2005, 110-117; Alig et al. 2000, 9). The Northwest Forest Plan assumed that nonfederal forests would contribute little to late-successional goals, but the *Monitoring Synthesis Report* acknowledged that this assumption may not have been correct, and that nonfederal lands, especially state lands, provide substantial late-successional forest (Spies 2006, 108).

The implementation of the Northwest Forest Plan reduced harvest levels on federally managed forests from recent historic levels. The vast majority of harvests and subsequent creation of early successional habitat is now occurring on nonfederal lands. The *Monitoring Synthesis Report* acknowledged that the Northwest Forest Plan did not explicitly provide for the biological diversity that is associated with early successional habitats. The *Monitoring Synthesis Report* observed that nonfederal lands cannot be assumed to provide for these elements of biological diversity because of the lack of diverse, early successional habitat with structural legacies on nonfederal lands (Spies 2006, 109).

The FEMAT report and the Northwest Forest Plan FSEIS provided a brief, qualitative evaluation of the existing spatial patterns of late-successional forests. Those analyses stated that what little late-successional forest remained on private and state lands occurred in small, isolated patches, and that most late-successional forests on federal forests are highly fragmented by harvested areas and young stands (FEMAT, IV-12; FSEIS, 3&4-29). The Northwest Forest Plan FSEIS evaluated the spatial patterns of alternatives by the connectivity of late-successional forest—measuring the distances between late-successional forested patches (FSEIS, 3&4-38 to 3&4-40). The Northwest Forest Plan FSEIS concluded that implementation of the Northwest Forest Plan would likely result in “moderate to strong” connectivity among late-successional forests (Spies 2006; FSEIS, 3&4-44, 3&4-46). However, that analysis did not project the retention or development of late-successional forests within the harvest land base unless explicitly reserved through the standards and guidelines (FSEIS, 3&4-42, 3&4-43).

Ecological Conditions at the Planning Area Scale

The ecological conditions at the scale of the planning area are discussed in terms of the structural stages of forests and physiographic provinces. See *Figure 20 (Percent of BLM-administered land within each of the physiographic provinces within the planning area)* and *Figure 21 (Physiographic provinces and BLM lands within the planning area)*.

Figure 20. Percent of BLM-administered land within each of the physiographic provinces within the planning area

Figure 21. Physiographic provinces and BLM lands within the planning area

Forests are classified in this analysis by four structural stage classifications:

- stand establishment
- young
- mature
- structurally complex.

These four structural classes are further subdivided by additional structural descriptors. See *Table 65 (Structural stage subdivisions)*. Most discussions in this section will only use the four classes described above. The subdivisions are applied only to BLM-administered lands and are used in this section only where needed to address specific analytical questions. A detailed description of the structural classifications is provided in *Appendix B. Ecology*.

Table 65. structural stage subdivisions

Structural Stages	Subdivisions	Descriptions
Stand Establishment	Stand Establishment without Structural Legacies	Very young forest (< 50 ft. tall) without larger trees
	Stand Establishment with Structural Legacies	Very young forest (< 50 ft. tall) with some larger trees
Young	Young without Structural Legacies	Taller than stand establishment, but still small (< 20 in. dbh) and without larger trees
	Young with Structural Legacies	Taller than stand establishment, but still small (< 20 in. dbh) and with some larger trees
Mature	Mature with Single-Layered Canopy	Larger trees (> 20 in. dbh) with little variation in tree size
	Mature with Multilayered Canopy	Larger trees (> 20 in. dbh) with more than one canopy layer
Structurally Complex	Existing Old Forest ^{ab}	Stands currently 200 years or older
	Developed Structurally Complex ^c	Larger trees (> 20 in. dbh) with some very large trees (> 40 in. dbh) and more than one canopy layer

Notes:

^aStands identified in the current inventory as 200 years or older remain in this subdivision in the future unless harvested.

^bA subset of this subdivision (Existing Very Old Forest, which represents stands that are 400 years or older) is also identified based on current inventory. The assignment of ages to these unmanaged stands is imprecise, but represents the only available data across BLM-administered lands within the planning area.

^cForests are classified in this subdivision if they have the structural attributes identified but are not 200 years or older in the current inventory. It includes stands that currently have the attributes of structurally complex stands and those stands that develop the attributes of structurally complex stands in the future.

This classification uses only measures of live trees. The dynamics of coarse woody debris and snags are integral to ecological definitions of late-successional forests, and there is increasing understanding of the importance of dead wood in early-successional forests (Franklin et al. 2002; Spies and Franklin 1988). However, this classification does not include measures of dead wood because of inadequate inventory of dead wood (Spies 2006), the high variability of dead wood levels in unmanaged forests (Spies and Franklin 1991), and the difficulty in modeling future creation of dead wood from such disturbances as fire or wind (Kennedy 2005, 97-160).

The stand establishment structural stage describes the early-successional conditions of a forest following such disturbances as timber harvesting or wildfires. This classification is comparable to the cohort establishment stage in Franklin et al. (2002). This classification is subdivided based on whether the new forest includes trees from the previous forest (with or without structural legacies). See *Figure 22 (Stand establishment forest without structural legacies)*. Natural disturbances within the planning area typically do not kill all trees within a stand, and surviving trees have important influences on stand development (Franklin et al. 2002; Aber et al. 2000).

Figure 22. Stand establishment forest without structural legacies

Young forests approximate small conifer forests as used in the FEMAT report and the Northwest Forest Plan. This classification is subdivided, like stand establishment, based on whether the young forest includes trees from the previous forest. See *Figure 23 (Young forest without structural legacies)*. Young forests with structural legacies develop from stand establishment forests that have structural legacies. Young forests with structural legacies typically develop directly into mature forests with multilayered canopies, whereas young forests without structural legacies typically develop into mature forests with a single-layered canopy.

Figure 23. Young forest without structural legacies

Mature forests are defined similarly to mature forests as described in the FEMAT report and the Northwest Forest Plan (although the definition in this analysis uses a lower threshold for the density of large trees in the southern portion of the planning area to reflect the generally lower site quality). This classification is subdivided based on whether the forest has a single-layered or multilayered canopy. See *Figure 24 (Mature forest with multilayered canopies)*. The development of multiple canopy layers may arise from the development of a new cohort of shade-tolerant trees below an older overstory or from prolonged or continuous tree regeneration in open young forests. This classification uses the diversity of tree diameters as a surrogate for direct modeling of tree crowns. (Development of continuous tree canopies may also arise from canopy trees re-establishing lower branches as the stand becomes more open. This process would not be detected by the subdivision in this classification. However, this process is typically associated with later stages of stand development, and therefore is part of the structurally complex structural stage in this classification scheme).

Figure 24. Mature forest with multilayered canopies

Mature forests with single-layered canopies typically must develop into mature forests with multilayered canopies first, before developing into structurally complex forests. This is because one of the defining characteristics of structurally complex forests is multiple canopy layers. Mature forests with multilayered canopies provide the precursors

to structurally complex forests, ensuring a replacement of structurally complex forests that are removed by timber harvesting or natural disturbances. Mature forests with multilayered canopies would provide more of the functions that are associated with structural complex forests, such as habitat for species that are associated with late-successional forests, than would mature forests with single-layered canopies (Spies 2006, 93; Washington State Department of Natural Resources 2005, 9-10).

Together, mature and structurally complex forests approximate what is termed late-successional forest in the FEMAT report, the Northwest Forest Plan, and the district resource management plans.

Structurally complex forests approximate what is termed:

- old-growth forests in many analyses (e.g., district resource management plans and environmental impact statements);
- medium and large conifer multistory forests in the FEMAT report; and
- large, multistoried older forest in the *Late-Successional Forest Monitoring Report* (Moeur et al. 2005).

See Figure 25 (*Structurally complex forest*).

Figure 25. Structurally complex forest

The structural development of structurally complex forests is a continuous and variable process, and the structure and composition of very old stands is not equivalent to those of the younger, less developed forests that are classified as structurally complex (Spies 2006; Washington State Department of Natural Resources 2005; Franklin and Van Pelt 2004; Spies 2004; Franklin et al. 2002). The structural complexity of forests continues to develop for many centuries after meeting the minimum criteria for a structurally complex forest (Franklin et al. 2002). The older, more complex forests provide superior habitat for some species, such as *Nephroma occultum* and *Pseudocyphellaria*

rainierensis, that are slow to colonize habitats, are highly sensitive to disturbance, or prefer highly complex canopy structure (USDA, USDI 2004a). However, there is inadequate information to evaluate whether older structurally complex forests would provide superior habitat to younger structurally complex forests for most species that are related to late-successional forests.

This analysis does not classify forests by age alone (though some parts of the analysis use stand age), because stand age alone does not reliably describe the structural conditions of stands (Franklin et al. 2006; Spies 2006; Moeur et al. 2005; Spies and Franklin 1991; Spies and Franklin 1988). The rate of development of several forest structural characteristics that are relevant to the issues in this analysis, such as large individual trees and multiple canopy layers, is dependent partly on the forest management actions that would differ among the alternatives. This differential rate of structural development would be masked by classifying the forest solely by age. Furthermore, classifying stands by age is problematic in mixed-aged stands. Stand age is used here to distinguish between existing old forest and existing very old forest within the broader classification of structurally complex forests.

There is inadequate information on existing stands to distinguish among levels of complexity among structurally complex forests. Current structurally complex forests are mostly or exclusively unmanaged stands, and the BLM has less stand-level inventory information regarding these stands than for managed stands. Therefore, this classification describes a subdivision of structurally complex forest as existing old forest (stands identified in the current inventory as 200 years or older), and a further subset of this subdivision of existing very old forest (stands identified in the current inventory as 400 years or older). The assignment of ages to these unmanaged stands is imprecise and was usually made based on qualitative and subjective evaluation, but this represents the only available data on stand age across the BLM-administered lands within the planning area. The existing old forest subdivision and existing very old forest subset labels do not directly describe structurally complex stands with the greatest structural complexity. However, without more detailed stand structural information, these forests are most likely to have the most developed structure and the longest time since a disturbance of the structurally complex forests.

Some analyses have evaluated forest structural complexity using an index approach rather than discrete thresholds for classifications (e.g., Washington State Department of Natural Resources 2005; Spies and Franklin 1991; Spies and Franklin 1988). An index approach can be effective and informative when used to classify existing conditions at the stand level, if there is an abundance of stand-level data (e.g., Spies and Franklin 1991). However, an index approach would produce an analysis of bewildering complexity if used to analyze multiple alternatives modeled into the future.

The structural stages for all lands other than the BLM-administered lands are classified using data from the Interagency Vegetation Mapping Project (IVMP), which uses satellite imagery to classify attributes of forest vegetation. See *Appendix B. Ecology*. Moeur et al. (2005) discuss the accuracy of mapping forest vegetation from IVMP data and conclude that it provides the best practice for classifying forest vegetation across all

ownerships in a region (Moeur et al. 2005, 18-30, 108-109, 123-128). Those discussions are incorporated by reference. The BLM-administered lands are classified for both the current and future conditions based on OPTIONS model outputs rather than IVMP data.

For analyses across all ownerships, the four classes of structural stages that are defined above are reduced to three classes—combining structurally complex and mature, which is equivalent to late-successional forest in other analyses. IVMP data cannot reliably distinguish between mature and structurally complex forests (Spies 2006; Moeur et al. 2005, 103-104). This analysis will refer to this combined class as mature&structurally complex forest.

Average Historic Conditions

This analysis compares the abundance and spatial patterns of the structural stages to average historical conditions, as did the FEMAT report and the Northwest Forest Plan FSEIS.

The FEMAT report estimated that 60 to 70% of the region was historically in mature&structurally complex forests (FEMAT, IV-51). At the scale of the physiographic provinces (e.g., the Coast Range), the amount of mature&structurally complex forests probably fluctuated between approximately 50 to 85% of the landscape (Spies 2006; Nonaka and Spies 2005; Wimberly 2002; Wimberly et al. 2000; Rasmussen and Ripple 1998).¹ The FEMAT report (with its focus on late-successional forest) did not characterize the abundance or spatial patterns of forest conditions other than for late-successional forests.

This analysis uses the descriptions of average historic conditions from Nonaka and Spies (2005) and the draft Rapid Assessment Reference Condition Model (USDA, USDI 2005a). Historic landscape conditions were dynamic, and the abundance of structural stages varied over time. Spies (2006) noted further that “no single point or short period can realistically be used to characterize this dynamic system.” However, comparing effects over time under multiple alternatives to a range of conditions would have the following problems.

- There are no existing characterizations of the range of historic conditions that match the geographic scale of the planning area.
- The magnitude of the range of historic conditions is highly dependent upon the spatial scale of analysis, and the range is so wide at fine scales as to be uninformative (Wimberly et al. 2000).
- A comparison to a range of conditions would not provide for a clear comparison of the alternatives.

Note that these studies modeled the historic range of variability for the Coast Range. Descriptions of the reference conditions vary for the other provinces (USDA, USDI 2005a), but these results are consistent with the region-wide estimates in the FEMAT report.

See *Appendix B. Ecology* for the average historical conditions and the historic range of variability). Therefore, this analysis uses average historic conditions rather than a historic range of variability as a benchmark for comparing the effects of the alternatives.

For the entire planning area, this analysis uses average structural stage abundance and spatial patterns from Nonaka and Spies (2005), which modeled historic conditions in the Coast Range. Although this research was conducted on only a portion of the planning area, it presents the only available description of historic spatial patterns at a broad scale, and the abundance results are consistent with the region-wide estimates of late-successional forest in the FEMAT report. The age classes in Nonaka and Spies were combined for comparison to the structural stages in this analysis. Average historic conditions adapted from Nonaka and Spies approximately correlate to 5% stand establishment, 15% young, 25% mature, and 55% structurally complex.

Wimberly (2002) also modeled historical ranges of variability in the Coast Range and found slightly different median average values, which would correlate to 17% stand establishment; 21% young; 16% mature; 42% structurally complex. Forest classes were defined differently in Wimberly. Notably, Wimberly defined the early successional forests, which correlate to stand establishment forests here, more broadly than Nonaka and Spies. Also, Wimberly assumed that both high-severity and moderate-severity fires reestablished early successional forests, whereas Nonaka and Spies assumed that only high-severity fires reestablished early successional forests (Nonaka and Spies 2005, 1737). Finally, comparison of mean averages from one model to median averages from another model is inherently problematic. Neither of these characterizations of average historic conditions is definitive, and the analysis here is attempting to make use of average values rather than a range describing the variability of a dynamic system. Using the average historic conditions from Wimberly as a benchmark for the comparison of alternatives would necessarily yield different conclusions about the absolute relationship of the effects of a specific alternative to average historic conditions. However, using a different benchmark for average historic conditions would not alter conclusions about the relative effects of the alternatives.

For individual physiographic provinces, this analysis uses the description of structural stage abundance from the draft Rapid Assessment Reference Condition Model (USDA, USDI 2005a). These models derive historic abundances by modeling disturbance probabilities that are generated from mean fire-return intervals combined with the probabilities of other disturbances (such as wind, insect, and pathogens). These models describe the average amount of the landscape that would be expected in each of the broad vegetation classes, which are roughly equivalent to the structural stages used in this analysis. The Coast Range and Western Cascades provinces are compared to

the Douglas fir hemlock wet-mesic model.² The Klamath province is compared to the mixed conifer-southwest Oregon model. The Eastern Cascades province is compared to the dry ponderosa pine-mesic model. These reference condition models provide representative descriptions of common conditions in each province. However, the provinces include other models, some of which describe other patterns of abundance. For example, the Coast Range and Western Cascades provinces include the Douglas fir Willamette Valley foothills model, which describes more stand establishment and young forest (15% and 25%, respectively). The Klamath province includes the Oregon coastal tanoak model, which describes more young forest (60%).

Abundance of Structural Stages

Stand establishment forests currently comprise 48% of the forested lands within the planning area across all ownerships. See *Table 66 (Current structural stage abundance on forested lands)*.³ Stand establishment forests have declined on BLM-administered and Forest Service lands and are becoming restricted to nonfederal lands. Despite the decline on federal forests, stand establishment forests across all ownerships are still above average historical conditions.

Intensive forest management practices on forest industry lands (including site preparation, rapid and dense replanting, and herbicide application) simplify the structure and composition of stand establishment habitat and shorten the time until canopy closure. As a result, stand establishment forests created by timber harvesting lack the habitat complexity and legacy components typical of stand establishment forests following natural disturbances (Spies 2006; Ohmann et al. 2005; Cohen et al. 2002; Franklin et al. 2002; Aber et al. 2000; Perry 1998).

On BLM-administered lands, stand establishment forests currently comprise 7% of forest-capable lands, which is close to average historical conditions. These forests are predominately (79%) stand establishment forests without structural legacies, resulting from regeneration harvesting before the Northwest Forest Plan.

Young forests currently comprise 17% of the forested lands within the planning area across all ownerships. See *Table 66 (Current structural stage abundance on forested lands)*, which is above average historical conditions. Young forests on BLM-administered lands are predominately high-density, even-aged managed

² Analysis of structural stage abundance by physiographic province splits the small acreage of BLM-administered lands in the Willamette Valley province at Interstate 5 and combines the resultant portions with the Coast Range and West Cascades provinces.

³ Current condition structural stage abundance differs slightly among the alternatives because of differences in how the inventory information is assembled for modeling under each alternative. The structural stage classification is made based on the Organon growth and yield curve attributes. The assignment of groupings of stands to specific yield curves varies among the alternatives, which results in slightly different current conditions. In addition, the classification for Alternatives 2 and 3 improved the identification of open water as non forest. Therefore, the following descriptions of current conditions use the 2006 data from Alternative 3.

stands. Most of these stands were established following timber harvesting and intensive site preparation practices. This management history has created stands with a homogeneous structure, uniform tree composition, and high tree density. These young forests are developing along a trajectory that is fundamentally different from that experienced by most of the existing structurally complex forests on BLM-administered lands (Muir et al. 2002; Poage and Tappeiner 2002; Sensenig 2002; Tappeiner et al. 1997).

On BLM-administered lands, young forests currently comprise 42% of forest-capable lands. These are predominately (78%) young forests without structural legacies.

Mature&structurally complex forests currently comprise 35% of forested lands within the planning area across all ownerships. See *Table 66 (Current structural stage abundance on forested lands)*. The abundance of mature&structurally complex forests within the planning area is well below the average historical condition of 80%.

On BLM-administered lands, mature&structurally complex forests together currently comprise 51% of forest-capable lands. Mature forests comprise 28% and structurally complex forests comprise 23% of forest-capable lands. Mature forests are predominately (82%) mature forests with multilayered canopies. Structurally complex forests are predominately existing old forest (60%) with a smaller amount of developed structurally complex (37%) (i.e., stands that meet the defining attributes of structurally complex but are identified as less than 200 years old in the current inventory), and only a very small amount of existing very old forest (3%). While establishing accurate stand ages for unmanaged stands is problematic, as described above, structurally complex forests on BLM-administered lands are dominated by stands that are less than 400 years old. This is in contrast to the extensive acreage of structurally complex forest in national forests in the Western Cascades province (most of which is 400 to 500 years old) (Weisberg and Swanson 2003).

Table 66. Current structural stage abundance on forested lands

Structural Stage Abundance	Acres	Physiographic Provinces				Totals per Stage
		Coast Range	Western Cascades	Klamath	Eastern Cascades	
Stand Establishment	All ownerships	3,393,000	2,362,000	1,812,000	209,000	7,776,000
	BLM only	34,000	48,000	68,000	5,000	155,000
Young	All ownerships	790,000	1,295,000	441,000	159,000	2,685,000
	BLM only	340,000	274,000	278,000	11,000	902,000
Mature&Structurally Complex	All ownerships	1,487,000	2,694,000	1,225,000	211,000	5,617,000
	BLM only	370,000	311,000	427,000	32,000	1,140,000
Totals per Province	All ownerships	5,670,000	6,352,000	3,478,000	578,000	16,078,000
	BLM only	743,000	633,000	773,000	49,000	2,197,000
Current Condition	All ownerships					
	BLM only					
Historical Average Condition of Forested Lands (USDA, USDI 2005a)						

Hardwood stands are typically dominated by red alder or big leaf maple in the Coast Range and Western Cascades provinces, by madrone and oaks in the Klamath province, and by tanoak in the coastal portion of the Klamath province. Hardwood stands provide many ecological functions that are distinct from conifer stands and are hotspots for biological diversity (Kennedy and Spies 2005). Red alder stands are particularly noted for nitrogen fixation and high-nitrogen litter (Harrington 2006; Compton et al. 2003). The nitrogen levels in alder stands generally contribute to high growth rates for trees, but nitrogen inputs by alder stands on sites that are already nitrogen rich may lead to nutrient imbalances, which may predispose coastal Douglas fir stands to intensification of Swiss needle cast disease (Perakis et al. 2006; Compton et al. 2003; Maguire et al. 2000). Other hardwood stands, especially dry upland sites dominated by oaks, madrone, or tanoak, are characterized by a lower soil fertility and have nitrogen levels that are more limited.

It is not possible to quantify the abundance or map the location of hardwood stands at this scale of analysis. Hardwood stands are often interspersed with conifer stands throughout the planning area. For example, red alder-dominated riparian stands are typically classified together with the adjacent upland conifer stand. In southwestern Oregon, oak, madrone, or tanoak stands are typically finely interspersed with conifer stands without discrete boundaries. Both cases generally result in classifying the stand as mixed or conifer-dominated in forest inventories. In the Coast Range province, Ohmann et al. (2005) modeled hardwood stand abundance as approximately 7% of the landscape across all ownerships. Hardwood abundance is likely lower in the Western Cascades and Eastern Cascades provinces, and higher in the Klamath province.

Spatial Patterns of Structural Stages

The spatial arrangement of forest structural stages influences fundamental ecosystem processes, such as the flows of energy, materials, and organisms (Nonaka and Spies 2005; Forman 1995). In addition to the abundance of structural stages, this analysis describes the spatial patterns of structural stages to evaluate forest fragmentation and connectivity.

Fragmentation is the breaking up of large habitat areas into smaller patches. Fragmentation is often coupled with habitat loss. The two processes together have a cumulative effect that can result in an overall reduction in biological diversity. The populations of species that are associated with mature&structurally complex forests are more likely to decline in a fragmented landscape because of the smaller patches of suitable habitat and the greater isolation from neighboring populations (Jules 1998; Forman 1995; FSEIS, 3&4-29 to 3&4-31). As habitat is fragmented, the connectivity of the habitat decreases. Beyond some threshold, fragmentation disrupts connectivity of the habitat and contributes to population declines. Such thresholds are poorly understood for most species and depend on the scale at which a species interacts with its habitat (With and Crist 1995).

Larger habitat patches can support greater species diversity. For many species that are associated with mature&structurally complex forests, patches below a certain size are no longer suitable habitat. However, these minimum patch sizes are highly species-specific (to the limited extent they have been quantified). For example, Carey et al. (1992) suggest that a breeding pair of northern spotted owls requires a mature&structurally complex forest patch of about 2,000 acres in mixed conifer forests, whereas marbled murrelets use much smaller patches for nesting (ranging from 7 to 368 acres) (Ralph et al. 1995). Smaller patch size leads to increased amounts of edge habitat and decreased amounts of interior forest habitat. Edge habitats are created where contrasting habitat types abut. Edges between mature&structurally complex forests and stand establishment or young forests are characterized by altered microclimate and altered biological interactions (Forman 1995, 412-415). The depth of edge habitat varies for specific biophysical characteristics and ecological processes, and is strongly

influenced by the degree of contrast between habitat types and such physical conditions as slope and aspect.

This analysis examines spatial patterns of the forested landscape using FRAGSTATS, a spatial patterns analysis program for categorical maps. See *Appendix B. Ecology*. FRAGSTATS quantifies the aerial extent and spatial configuration of patches within a landscape. The user defines and scales the landscape (including the extent and grain of the landscape) and the scheme upon which patches are classified and delineated. For a given landscape mosaic, FRAGSTATS computes several metrics for:

- each patch in the mosaic;
- each patch type (class) in the mosaic; and
- the landscape mosaic as a whole.

For this analysis, patches are delineated as stand establishment, young, or mature&structurally complex forest. As noted above, the IVMP data used to classify non-BLM-administered lands cannot reliably distinguish between mature and structurally complex forest, and therefore these structural stages are combined for this portion of the analysis. Additionally, the contrast between mature and structurally complex forest patches is too low to constitute an edge for many important ecological processes (such as the habitat for the northern spotted owls). Nonforest is not included in the spatial analysis.

FRAGSTATS produces a wealth of metrics, many of which are highly correlated. For any given analysis of spatial patterns, many of the metrics do not reveal clear patterns. The analysis here uses the following metrics:

- mean patch size (mean average of the distribution of patch sizes); and
- connectance index (number of functional joinings between patches of the same structural stage; this analysis defines patches as functionally joined if they are within 1,969 feet (600 m)).

Results for additional metrics are included in the *Appendix B. Ecology*.

Spatial patterns are analyzed by province for BLM-administered lands, because the entire planning area comprises too large a database for computing many of the metrics. For all ownerships, even the province comprises too large a database for computing most metrics, including connectance. Therefore, only mean patch size is computed for all ownerships at the province scale. See *Table 67 (Current mean patch size by structural stage by province)*.

Table 67. Current mean patch size by structural stage by province

Structural Stages	Current Mean Patch Size (acres)	Physiographic Provinces			
		Coast Range	Western Cascades	Klamath	Eastern Cascades
Stand Establishment	All ownerships	25.5	29.2	30.2	44.4
	BLM only	44.3	21.5	41.9	14.5
Young	All ownerships	104.4	82.1	65.0	49.3
	BLM only	5.8	8.0	6.2	11.1
Mature&Structurally Complex	All ownerships	110.8	106.6	137.3	182.8
	BLM only	15.3	28.4	28.8	28.2

Note: Because the 2006 data differs slightly for the alternatives (as explained above), the spatial configuration differs among the alternatives. As with the abundance data above, the spatial pattern results for 2006 use data from Alternative 3.

The changes in spatial patterns over time from this analysis can be compared to the measures of spatial patterns from other studies or estimates of average historic conditions of spatial patterns to provide a qualitative evaluation of overall trends. However, a direct comparison of the absolute values of the spatial pattern measures should be made with caution. Measures of spatial patterns are highly dependent on the spatial extent of the analysis, the resolution of the data (i.e., the grain size), and the classification scheme (in this analysis, the structural stage classification). As these factors differ, the absolute values in the results will differ. For example, connectance is higher in the Eastern Cascades province than in other provinces for all structural stages partly because the spatial extent of this province is much smaller than the other provinces. See Table 68 (*Current connectance on BLM-administered lands by structural stage by province*). The spatial extent, grain size, and classification scheme in this analysis differ from studies of historic spatial patterns within the planning area (Nonaka and Spies 2005; Wimberly 2002). Therefore, the results here should be compared to the results from those studies only to evaluate relative trends in spatial patterns, not to make a direct comparison of the absolute values of the specific spatial pattern measures.

Table 68. Current connectance on BLM-administered lands by structural stage by province

Structural Stages	Physiographic Provinces			
	Coast Range	Western Cascades	Klamath	Eastern Cascades
Stand Establishment	0.13	0.13	0.10	2.42
Young	0.09	0.10	0.08	1.22
Mature & Structurally Complex	0.09	0.11	0.10	1.64

Ecological Conditions at the Province Scale

The FEMAT report and the Northwest Forest Plan FSEIS provide general descriptions of the existing conditions at the province scale (FEMAT, IV-6 to IV-11; FSEIS, 3&4-16 to 3&4-28), but did not explicitly analyze the effects of the alternatives at the province scale. The six resource management plans and environmental impact statements (RMPs/EISs) for the six districts within the planning area described the vegetation communities, the characteristics of the stages of forest development, and the biological diversity and ecological health of the forest ecosystems within each BLM district. Each district analysis concluded, consistent with the FEMAT report and Northwest Forest Plan FSEIS, that late-successional forests have been reduced in abundance and highly fragmented by past timber harvesting and other land management activities (USDI, BLM 1994a, 3-23 to 3-39; USDI, BLM 1994b, 3-34 to 3-46; USDI, BLM 1994c, 3-18 to 3-45; USDI, BLM 1994d, 3-30 to 3-57; USDI, BLM 1994e, 3-17 to 3-42; USDI, BLM 1994f, 3-21 to 3-41, 3-63 to 3-66, 3-79 to 3-82). Those analyses are incorporated by reference.

Current conditions across in the Coast Range, Western Cascades, and Klamath provinces generally reflect the structural stage abundance and spatial patterns described for the planning area as a whole. The Eastern Cascades province differs from the other provinces in many measures of structural stage abundance and spatial patterns partly because of its differing ecological conditions and management history. However, these different patterns have little effect on the overall pattern for the planning area, because the Eastern Cascades province makes up only 2% of the BLM-administered forest lands modeled within the planning area.

Coast Range

The natural disturbance regime in much of the Coast Range province is characterized by infrequent, high-intensity fires and windstorms. Average historic forest conditions were 79% mature&structurally complex forests, 16% young forests, and 5% stand establishment forests (USDA, USDI 2005a).

Currently, the Coast Range province has more stand establishment forests and less mature&structurally complex forests than it did historically. The Coast Range province has little remaining mature&structurally complex forests, most of which are mature forests with highly fragmented patches of structurally complex forests, primarily on BLM-administered lands (FSEIS, 3&4-21, 3&4-25, 3&4-27). The mature&structurally complex forests currently comprise 26% of all forest lands in the province (50% of BLM-administered lands). Stand establishment forests currently comprise 60% of all forest lands in the province (5% of BLM-administered lands). See *Table 66 (Current structural stage abundance on forested lands)*.

The spatial patterns of structural stages in the Coast Range province has been strongly altered from historic conditions (Nonaka and Spies 2005; Wimberly 2002). Current spatial patterns in the Coast Range are characterized by small, scattered patches of mature&structurally complex forest set in a matrix of young and stand establishment forests. Mean patch size and connectance of mature&structurally complex forest is lower than average historic conditions (Nonaka and Spies 2005).

On BLM-administered lands, stand establishment forests are in fewer and smaller patches than young or mature&structurally complex forest, which is consistent with the overall abundance of structural stages.

Red alder stands in the Coast Range have increased in abundance since the 1930s (Wimberly and Ohmann 2004), but it is unknown how current hardwood abundance compares with the historical range of variability (Ohmann et al. 2005; Long et al. 1998). The current distribution and abundance of red alder stands in the Coast Range has been considered by some to be an unnatural artifact of past timber harvesting practices (FEMAT, V-25). The increase in red alder stands is not continuing throughout the Coast Range. The abundance of red alder stands in the central Coast Range has been declining in recent decades, in contrast to the southern Coast Range (Kennedy and Spies 2005; Wimberley and Ohmann 2004). Forest management practices will likely reduce the abundance of red alder stands within the planning area (Spies 2006; Alig et al. 2000).

Swiss needle cast, caused by the native fungus, *Phaeocryptopus gaeumannii*, has recently caused substantial growth loss of Douglas fir, primarily in young plantations within 30 miles of the coast (Kanaskie et al. 2005; Maguire et al. 2000; USDI, BLM 1994a, 3-27). Possible reasons for the increased effects of Swiss needle cast include shifting plantation composition to pure Douglas fir on sites that previously supported Sitka spruce, western red-cedar, and western hemlock; past planting of off-site Douglas fir; climate changes; and soil nutrition changes (Perakis et al. 2006; Campbell and Liegel 1996).

Western Cascades

The natural disturbance regime in the Western Cascades is complex with moderate or highly variable fire frequencies and intensities. Average historical conditions are similar to the Coast Range (USDA, USDI 2005a).

Like the Coast Range and Klamath provinces, the Western Cascades province currently has more stand establishment forest and less mature&structurally complex forest than average historical conditions. Nevertheless, the Western Cascades province currently has greater amounts of mature&structurally complex forests than other provinces, especially on Forest Service lands (FSEIS, 3&4-19, 3&4-20, 3&4-25, 3&4-27). Mature&structurally complex forests currently comprise 43% of all forest lands in the province (49% of BLM-administered lands). Stand establishment forests currently comprise 37% of all forest lands in

the province (8% of BLM-administered lands). See *Table 66 (Current structural stage abundance on forested lands)*.

There are no studies modeling the historic spatial patterns in the Western Cascades comparable to those done in the Coast Range, which approximated a range of historic patch sizes (Cissel et al. 1999). The overall comparison to current conditions is likely similar to the Coast Range with a current mean patch size and connectance of mature&structurally complex forest that is lower than average historic conditions.

As in the Coast Range, stand establishment forests on BLM-administered lands are in fewer and smaller patches than young or mature&structurally complex forest, which is consistent with the overall abundance of structural stages.

Klamath

The natural disturbance regime in much of the Klamath province is characterized by frequent, low-intensity fires. Forests in the Klamath province are highly fragmented by natural factors, and past cutting has resulted in many mixed-age stands (FSEIS, 3&4-22, 3&4-25, 3&4-27). Average historic forest conditions in most of the province were 70% mature&structurally complex forests, 15% young forests, and 15% stand establishment forests (mixed conifer southwest Oregon reference condition model; USDA, USDI 2005a). Other reference condition models are applicable in smaller portions of the province. For example, the Oregon coastal tanoak model, applicable to the coastal portions of the province, describes average historical forest conditions as 30% mature&structurally complex forests, 60% young forests, and 10% stand establishment forests (USDA, USDI 2005a). The dry ponderosa pine-mesic model, applicable to the dry sites in the eastern portion of the province, describes average historical forest conditions as 45% mature&structurally complex forests, 45% Young forests, and 10% Stand Establishment forests (USDA, USDI 2005a).

Like the Coast Range and Western Cascades, the Klamath province currently has more stand establishment forests and less mature&structurally complex forests than it did historically. Mature&structurally complex forests currently comprise 35% of all forest lands in the province (55% of BLM-administered lands). Stand establishment forests currently comprise 52% of all forest lands in the Klamath province (9% of BLM-administered lands). See *Table 66 (Current structural stage abundance on forested lands)*.

There are no studies modeling the historic spatial patterns in the Klamath province comparable to those done in the Coast Range. Historic spatial patterns were likely more variable and difficult to characterize, because of the complex interaction of highly variable geology and climate with the highly variable disturbance regimes. Therefore, comparisons to the historic spatial patterns for the province would be speculative.

As in the Coast Range and Western Cascades provinces, stand establishment forests on BLM-administered lands are in fewer and smaller patches than young or mature&structurally complex forests. The disparity in the patch size between stand establishment forests and young forests is less. The patch size of mature&structurally complex forests is larger than in the Coast Range or Western Cascades, which is consistent with the overall abundance of structural stages.

In the coastal Klamath province, Port-Orford cedar root rot, caused by the introduced pathogen, *Phytophthora lateralis*, has been killing Port-Orford cedar (*Chamaecyparis lawsoniana*). The supplemental environmental impact statement for management of Port-Orford cedar in southwest Oregon (USDA, USDI 2004b) described the ecological role of Port-Orford cedar, the spread of the disease, and the effects of different management actions to control the disease. That analysis concluded that the rate of the spread of the disease is decreasing, and that Port-Orford-cedar is not in danger of extirpation (USDA, USDI 2004b, 3&4-19 to 3&4-52). That analysis is incorporated by reference.

In the Klamath province, fire suppression has shifted fuel loads and tree species composition, which has made these stands more susceptible to drought-induced mortality, insect and disease mortality, and high-intensity, stand-replacing fires (Taylor and Skinner 2003; Frost and Sweeney 2000; FSEIS, 3&4-22; USDI, BLM 1994e, 3-24 to 3-26).

Eastern Cascades

Forests in the Eastern Cascades are highly fragmented by natural factors. The natural disturbance regime in much of the region is characterized by frequent, low-intensity fires. (FSEIS, 3&4-20, 3&4-21, 3&4-25, 3&4-27). The average historic forest conditions in the province were 45% mature&structurally complex forests, 45% young forests, and 10% stand establishment forests (USDA, USDI 2005a).

The Eastern Cascades province currently has slightly less mature&structurally complex forests, less young forests, and more stand establishment forests than it did historically. The mature&structurally complex forests currently comprise 36% of all forest lands in the province (66% of BLM-administered lands). Young forests currently comprise 27% of all forest lands in the province (23% of BLM-administered lands). Stand establishment forests currently comprise 37% of all forest lands in the province (11% of BLM-administered lands). See *Table 66 (Current structural stage abundance on forested lands)*.

The classification of structural stages in the Eastern Cascades province and the characterization of average historic conditions is more challenging than in any other province. The prevailing frequent, low-intensity fire regime produced stands that are difficult to classify. Most descriptions of the average historic abundance, including the estimates used above, would estimate greater abundance of stand establishment forest if all stands that were partially disturbed (such as by moderate- or low-severity fires) were classified as stand establishment forest.

There are no studies that are modeling the historic spatial patterns in the Eastern Cascades province comparable to those that were done in the Coast Range. The historic spatial patterns were likely very different from the Coast Range, because the frequent, low-intensity fire regime in the Eastern Cascades province would have produced a more fine-grained mosaic of structural stages.

The total acreage of the Eastern Cascades province within the planning area is far less than in the other provinces, which complicates the direct comparison of the measures of spatial patterns with other provinces. The extent of the landscape analyzed alters the absolute values of spatial pattern metrics, as explained above. As in the other provinces, stand establishment forests on BLM-administered lands in the Eastern Cascades province are in fewer and smaller patches than mature&structurally complex forests. However, unlike other provinces, the spatial patterns of young forests are similar to stand establishment forests, which is consistent with overall abundance. The Eastern Cascades has the lowest percentage of Young forest on BLM-administered lands of all the provinces within the planning area.

In the Eastern Cascades province, as in the Klamath province, fire suppression has shifted fuel loads and tree species composition, which has made these stands more susceptible to drought-induced mortality, insect and disease mortality, and high-intensity, stand-replacing fires (FSEIS, 3&4-20, 3&4-21; USDI, BLM 1994f, 3-24, 3-63 to 3-66, 3-79 to 3-82).

Socioeconomics

Key Points

- A comprehensive measure of community health and resiliency does not exist.
- The Oregon primary wood products sector employs 51,900 workers that earn \$1.9 billion annually, which is about 3.2% of Oregon's total wages.
- In total, the counties rely on BLM-associated revenues for about 2.7% of their budgets. BLM revenues, however, account for 9.2% of their discretionary revenue ranging from less than 1% for larger metropolitan counties to up to 70% for rural counties.
- Without funding under the Secure Rural Schools Act, BLM payments to counties would fall about 90%.
- There is currently a strong market for wood products in western Oregon. There is adequate capacity to process larger logs that would come from BLM lands.

The management of BLM-administered lands contributes to the economic activity in western Oregon communities and can be measured. For example, timber harvesting and manufacture of wood products creates jobs and income in these sectors, which in turn stimulates economic activity in other sectors of local and regional economies. BLM employees, and BLM management expenditures also contribute to local economies. Approximately 50% of revenues received from timber harvesting on O&C lands, furthermore, flow directly to the county governments and is used to fund a variety of social services and investments.

Receipts from such nontimber sources as special forest products (approximately \$300,000 annually) and grazing receipts (\$30,000 to \$40,000 annually) is relatively minor and would not vary between the alternatives. The nonmarket values (e.g., wildlife, recreation, and water quality) are not included in this analysis.

Oregon is a growth state with a history of relatively steady in-migration. The 2006 state population of 3.7 million has slightly more than doubled (109%) since 1960. In western Oregon, population growth is spatially concentrated and rates vary considerably by the nature of the economic base. See *Figure 26 (Oregon population growth by county group)*. Portland's metro counties (Clackamas, Columbia, and Washington, excluding Multnomah) started from a relatively low base but grew three times more rapidly (302%) during the same era. The central Willamette Valley counties (Benton, Marion, Polk, and Yamhill) grew 151%. Counties that are focused on wood products (Douglas, Jackson, Josephine, Klamath, Lane, and Linn) kept pace with state growth (103%). Only the coastal county group (Coos, Curry, Lincoln, and Tillamook) had significantly below average population growth (37%).

Figure 26. Oregon population growth by county group

County economies typically had a resource-based history (agriculture and wood products). A dominance of public land ownership gave federal forest policy shifts large influences over the evolution of those economies. Through most of the twentieth century, increasing federal harvests expanded local wood products industries. Since World War II, technological progress gradually decreased worker/output ratios. During the 1990s, federal harvest reductions under the Northwest Forest Plan led to a reduction in wood products sector jobs, wages, and salaries in most of the county economies.

Changes in county economies vary by county. There are differences in timber substitution capacity, contemporary economic diversity, and opportunities for alternative economic development. See Figure 27 (*Coos and Washington county wage and salary income as a percent of total income*). Both counties experienced declining wage and salary income from the wood products sector but differed in the nature of income replacement. In Coos County, the percentage of income attributable to wages and salaries declined continuously due to decreasing wood products manufacturing and an increasing share of unearned income derived from retirement. Growth in the diversified Washington County economy, on the other hand, replaced resource sector incomes with increased wages in other developing sectors. The figure's comparison is in proportional terms to normalize the fact that the Washington County economy is 25 times larger.

Figure 27. Coos and Washington county wage and salary income as a percent of total income

In most cases, these new trajectories become permanent redirections. As returning these economies to their historic structures is unlikely, this analysis considers the 2005 base year structure as a stable reference point for evaluating any new economic changes.

The economies of the O&C counties vary in the magnitude, type, and diversity of economic activity. These differences affect the patterns of how each economy might be changed by new external effects. The initial size of each county economy can be profiled with three primary indicators. These are industrial output, total employment, and earnings. See *Table 69 (2005 county economy indicators)*.

These measures show a wide range of differences between the county economies. Curry County is a small economy with the region's lowest output, employment, and earnings. Washington County, on the other hand, has 49 times more industrial output, 25 times more employment, and 45 times more earnings. More detailed indicators (not shown) reveal quality-of-life implications as well. Curry County's average annual wage is \$26,200 compared to \$46,400 for Washington County.

Table 69. 2005 county economy indicators

County	Industrial Output (\$1,000)	Employment (total jobs)	Earnings (\$1,000)
Benton	4,208,367	37,603	1,416,139
Clackamas	19,046,826	197,405	6,994,767
Columbia	1,708,099	14,182	390,413
Coos	2,171,795	28,792	797,151
Curry	762,355	10,726	281,937
Douglas	4,732,462	52,770	1,469,009
Jackson	8,364,619	103,612	3,247,024
Josephine	2,676,289	37,253	1,033,446
Klamath	2,719,816	34,179	1,024,239
Lane	15,445,518	178,924	5,729,986
Lincoln	1,797,597	21,560	606,118
Linn	5,010,081	50,568	1,619,544
Marion	14,249,826	157,199	5,782,895
Polk	1,682,760	22,499	624,709
Tillamook	1,170,965	10,985	306,070
Washington	37,563,913	272,210	12,626,678
Yamhill	3,492,580	37,928	1,129,303
Region Total	126,803,868	1,268,395	45,079,428

The economic impact analysis (see *Chapter 4*) estimates the implications of three large external effects on each county economy between the base reference year of 2005 and the impact year of 2009.

These large external effects on each county are (Adams and Latta 2007):

- loss of Secure Rural School payments to counties,
- BLM’s selection and implementation of one of the management alternatives in the plan revision, and
- structural changes in the plywood industry projected by the WOR model.

By artificially isolating the first two policy-driven effects, the county-level input-output models can estimate the roles of each effect in these county economies. *Table 70 (2005 county economy dependence on Secure Rural Schools and BLM effects)* shows the relative influence of combined Secure Rural School payments and current BLM harvest levels as of 2005. Using current employment as an indicator of impact, *Table 70* also shows that the Secure Rural School funding and BLM expenditures account for a very small portion of the jobs in Washington County and up to 4.18% of the jobs in Douglas County. Counties with small portions of their economies dependent on Secure Rural School and BLM activities (less than 0.5%) would likely experience little overall impact from projected changes.

Table 70. 2005 county economy dependence on Secure Rural Schools and BLM effects

County	Industrial Output (%)	Employment (%)	Earnings (%)
Benton	0.23%	0.31%	0.28%
Clackamas	0.18%	0.13%	0.16%
Columbia	0.29%	0.37%	0.46%
Coos	1.63%	1.42%	1.80%
Curry	1.83%	2.19%	2.39%
Douglas	4.33%	4.18%	4.70%
Jackson	1.69%	1.56%	1.70%
Josephine	1.40%	1.26%	1.57%
Klamath	2.12%	1.67%	2.13%
Lane	1.18%	1.11%	1.35%
Lincoln	0.50%	0.66%	0.70%
Linn	0.84%	0.78%	0.99%
Marion	0.20%	0.17%	0.23%
Polk	0.24%	0.24%	0.30%
Tillamook	0.49%	0.72%	0.81%
Washington	0.01%	0.01%	0.01%
Yamhill	0.23%	0.16%	0.21%
Region Total	0.65%	0.71%	0.71%

Higher percentages in *Table 70* typically reflect a higher dependence on Secure Rural Schools funding, an economic concentration in woods products industries, and the location of BLM administrative units. Even though influence percentages appear small, their effects would be concentrated in specific sectors, which could concentrate the effects of any changes.

Together, the three external effects are expected to cause somewhat countervailing impacts spread to different sectors. The loss of the Secure Rural School payments would reduce jobs and income in county government. Increased BLM timber harvesting would increase wood products employment, but industrial contractions in the plywood sector would reduce jobs there. As a result, the economic response in any county depends as much on the internal economic structure of the county as well as its overall size. *Table 71 (2005 county economy grouped income patterns)* classifies each county into one of four indicative types defined by their general economic structure and diversity. Each type would react to changes differently.

Table 71. 2005 county economy grouped income patterns

Counties by Indicative Type	Sources of Income					
	Wage and Salary	Business Profits	Unearned DIR	Unearned Transfers	Commuting	Seasonal Homes
Coastal Counties						
Coos	46%	13%	16%	22%	1%	2%
Curry	26%	9%	31%	27%	5%	3%
Lincoln	31%	11%	17%	30%	2%	10%
Tillamook	38%	13%	16%	16%	3%	14%
Wood Products						
Douglas	49%	17%	7%	22%	4%	1%
Jackson	53%	13%	16%	16%	2%	0%
Josephine	45%	13%	14%	22%	5%	1%
Klamath	39%	10%	19%	28%	2%	2%
Lane	53%	16%	14%	15%	3%	1%
Linn	44%	13%	10%	16%	17%	0%
Central Willamette						
Benton	47%	17%	18%	8%	8%	0%
Marion	53%	13%	11%	13%	10%	0%
Polk	30%	7%	16%	13%	33%	0%
Yamhill	40%	12%	12%	12%	23%	0%
Portland Metro						
Clackamas	41%	14%	12%	8%	25%	0%
Columbia	22%	10%	19%	23%	25%	0%
Washington	48%	26%	8%	6%	11%	0%

The indicative types that the counties fit into are described as follows:

- **Coastal.** Counties on the coast have a relatively small percent of income derived from wage and salary employment. Seasonal home spending is proportionately larger than the rest of Oregon, particularly nearer Portland on the northern coast. Curry County has relatively larger property income (DIR) and transfers indicating retirees with higher incomes.⁴
- **Wood Products.** Counties that are based on wood products combine the highest proportions of wage and salary income with lower property incomes. Linn County is a bit of anomaly because of its high commuting rates--presumably to high wage jobs in Salem, Corvallis, and Eugene.

⁴ DIR is the aggregate total of a category of unearned (or property) income “dividend, interest and rents”. High DIR is typically associated with a retirement services economy.

- **Central.** Counties in the central Willamette Valley have significantly more commuting and earned income proportions (wage and salary income plus commuting). Earned income accounts for more than 60% of total income in these counties. These counties have the lowest overall percent of retirees and the lowest proportion of social security income.
- **Portland Metro.** Counties surrounding the Portland metropolitan area have very high commuting. Washington County has the lowest commuting, because its high tech jobs cluster is itself a job magnet. Retirement income (transfers) tends to be low except for Columbia County which contains a significant retiree population.

Another way of describing the county economic structures is through location quotients. This index measures how the economic concentration for one economic sector in a county compares to the national average concentration for that same sector. A location quotient much larger than 1.0 in the wood products sector, for example, indicates that the county has a higher than average concentration in that sector, and may reflect a relatively specialized economic base that is more sensitive to changes.

Location quotients reveal that western Oregon is still a wood products region. County wood products cluster location quotients are very large for 15 of the 17 counties. See *Figure 28 (County economies with high wood products sector location quotients (LQ))*. The large number of high location quotients indicate how sensitive those county economies might be to BLM harvest changes.

Figure 28. County economies with high wood products sector location quotients (LQ)

Although several measures of socioeconomic well-being, community capacity, and community resiliency have been developed, no universally accepted measures exist. Community capacity and community resiliency are fundamentally about dynamic processes that involve the actions of community leaders and residents. Leadership, social cohesion, and decision making are important to how a community adapts to change and betters the lives of its residents, but they are not attributes that can be easily measured.

Causality between changes in forest management policy and some community socioeconomic conditions is difficult to demonstrate. The social and economic well-being index and scores for western Oregon communities were developed as part of the Northwest Forest Plan Socioeconomic Economic Monitoring report (USDA, U.S. Forest Service 2006a). The index consists of six indicators:

- diversity of employment by industry
- percentage of population that is 25 years and older with a bachelor's degree or higher
- percentage unemployed
- percentage of persons living below the poverty level
- household income inequality
- average travel time to work

Many communities in western Oregon either increased or decreased in their social and economic well-being score between 1990 and 2000. See *Figure 29 (Change in socioeconomic well-being scores from 1990 to 2000 in the northern portion of the planning area)* and *Figure 30 (Change in the socioeconomic well-being scores from 1990 to 2000 in the southern portion of the planning area)* for a summary of the direction and magnitude of change in this index. The communities were examined by population size class; small, medium, and large communities. The smaller community size classes of 501 to 2,000 people had proportionately more communities with relatively lower social and economic well-being scores, whereas the larger population size classes of 2,001 to 5,000 people and 5,001 to 50,000 people had proportionately more communities with higher scores. Recent regional social assessments suggested that the higher the population in a rural community, the greater the infrastructure and the higher the socioeconomic resilience (Harris et al. 2000).

Figure 29. Change in the socioeconomic well-being scores from 1990 to 2000 in the northern portion of the planning area

Source: USDA 2006

Figure 30. Change in the socioeconomic well-being scores from 1990 to 2000 in the southern portion of the planning area

Source: USDA 2006

O&C Revenues and County Budgets

The O&C Act specifies that counties with O&C lands will receive 75% of the revenue generated from these lands. In 1953, the O&C counties agreed to receive 50% of the revenue and that the other 25% would be used by the BLM for roads, reforestation and silvicultural treatments, recreation sites, fire protection, and other forest management. Historically, the bulk of the revenue generated from the BLM has been and continues to be associated with timber harvesting and is the focus of this discussion.

County governments provide a variety of public services. A survey of the O&C counties was conducted to understand the source and use of county revenues. See *Appendix C. Socioeconomics*. See *Table 72 (Public services that county revenues support)* for a list of service categories and the services within each category. Also see *Figure 31 (Fiscal year 2005 county expenditures)* for a summary of the \$3.9 billion spent in fiscal year 2005 by the O&C counties.

Table 72. Public services that county revenues support

Service Categories	Types of Services	
Health and Community Services	Aging services	Veterans services
	Alcohol and drug addiction services	Public health services
	Services for children and families	Environmental health services
	Developmentally disabled	Housing services
	Mental health services	Medical examiner
	Oregon health plan services	Solid waste disposal/recycling
Public Safety	Trial courts	Community corrections
	District attorney	Court security
	County jail	Juvenile services
	911/emergency communications	County law library
	Emergency management	Sheriff patrol
	Homeland security	Animal control
Economic Development, Natural Resources and Recreation	Oregon plan implementation	Watermaster
	State forest management	County forests
	Federal land policy	County library
	Extension services	County parks
	Telecommunications	County museums
	County fair	
Transportation and Land Use	Highway and road systems	Engineering
	Land use planning and coordination	Building permitting and inspections
	Senior and disabled transportation	Surveying
	Development services	Capital projects
Other Community Services	Management and administration	
	Elections	Property and facilities management
	Assessment and taxation	Procurement
	Human resources and employee relations	Recording public documents

Figure 31. Fiscal year 2005 county expenditures

County governments are funded from sources such as local taxes, transfers from federal and state governments, and fees and charges for services. In addition, the O&C counties receive 50% of the revenue generated by the sale of timber and other goods and services produced from the O&C lands. See *Figure 32 (Fiscal year 2005 revenues for the O&C counties)* for the source of the \$4.2 billion in revenues received by the O&C counties in the 2005 fiscal year.

Figure 32. Fiscal year 2005 revenues for the O&C counties

In fiscal year 2005, O&C-related revenues accounted for about \$114 million (or about 2.7% of the total funds available to the O&C counties⁵). The importance of O&C revenues varies by county. See *Table 73 (Total revenue, discretionary revenue, and O&C funding)*. O&C revenues account for more than 20% of the Douglas County revenue but only 0.1% of the metropolitan Multnomah and Washington county revenues.

The counties also reported receiving about \$99 million of Secure Rural Schools funding that was associated with land that is managed by the U.S. Forest Service. The U.S. Forest Service reports a distribution of \$123.3 million for western Oregon counties. (The difference could be related to the fact that U.S. Forest Service funding is distributed through the state rather than directly to the counties.) The U.S. Forest Service funds are typically not considered discretionary in that they are earmarked for schools and roads.

Table 73. Total revenue, discretionary revenue, and O&C funding for fiscal year 2005

County	Revenue			O&C Revenue as % of	
	All Sources		BLM		
	Total	Discretionary	Total O&C	Total (%)	Discretionary (%)
Rural Counties					
Benton	72,288,316	24,114,009	2,920,490	4.0	12.1
Columbia	47,303,696	9,881,991	2,250,622	4.8	22.8
Coos	45,315,118	13,113,030	6,537,510	14.4	49.9
Curry	54,959,478	6,920,829	3,424,000	6.2	49.5
Douglas	136,784,970	39,942,546	28,105,526	20.5	70.4
Jackson	290,614,408	77,040,445	15,145,237	5.2	19.7
Josephine	109,802,550	29,278,099	12,092,595	11.0	41.3
Klamath	160,315,525	15,522,030	2,206,000	1.4	14.2
Lane	466,328,935	56,786,868	14,583,629	3.1	25.7
Lincoln	74,031,888	32,218,773	388,968	0.5	1.2
Linn	83,070,524	25,287,488	2,518,846	3.0	10.0
Marion	314,833,911	70,333,962	1,360,000	0.4	1.9
Polk	60,207,240	13,956,261	2,385,000	4.0	17.1
Tillamook	57,560,514	14,622,039	730,820	1.3	5.0
Yamhill	82,504,377	13,211,916	807,500	1.0	6.1
Rural Subtotals	2,055,921,450	442,230,286	95,456,743	4.6	21.6
Metropolitan Counties					
Clackamas	406,647,713	82,829,267	5,890,071	1.4	7.1
Multnomah	1,092,793,083	409,015,566	1,000,000	0.1	0.2
Washington	607,731,836	121,402,176	707,861	0.1	0.6
Metro Subtotals	2,107,172,632	613,247,009	7,597,932	0.4	1.2
Totals (all counties)	4,163,094,082	1,055,477,295	103,054,675	2.5	9.8

⁵ In the survey, the counties reported receiving \$103 million from the BLM, whereas the BLM reports total payments of \$114 million. Most of that difference is accounted for as Title II funds, which are expended by the agency under the direction of the county-level resource advisory committees but do not go directly through the county budgets.

Much of the funding received by county governments is directed to specific programs. For fiscal year 2005, the O&C Counties reported that only about 25% of total revenue received was discretionary—the rest of the revenue received by the county governments is earmarked for specific programs. Counties consider most the BLM revenue as discretionary in that it can be used for whatever purpose the county commissioners deem suitable.

See Figure 33 (*Fiscal year 2005 discretionary spending for the O&C counties*) for how the O&C counties spent the funds considered discretionary. About 43% of the discretionary budget is spent on public safety. The next largest category is for other community services, which includes such services as management, administration, and elections.

Figure 33. Fiscal year 2005 discretionary spending for the O&C counties

Table 73 (*Total revenue, discretionary revenue, and O&C funding for fiscal year 2005*) shows that across the O&C counties, O&C revenues accounted for 9.8% of the discretionary funding. Some counties, however, rely on O&C revenues much more to fund discretionary programs than others. Over 70% of the discretionary funding in Douglas County, for example, is based on O&C revenues. A number of counties rely on O&C revenues for more than 20% of discretionary funding. O&C revenues make up only a small portion of the discretionary funding for the larger metropolitan counties.

Timber harvesting from O&C lands began dropping in the 1990s as a result of the listing of the northern spotted owl and the adoption of the Northwest Forest Plan. In response, Congress established safety net payments for 72 counties in Oregon, Washington, and California through the Omnibus Budget Reconciliation Act of 1993. This provided a stabilized income flow to timber-dependent communities through the remainder of the 1990s.

In 2000, Congress repealed the safety net payments and passed the Secure Rural School and Community Self Determination Act (P.L. 106-393). This law established a stable level of payments to counties at an amount equal to the average of their three highest

timber receipts from 1986 through 1999. Under the Act, counties elect the percentage of payment (80 to 85%) to be distributed directly to the county (Title I), and the percentage (15 to 20%) to be allocated between Title II projects and Title III projects.

- **Title I.** These are funds that are distributed to the county and may be used for any purpose the previous 50% revenue sharing funds were used for, as a supplement to other county funds. Typically, these revenues go to county general fund budgets.
- **Title II.** These are funds that are used to support cooperative projects under the guidance of a resource advisory committee to restore healthy conditions on public lands or on private lands for the benefit of public land resources. Such projects include wildfire hazard reduction, stream and watershed restoration, forest road maintenance, road decommissioning or obliteration, control of noxious weeds, and improvement of fish and wildlife habitat.
- **Title III.** Under Title III of the Act, counties may use funds for search, rescue, and emergency services; community service work camps; purchase of easements for recreation or conservation; forest related educational programs; and fire prevention activities.

See Figure 34 (*BLM payments to counties for fiscal years 1985 to 2005*) for the trend in BLM payments to counties since 1985. In fiscal year 2005, BLM payments to counties totaled about \$115 million.

Figure 34. BLM payments to counties for fiscal years 1985 to 2005

Historically, payments authorized under the O&C Act account for the bulk of the total BLM payments to counties. Counties do, however, receive revenue associated with other BLM funding sources. Douglas and Coos Counties receive payments from the Coos Bay Wagon Road grant fund. There are 15 counties that receive payments in lieu of taxes (PILT) from public domain lands that are located within their county. A few counties also

receive grazing and mineral lease income. Altogether, these other sources of payments averaged just over \$1.0 million annually over the last five years.

Table 74 (BLM payments to counties within the planning area for selected years (\$million)) summarizes the total payments to counties from western Oregon BLM lands including timber receipts, safety net payments, and Secure Rural Schools Self Determination Act payments under Title I, II and III, Coos Bay Wagon Road grants, payments in lieu of taxes, and mineral and grazing income. The average annual BLM payment to all counties since implementation of the Secure Rural Schools legislation has been \$112 million.

Table 74. BLM payments to counties within the planning area for selected years (\$million)

County	1985	1990	1995	2000	2001	2002	2003	2004	2005
Benton	1.7	2.9	2.1	1.7	3.1	3.1	3.1	3.2	3.2
Clackamas	3.4	5.8	4.2	3.4	6.0	6.1	6.2	6.2	6.3
Columbia	1.3	2.1	1.6	1.3	2.2	2.3	2.3	2.3	2.3
Coos	4.0	6.8	5.0	4.1	7.2	7.3	7.4	7.5	7.6
Curry	2.2	3.8	2.8	2.3	4.0	4.0	4.1	4.1	4.2
Douglas	15.4	26.0	19.1	15.6	27.4	27.6	27.9	28.3	28.7
Jackson	9.6	16.2	11.9	9.7	17.0	17.2	17.4	17.6	17.8
Josephine	7.4	12.5	9.2	7.5	13.1	13.2	13.4	13.6	13.8
Klamath	1.5	2.4	1.8	1.5	2.6	2.6	2.6	2.7	2.7
Lane	9.3	15.8	11.6	9.5	16.6	16.7	16.9	17.2	17.4
Lincoln	0.2	0.4	0.3	0.2	0.4	0.4	0.4	0.4	0.4
Linn	1.6	2.7	2.0	1.6	2.9	2.9	2.9	3.0	3.0
Marion	0.9	1.5	1.1	0.9	1.6	1.6	1.6	1.6	1.7
Multnomah	0.7	1.1	0.8	0.7	1.2	1.2	1.2	1.2	1.2
Polk	1.3	2.2	1.6	1.3	2.3	2.4	2.4	2.4	2.5
Tillamook	0.3	0.6	0.4	0.3	0.6	0.6	0.6	0.6	0.6
Washington	0.4	0.7	0.5	0.4	0.7	0.7	0.7	0.7	0.7
Yamhill	0.4	0.7	0.5	0.4	0.8	0.8	0.8	0.8	0.8
Totals	61.7	104.2	76.5	62.5	109.8	110.6	112.0	113.4	114.9

The O&C revenue is allocated between counties based on an acre-weighted proration formula. The largest recipients of payments from western Oregon BLM lands are Douglas, Jackson, Lane, and Josephine counties, which together received 68% of total payments in 2005.

The Secure Rural Schools legislation was not reauthorized for 2007. Absent a reauthorization or new legislation, the size of the BLM payment to counties will be highly dependent on the amount and price of timber sold from O&C lands. For example, without the Secure Rural Schools legislation the fiscal year 2005 BLM payment to counties would have totaled about \$12.2 million, which is a reduction of about 90% from the total with the legislation.

In addition, many of the O&C counties would also lose Secure Rural School funding attributable to land that is managed by the U.S. Forest Service. For fiscal year 2005, such funding totaled \$123.3 million.

O&C counties have a limited ability to replace BLM revenues with other sources of revenue. Oregon income taxes are paid to the state, not the counties. As a result of several ballot measures, Oregon counties are not able to raise tax rates and the growth in taxable property value is capped at 3% a year. The federal government, furthermore, owns a large portion of the land in some of the O&C counties. See *Table 75 (Percent public land in O&C counties)*. These lands are not on the tax rolls. The O&C Counties believe that neither economic growth nor tourism can be reasonably expected to offset a shortfall in O&C-related revenues (Davis 2006). See *Appendix C. Socioeconomics*.

Table 75. Percent public land in O&C counties

O&C County	Total (acres)	BLM (acres)	BLM (%)	Government (acres)	Government (%)
Benton	433,500	58,100	13.4%	106,300	24.5%
Clackamas	1,205,000	75,400	6.3%	632,200	52.5%
Columbia	440,800	10,800	2.5%	32,100	7.3%
Coos	1,041,000	162,900	15.6%	261,100	25.1%
Curry	1,047,100	67,600	6.5%	688,700	65.8%
Douglas	3,244,500	655,100	20.2%	1,670,500	51.5%
Jackson	1,792,700	449,700	25.1%	914,200	51.0%
Josephine	1,050,200	299,800	28.5%	714,900	68.1%
Klamath	3,137,900	224,900	7.2%	1,651,300	52.6%
Lane	2,957,900	288,100	9.7%	1,740,400	58.8%
Lincoln	635,600	20,200	3.2%	216,800	34.1%
Linn	1,477,000	87,200	5.9%	581,400	39.4%
Marion	762,600	20,900	2.7%	258,800	33.9%
Multnomah	297,500	4,200	1.4%	88,400	29.7%
Polk	476,000	40,200	8.4%	53,100	11.2%
Tillamook	719,500	48,500	6.7%	450,200	62.6%
Washington	465,000	11,500	2.5%	67,700	14.6%
Yamhill	459,700	32,600	7.1%	65,100	14.2%
Totals	21,643,500	2,557,700	11.8%	10,193,200	47.1%

The economics of BLM timber harvesting are directly linked to western Oregon's timber economy and market.

The counties in western Oregon comprise the relevant market area for this analysis. Although some of the BLM timber may be shipped outside of this area for primary processing, the most recent information about log flow suggests that it is likely that the bulk of the BLM timber will be processed within the market area. As shown below, western Oregon is a net importer of logs—more timber is processed than harvested in the area.

There are 413 bbf of sawtimber on 16.3 million acres of timberland⁶ within the planning area of western Oregon (Miles et al. 2006). See *Table 76 (2005 timberland area and inventory within the planning area)*. The BLM administers about 13% of the timberland and 16% of the sawtimber in western Oregon.

⁶ Not all of the 2.5 million BLM acres within the planning area are classified as timberland.

Table 76. 2005 timberland area and inventory within the planning area

Ownership Class	Timberland Area (acres)	Sawtimber Inventory (bbf)
National Forest	5,937,000	210
Bureau of Land Mgmt	2,068,000	66
Other federal	27,000	1
State	839,000	29
County and Municipal	116,000	2
Other local government	10,000	-
Private	7,323,000	105
Totals	16,320,000	413

See Figure 35 (*Harvest by land owner within the planning area*) for the western Oregon harvest by owner. Since 2000, western Oregon harvests have averaged about 3.4 bbf⁷—a 47% reduction from the average 6.4 bbf average harvest prior to the 1990 listing of the northern spotted owl. Most of the reduction came from federal timberlands (U.S. Forest Service and BLM).

Figure 35. Harvest by land owner within the planning area

During the 1970s, BLM harvests averaged 1.05 bbf, which is about 16% of the total.⁸ BLM harvests averaged 0.87 bbf in the 1980s, which is about 15% of the total. Under the Northwest Forest Plan (since 1994), BLM harvests have averaged about 0.11 bbf annually, which is about 3.4% of the total harvest.

⁷ bbf – billion board feet, Scribner log scale.

⁸ In this discussion, BLM timber volumes have been converted from the 16 foot log scale used by the BLM, to the 32 foot log scale used by other western landowners. The conversion factor varies with timber species and log size. Generally, a factor of 0.80 can be used to convert BLM 16 foot log volumes to 32 foot log volumes.

Harvests from private lands trended down slightly through the 1990s (3.08 bbf in the 1970s, 2.79 bbf in the 1980s, and 2.61 bbf in the 1990s). Private harvests have been trending up since 1995 and have averaged 2.89 bbf since 2000. Currently, private lands provide about 85% of the harvest within the planning area.

See *Figure 36 (Willamette Valley Douglas fir delivered log prices and BLM volume and average stumpage)* for log price trends since 1989 (Log Lines 1989-2006)⁹. Log prices rose dramatically in the early 1990s, due primarily to a reduction in federal harvests during a time of strong demand for lumber and wood products. High log prices and increased penetration of U.S. markets by Canadian lumber manufacturers led to a reduction in mill capacity in western Oregon. Log prices declined through the 1990s. Log prices began trending up again in 2003 as housing markets strengthened. Western Oregon mills added capacity with the sawmills still operating in 2005 and producing about 37% more wood in 2005 than they did in 2001 (Ehinger 2006a). In Western Washington, mills have added about 1.0 bbf in net capacity over the last five years. This has further strengthened log prices (Ehinger 2006b.)

Figure 36. Willamette Valley Douglas fir delivered log prices and BLM volume and average stumpage

Source: Log Lines Log Price Reporting Service 2006

Figure 36 (Willamette Valley Douglas fir delivered log prices and BLM volume and average stumpage) also shows that the premium for higher grade logs has been shrinking (2S and 3S logs¹⁰ sell for about the same price and 3P log margins are narrowing). This reflects recent investment in smaller log mills and the ongoing shift toward dimension lumber.

⁹ Log Lines is a log price reporting service that began reporting log prices in 1988.

¹⁰ 3P, 2S and 3S are log grades reflecting size and quality.

Figure 36 also shows the total volume and average stumpage price of the BLM timber sold in western Oregon.¹¹ Note that since 1995, when the BLM began selling smaller timber under the Northwest Forest Plan, stumpage prices have followed a trend similar to the current market for 2S and 3S logs.

Logs harvested in one area are often manufactured into wood products in another area. Understanding how logs flow helps to establish the geographic extent of the market area. Predicting future log flows, furthermore, is important to establishing impact at the county level.

See Table 77 (2003 mill study log flows) for a summary of log flows reported in the 2003 mill study (Brandt et al. 2003; USDA, U.S. Forest Service 2006a). About 3.757 bbf was consumed by western Oregon mills in 2003. About 8% of the total was imported into western Oregon from outside the state and another 4% was imported from eastern Oregon.

Table 77 (2003 mill study log flows) also suggests that the difference between local log supply and local log demand is greatest in southwest Oregon. These mills imported 412 mmbf from northwest Oregon, whereas only 58 mmbf went from southern Oregon to northwest Oregon.

Table 77. 2003 mill study log flows

Destination	Log Volume (mmbf)				
	Total Utilization	Source			
		Northwest Oregon	Southwest Oregon	Eastern Oregon	Other States
Northwest Oregon	1,667	1,378	58	0	231
Southwest Oregon	2,090	412	1,460	158	60
Total Western Oregon	3,757	1,790	1,518	158	291

Current estimates are that log imports into western Oregon have increased since the 2003 mill study. Figure 37 (Log imports from Canada to Washington and Oregon ports) shows that Canadian logs imported into western ports exceeded 500 mmbf in 2005 and is on a similar track in 2006. Oregon log buyers expect that about 500 mmbf is currently flowing into Oregon from Washington and Canada. Many consider the Canadian volume to be subject to intense competition by more favorably located mills in Washington, or by new ventures in Canada (Rasmussen, personal communication 25 August 2006).

¹¹ Stumpage is the price paid for timber on the stump. A BLM timber purchaser pays stumpage to the BLM and then incurs the costs of logging and hauling the logs to the mill.

Figure 37. Log imports from Canada to Washington and Oregon ports

Source: Warren 2006

The log market in western Oregon is competitive. In 2005, for example, only 28% of the timber used by Oregon’s sawmills was fee timber (timber owned by the manufacturing company). The rest of the timber harvested was purchased by manufacturers from timberland owners (Western Wood Products Association 2006). Much of this timber is sold in an open, competitive market to the highest bidder. BLM timber is appraised and sold at auction to the highest qualified bidder, which ensures that the agency receives fair market value.

Mills are typically optimized to process certain species and sizes of logs. The log market allocates logs to the mills that can most efficiently and effectively process particular types of logs. Prior to the Northwest Forest Plan, the U.S. Forest Service and the BLM were key suppliers of large, high-quality logs. Decisions made in the Northwest Forest Plan substantially reduced the volume of large logs available to Oregon mills. Much of the recent investment made in Oregon mills focused on more efficient processing of the smaller logs harvested from private lands. *Figure 38 (Oregon sawmill consumption by diameter class)* shows that logs that are less than 9 inches DIB (diameter inside the bark at the small end of the log) being processed by Oregon mills has doubled from 632 mmbf in 1994 to 1,230 mmbf in 2003.

Figure 38. Oregon sawmill consumption by diameter class

Even with the investment in smaller log processing, there remains in Oregon a sizeable capacity for the larger logs that could be harvested from BLM land.

- *Figure 38 (Oregon sawmill consumption by diameter class)* shows that about 300 mmbf of logs greater than 21 inches DIB were processed in 1994 and 1998. The 2003 study changed the classification—179 mmbf of logs greater than 24 inches DIB were processed in that year.
- Ehinger (2006) defines large logs as those over 48 inches DIB, lists eleven mills that process large logs, and reports that 10% of western Oregon mill capacity is capable of handling large logs (about 450 mmbf), and that more large log capacity is being added.
- An Oregon State University study defined large logs as those over 30 inches DIB and found 18 mills that handle large logs (Wagner et al. 2003).

The primary wood products manufacturing sector is a large contributor to the Oregon economy. In 2003, 249 firms used 4.3 billion board feet of wood to produce \$6.7 billion of annual sales (Brandt et al. 2006). While this sector accounts for less than 0.1% of Oregon firms, it produces 14.6% of annual manufacturers' shipments (U.S. Census Bureau 2000-2004). This estimate does not include substantial secondary wood products sectors such as furniture and cabinetry.

The Oregon primary wood products sector employs 51,900 workers that earn \$1.9 billion annually (OLMIS¹² 2006), which is about 3.2% of total Oregon wages. Using a conservative employment multiplier of 2.5, the primary wood products sector accounts for about 130,000 nonfarm Oregon jobs, which is about 7.6% of the total.

Periodic surveys of wood product manufacturers show how the wood products manufacturing sector has changed (Brandt 2006). This information, coupled with annual production data, suggests that the current manufacturing sector could absorb additional timber from BLM lands.

¹² Oregon Labor Market Information System

Since the early 1990s, western Oregon’s wood products manufacturing capacity has been shifting toward lumber production. See *Figure 39 (Log consumption by product in western Oregon)*. Lumber mills now account for about 75% of the wood consumed in western Oregon mills. Oregon’s plywood and veneer mills were heavily dependent on larger logs, much of which came from federal forests. With the reduction in federal timber harvests, larger logs became more expensive at the same time that manufacturers in the Midwest and southern United States added lower cost panel capacity to oriented strand board mills. Very few logs are exported from Oregon’s ports.

Figure 39. Log consumption by product in western Oregon

New investments in lumber mills have been concentrated in larger mills. *Figure 40 (Western Oregon sawmills by capacity)* shows that most of the remaining mills are larger mills, which produce over 120 mbf per shift. The average production per mill for this largest class, in fact, is now over twice what it was in 1976. The apparent increase in the number of small mills in 2003 is due to a difference in survey techniques.

Figure 40. Western Oregon sawmills by capacity

Figure 41 (*Lumber production in Oregon and Washington*) shows lumber production in Oregon and Washington (Western Wood Products Association 2006). Lumber production in western Oregon fell by about 45% between 1989 and 1995, primarily due to reduced federal log supplies. Production began increasing as mills invested in more equipment that could process smaller timber. A softening log export market, furthermore, resulted in a greater portion of the harvest becoming available to domestic mills.

Figure 41. Lumber production in Oregon and Washington

Washington production trends are important as western Oregon mills currently compete for Washington logs. Lumber production in western Washington did not fall off as sharply as it did in Oregon, primarily because much of the western Washington timber was exported as logs rather than sawn into lumber. The reduction in log exports made more timber available to sawmills in both states. Since 1999, western Washington mills have added 1.0 bbf of net new lumber production capacity (Ehinger 2006) and production has been increasing steadily.

Western plywood production began a downward trend in the early 1990s. See Figure 42 (*Western plywood production*). At 3.04 billion square feet for 2005, Oregon plywood is about 58% below the 1970 to 1990 average.

Figure 42. Western plywood production

The reduction in federal timber harvest, which is a source of large, clear veneer logs, created upward pressure on plywood prices. At the same time, panel manufactures in the Midwest, the southern United States, and Canada were adding capacity to produce less expensive oriented strand board (OSB) panels from low cost timber. U.S. Forest Service projections suggest that plywood will lose additional market share to OSB. *Figure 43 (U.S. panel production)* shows US plywood production at just half of current levels by 2020.

Figure 43. U.S. panel production

Figure 44 (*Log exports from western United States ports*) shows the volume and price of logs exported from western United States ports. Currently, about 800 mmbf of logs are exported, which is down 80% from the 4.4 bbf peak in 1989. The Asian financial crisis, the weakening of the Yen against the United States dollar, a shift toward Asian log suppliers, and stronger US domestic log markets account for most of the change.

Figure 44. Log exports from western United States ports

The BLM conducted an information gathering meeting with log buyers and timber industry representatives. There was a common concern that current western Oregon wood product production levels cannot be maintained without additional timber supplies. Current production relies on log imports from Canada and western Washington. Both those sources of supply are vulnerable to competition from the new mills in Washington and to export restrictions in Canada. (Rasmussen, pers. comm. 25 August 2006)

Changes in the level of employment in Oregon’s forest product industry are indicated by U.S. Department of Commerce employment statistics, which tally forest products sector jobs into four sectors:

- forestry and logging (NAICS 113)
- forestry support activities (NAICS 1153)
- wood products manufacturing (NAICS 321)
- paper manufacturing (NAICS 322)

These sectors include both primary and secondary manufacturers along with the infrastructure (forestry workers, loggers, etc.) required to manage the growing and harvesting of timber crops.¹³

¹³ The previous discussion of the economy of the wood products sector in western Oregon is based on research conducted for this DEIS, and resulted in adjustments to the U.S. Department of Commerce figures. Such adjustments are not available for previous periods, however. The U.S. Department of Commerce data, therefore, are used for the purpose of analyzing historic employment trends.

Primary manufacturing includes logging, processing of logs into lumber and other wood products, processing wood residues from timber-processing plants into such outputs as paper or electricity, and private sector forest management services. The secondary industry includes firms processing outputs from the primary industry. These outputs may come from mills in Oregon or elsewhere. Secondary products include prefabricated buildings, molding, millwork and cut stock, doors, windows, laminated veneer lumber, and other products (Brandt et al. 2006).

Employment in Oregon in these four sectors totaled nearly 63,400 workers in 2005 (U.S. Department of Commerce 2006). Wood products manufacturing represents the largest sector, which comprise 61% of the jobs. See *Figure 45 (Employment in Oregon’s forest products sector (2005))*.

Figure 45. Employment in Oregon’s forest products sector (2005)

Source: USDC 2006

Employment in 2005 was down 37% from peak employment of more than 100,700 workers in 1979. See *Figure 46 (Employment in Oregon’s forest products industry (1969 to 2005))*. The decline in forest sector employment is due to the reduction in total timber harvest and technological change (Brandt et al. 2006; USDA, U.S. Forest Service 2006a). Oregon’s forest sector job loss might have been greater, but was offset to some degree by a concurrent decrease in log exports, an increase in log imports from surrounding states, and an expansion of secondary wood products manufacturing (Brandt et al. 2006).

Figure 46. Employment in Oregon's forest products industry (1969 to 2005)

Source: Adapted and updated from Brandt et al. 2006

Forest industry employment trends for the coastal Pacific Northwest were recently studied as part of a 10-year review of the implementation of the Northwest Forest Plan. Across the region included in the Northwest Forest Plan—western Oregon, western Washington, and northern California—it has been estimated that 45,000 direct, indirect, and induced jobs were affected by reduced timber harvesting between 1990 and 2000. Of that, 30,000 were direct jobs including 7,500 in the logging industry and 22,500 in other primary wood industries.

About 19,000 jobs were lost in the region between 1990 and 1994 as the volume of timber harvested but not exported fell from 10.1 bbf to 7.4 bbf. An additional 11,000 direct job losses occurred between 1994 and 2000, even though the volume of wood available for manufacture stabilized and even rose slightly. These latter job losses are attributable largely to additional industry restructuring and changes in technology (USDA, U.S. Forest Service 2006a).

Technological change has also impacted employment in the logging industry. In Oregon, for example, increased mechanization of harvest operations has increased annual productivity per worker from 544,000 board feet harvested per worker in 1990 to 592,000 board feet per worker in 2004, which is an 8% increase (Rooney 2006).

Oregon employment in the solid-wood industry was hit disproportionately hard compared to Washington and California. Oregon represented approximately 50% of solid-wood employment in the region. However, about 61% of the decline in jobs occurred in Oregon. The reverse is true of paper manufacturing—Oregon represented 30% of primary pulp and paper industry employment during the 1990's but only 21% of the job losses in that sector (USDA, U.S. Forest Service 2006a).

In addition to timber harvest, the western Oregon BLM budget contributes to local economic activity. The western Oregon BLM budget for 1995 to 2005 is summarized in *Figure 47 (Western Oregon BLM budget for selected fiscal years)*. The largest expenditure of funds, representing 64% of the current budget, is for the O&C land grants and management of lands and resources programs. These programs provide for forest management, reforestation and forest development, rangeland, recreation, soil, water and air, and wildlife and fish habitat on the O&C grant lands and public domain lands in western Oregon.

Figure 47. Western Oregon BLM budget for selected fiscal years

The wildland fire management program, which is 18% of the current budget, provides for fire preparedness, fire suppression operations, and other operations. Funding for hazardous fuels reduction and burned area rehabilitation is included in the latter category. Other appropriations represent another 18% of the total budget. This includes funding for acquisitions, construction projects, and other needs.

Over the past few years, the BLM budget for western Oregon has been relatively constant (averaging about \$141 million annually). See *Figure 48 (BLM budget by district and state office for selected fiscal years)*.

Figure 48. BLM budget by district and state office for selected fiscal years

In addition to employment in the forest products industry, the management of the BLM-administered lands in western Oregon requires the employment of a staff of natural resource specialists, managers, and administrative personnel. *Figure 49 (Full-time equivalent positions by BLM district and state office)* shows that BLM staffing has been relatively constant. The state office in Portland provides administrative oversight and support for all BLM lands in Oregon and Washington. The full-time employee data shown includes all positions at this office.

Figure 49. Full-time equivalent positions by BLM district and state office

Figure 50 (Number of BLM full-time equivalent positions by county) shows the number of BLM full-time equivalent positions by the county in which the position is based for the fiscal year 2004. The jobs shown for Multnomah County are in the state office.

Figure 50. Number of BLM full-time equivalent positions by county

Timber

Key Points

- Recent inventories have indicated an increase in the standing inventory on BLM lands.
- The BLM lands contain a substantial amount of large, high-grade logs in older stands (i.e., mature and structurally complex forests).
- The majority of the younger stands (i.e., stand establishment and young forests) within the planning area have resulted from harvesting and the application of intensive forestry practices on the reforested acres.
- Stands with a management history comprise approximately 46% of the BLM forested lands, which are classified as suitable for a sustained harvest of timber.

The forests on BLM-administered lands can be characterized by their standing volume and their acres of existing age classes. The current standing volume is shown in *Table 78 (Current standing volume and acres of forested lands)*.

Table 78. Current standing volume and acres of forested land

BLM Districts	Forested Lands ^a (acres)	Standing Volume (bbf ^b)
Salem	365,000	16.8
Eugene	296,000	13.4
Roseburg	399,000	15.5
Coos Bay	302,000	12.8
Medford	788,000	14.8
Klamath Falls Resource Area of the Lakeview District (west)	47,000	-- ^c
Totals	2,197,000	73.3

Notes:

^aSee *Chapter 4* for definition.

^bBillion board feet.

^cIncluded in the Medford District inventory.

The volume figures in *Table 78* are based on current vegetative survey plots. See *Appendix Q. Vegetation Modeling* for further information on the continuous vegetative survey inventory system. The Klamath Falls Resource Area is not included in the above inventory and acres are rounded to nearest thousands

See *Table 79 (Historic timber volume estimates)* for the previous estimates of the volumes on portions of the BLM-administered lands. These figures are the best estimate of merchantable volume for the acreage and include the definitions of use at the time period indicated. Note that the definitions of use did change over time. Although these inventories were conducted using different inventory systems, different assumptions, and different portions of the BLM lands, they provide the basis for broad comparisons and general trends. These inventories also show that overall growth on the BLM lands has kept pace with harvesting, and that there is no evidence that cutting has exceeded growth.

Table 79. Historic timber volume estimates

Historic Estimates	1940 ^b	1960 ^c	1970 ^d	1980 ^e	1990 ^e
Timber volume (mbf ^a)	46,000,000	49,059,900	50,308,000	46,856,721	49,865,870
Acres	2,165,900	2,145,072	2,391,172	1,771,657	1,794,420
Diameter at breast height (dbh)	≥ 16 in.	≥ 11 in	≥ 11 in.	≥ 7 in.	≥ 7 in.

Notes:

^aThousand board feet.

^bAndrews and Colvin 1940

^cUSDI, BLM 1960

^dUSDI, BLM 1970

^eUSDI, BLM 1991

In addition to the total standing volume, the forest can be characterized by the acres of existing age classes. The age class distribution is shown in *Figure 51 (Acres of forested lands within the planning area for 2006 by 10-year age class)*.

Figure 51. Acres of forested lands within the planning area for 2006 by 10-year age class

The above figure does not include the eastern management lands of the Klamath Falls Resource Area (of the Lakeview District) since no starting age class was assigned to these acres. The Salem, Eugene, Roseburg, Coos Bay, and Medford districts contain predominately Douglas fir by volume. Historical volume harvested by species shows that for most districts, forest stands average about 80% of their volume harvested from Douglas fir. See *Appendix D. Timber*. The Klamath Falls Resource Area of the Lakeview District has white fir as the primary commercial species along with ponderosa pine.

The inventory systems that the BLM maintains are not designed to record log quality by level of expected size and grades. Therefore, only general information is available. Log sizes and grades are highly variable depending on the stand type that is harvested. This is particularly true in older stands where substantial peeler grade logs might be expected. Some general information can be derived from examining the historical level of peeler versus sawlogs as a percent of

volume in past harvesting actions. This historic information can then be used to predict the future levels from different types of stands using the structural stage of stands as a classification with anticipated levels of peeler grade for each structural stage. See *Appendix D. Timber*. See *Figure 52 (Peeler versus sawlog grade of Douglas fir logs by district within the planning area)* for the level of anticipated peeler grades of Douglas fir on the BLM lands that are suitable for timber harvesting and not part of the National Landscape Conservation System.

Figure 52. Peeler versus sawlog grade of Douglas fir logs by district within the planning area

Existing stand condition is a codified classification system for inventory that separates stands into classes with similar management histories and conditions. This system is used to predict future growth and development trajectories of stands. As follows, past management history and current stand density can affect the future growth that is anticipated from stands:

- Managed stands are expected to have considerably higher volumes of timber per acre than natural stands of similar age due to the more consistent spacing, the changes in species composition, and the use of improved genetic stock during reforestation.
- Young stands resulting from regeneration harvesting where a component of the original stand is left as a legacy often have lower growth rates for the understory component of those stands.

See *Figure 53 (Percent of BLM lands within the planning area with management history that are suitable for sustained timber production)* for the percentage of BLM lands within the planning area with management history that are suitable for sustained timber production. In general, the BLM lands have had a substantial amount of past management from either regeneration harvesting or thinning.

Figure 53. Percent of BLM lands within the planning area with management history that are suitable for sustained timber production

Special Forest Products

Key Points

- There are 84 forest products in 10 categories that were harvested or collected over the past five years on BLM lands.
- Wood products (including firewood), mushrooms, and floral and greenery are consistently the highest three special forest product categories by the number of permits sold and by revenue.
- Collectors normally focus their harvesting efforts in areas where the commercial forest product is abundant and is easy and economical to harvest.

Special forest products are plant and fungi resources that are harvested, gathered, or collected, and have social, economical, or spiritual value. Common examples include conifer boughs, Christmas trees, mushrooms, edibles and medicinals, floral and greenery, mosses and lichens, ornamentals, seed and cones, tree burls, transplants and wood products including posts, poles, firewood, shakes, and rails. The types of special forest products are continually expanding as entrepreneurs develop new products and create new markets.

Most special forest products are common, widespread, and generalists (i.e., tolerant of a broad range of environmental conditions), while some require a specific community or habitat, or even a specific host. The demand for special forest products varies as markets conditions change. These changes can be seasonal variable or cyclical from year to year depending upon economic factors and environmental conditions. The availability of road access, particularly roads to harvest areas, and land use restrictions influences the type and amount of forest products available for harvest.

Although most commercial harvesters in the Pacific Northwest do not rely on special forest products for their sole source of income, these products do provide important supplemental or seasonal sources of income that contribute to household economies (Charnley 2006).

Special forest products are generally harvested from common plants and fungi that are associated with vegetative communities on BLM managed lands that include conifer forests, grasslands, shrublands, and hardwood communities. The 84 special forest products are grouped into 10 special forest product categories based on a retrospective analysis of BLM permit data over the past five years.

Following is a list of the special forest product categories and the number of products included in each category.

- boughs (coniferous) (12)
- burls and miscellaneous (2)
- Christmas trees (4)
- edibles and medicinals (8)
- floral and greenery (8)
- mosses (bryophytes) (3)
- mushrooms (fungi) (12)
- seeds and seed cones (5)
- transplants (13)
- wood products (17)

A general description of the common special forest products is provided below. See *Table 80 (Special forest products by category)* for a complete list of the special forest products.

Boughs. The typical species from which boughs are collected are western red cedar and incense cedars, true firs, pines, juniper, and Douglas fir. Conifer boughs are used by individuals and the floral industry primarily during the Christmas season for seasonal decorations. Boughs are generally collected from young or mature forest stands. Western red cedars occur in riparian zones.

Burls. Burls are used for woodcrafting in the manufacture of specialty items, such as clocks, tables, veneers, and other decorative items. Burls are found on either the bole (cluster burls) or on the stumps (stump burls) of trees. Burls are harvested from hardwood trees in mature and structurally complex forest stands of hardwood and mixed conifer and hardwoods forest types.

Christmas trees. Christmas trees are sold as seasonal decorations for personal or commercial use. Christmas trees are harvested from stand establishment conifer plantations.

Floral and greenery. Floral and greenery is collected and used as decorative arrangements. Common plants include salal, evergreen huckleberry, sword fern, and beargrass that generally occur in the understory of conifer forests. Floral and greenery are harvested from upland areas in conifer forest types in mature and structurally complex forests stands. Manzanita is harvested for decorative greens and bird perches and occurs in woodland and shrubland communities, mostly in southern Oregon.

Medicinals. Cascara and yew bark is peeled from the bole of trees and used to make laxatives and tonics. The majority of Cascara and yew occur along streams or seasonally wet areas. Harvest areas are limited because they occur in riparian zones.

Mushrooms. Mushrooms that are commonly harvested include golden chanterelle, winter chanterelle (yellow foot), morels, matsutake, shaggy parasols, coral mushrooms, truffles, and hedgehogs. Each mushroom is associated with one or more specific hosts in forested conifer or mixed hardwood stands. Mushrooms are generally harvested from hardwood and conifer forest communities of mature and structurally complex forests stands. Morels are harvested immediately after a wildfire.

Seeds and cones. Cones are collected commercially for seed or harvested for ornamental purposes from mature and structurally complex forests.

Transplants. Transplants include various native ground covers or shrubs, forbs, and tree species including root stock for medicinal purposes. These plant species are found in riparian and upland areas in all vegetation communities.

Wood products. Wood products include firewood, posts and poles, rails, cedar shake bolts, biomass, or pulp wood. Poles can be any length, but no more than 6 inches in diameter on the large end. Wood products are harvested from young, mature, and structurally complex forests. Wood products also includes ornamental wood species that include red alder, big leaf maple, madrone, vine maple, and willows. These are used to construct furniture and cabinetry, veneers, and bow staves. Ornamental wood species also include cut sticks, which are generally red alder or other hardwood species that measure less than 4 inches in diameter at the large end. Ornamental wood species are harvested from all forest communities, but generally from mature and structurally complex forests.

Permits for special forest products include restrictions to help meet renewable resource standards and to protect other sensitive resource values. Permits may restrict the type of species, the quantity harvested, the harvest or collection method, the location, access, and the season.

The types and abundance of special forest products vary across the planning area. The location of the commercial harvesting sites and the product and site conditions may change from year to year. These differences are reflected in the forest product permits issued by BLM district. See *Figure 54 (Trend in the total number of permits issued over five years by BLM district)*. The overall trend is mixed with a slight increase by three districts and a slight decrease by three districts.

Figure 54. Trend in the total number of permits issued over five years by BLM district

Many special forest products, such as firewood, Christmas trees, evergreen boughs, huckleberries, and mushrooms are broadly distributed throughout the planning area. Other special forest products are limited to a particular plant community, special environments, or narrow geographic area.

Overharvesting is not known to occur across the range of a species or to the extent that it creates concern for the sustainability of the product or species, except in a few local situations. When these situations are discovered, harvesting permits are discontinued or issued in other areas.

Natural disturbances, such as wildfire, storms, and floods, shape the types and productivity of special forest products over time. Wildfires change vegetative and structural components of the

landscape by consuming biomass, but can promote productive responses of some special forest products. For example, morel mushrooms respond quickly after wildfires. Wildfires can create conditions suitable for other vegetative products in subsequent years, such as willow whips, beargrass and other floral and greenery products, and medicinal forbs. Wildfires char and degrade the value of such special forest wood products as boughs, Christmas trees, firewood, and poles.

Floods alter vegetation and the special forest products found in riparian plant communities. Although initially floods may appear to destroy the existing riparian vegetation, the changed conditions provide vigor to the resprouting and reseeded shrubs and forbs, and within a few years provide a new potential crop of alder and willow products along streams and wetland areas.

Timber harvesting changes the forest condition and increases or decreases opportunities and quality depending on the product. Species composition, age, distribution of age classes, growth rate, and density of forest stands influence the type and productivity of special forest products.

Timber harvesting and associated fuels reduction treatments routinely alter stand structure and forest floor conditions, and combined, modify forest conditions on more acres than all other planned activities. The method of timber harvesting particularly influences special forest products. Ground-based harvesting operations disturb more area and at heavier levels of disturbance on the understory vegetation (and associated special forest products, such as mushrooms and floral and greenery) than cable operations. Helicopter harvesting has even less disturbance. Timber management activities, however, do provide road access to harvest areas that would otherwise not be available.

Regeneration harvesting reduces suitable conditions for numerous special forest products, while at the same time providing abundant biomass, fiber, and firewood as commercial by-products. For example, chanterelles do not fruit for the first 15 years after a regeneration harvest and matsutakes rarely fruit in stands under 40 years of age (Vance et al. 2001). Many commercial floral and greenery products, as well as boughs, may be lost from the harvest units. Huckleberries for greenery and moss products may be lost for decades. Commercial thinning generally provides conditions where understory greenery products can persist and the commercial value may even improve within a short period of time due to an increase in the light to the understory vegetation. Silviculture treatments in regeneration harvest units generally cut evergreen vegetation and hardwoods that would reduce the amount and commercial quality of other forest products. Understory greenery products can increase within a short period of time due to an increase in the light to the understory vegetation during thinning harvests.

Silviculture treatments in regeneration harvest units generally cut evergreen vegetation and hardwoods that reduces the amount and commercial quality of other forest products.

Fuels treatments target the pole component of forest stands as well as the hardwood and shrub understory. Fuels treatments include broadcast burning, hand, and mechanical treatments. Broadcast burning disposes logging slash and other forest floor fuels, burns wood products, and degrades quality. Manual treatments have less impact to understory vegetation and the forest floor duff layer and associated special forest products than mechanical treatments (such as slash-buster operations) due to the size of the equipment. Opportunistic situations occur where pole harvesting is coordinated with fuels projects. Flora and greenery products and mushrooms respond quicker to manual operations than mechanical operations.

The available data regarding the quantities and value of special forest products is limited to a basic comparison over time (trend) by the number of permits sold by category, units sold, and revenue. The number of units sold of special forest products has declined slightly for wood products, boughs, and floral and greenery over the last five years. Mushrooms is the only category that has increased.

The total number of special forest product permits varies by approximately 20% between any two-year interval. Each forest product group varies based on relevant market and environmental conditions.

Permit sales have averaged over \$200,000 per year and totaled over \$1,100,000 over the past five years. In the last two years, revenue from wood products, floral and greenery, and boughs has declined, while mushroom revenue has increased during the last three years. Wood product revenue has varied more than other special forest products due to pole sale fluctuations in Medford.

Field inventories of special forest products, harvest areas, and actual harvest data on BLM lands is not available. Detailed studies and analysis have been conducted where concerns for overharvesting and long-term sustainability existed in the past, such as moss harvesting in Eugene (Muir 2004) and yew wood harvesting (USDA, USDI 1993a).

See *Table 80 (Special forest products by category)* for the 10 categories of 84 specific forest products that are found on BLM-administered land within the planning area.

Table 80. Special forest products by category

Category	Special Forest Products		
Boughs (coniferous)	Douglas fir Grand fir Incense cedar Juniper	Noble fir Pacific silver fir Port Orford cedar Shasta red fir	Sugar pine Western hemlock Western red cedar White fir
Burls and miscellaneous	Big leaf maple Pacific madrone		
Christmas trees	Douglas fir Grand fir	Noble fir Shasta red fir	
Edibles and medicinals	Bay leaves Cascara bark Elderberries Oregon grape root	Pacific yew bark Pacific yew boughs Prince's pine St. John's wart	
Floral and greenery	Beargrass Bracken fern Cactus species Huckleberry	Manzanita Oregon grape Salal sp. Sword fern	
Mosses (bryophytes)	Lichen sp. Sheet moss Tree moss		
Mushrooms (fungi)	Black picoa Cauliflower Coral tooth Golden chanterelle	Horn of plenty King bolete Matsutake sp. Morel sp.	Shaggy parasol Spreading hedgehog White chanterelle Yellowfoot mushroom
Seeds and seed cones	Douglas fir Noble fir Ponderosa pine	Sugar pine Western hemlock	
Transplants	Bleeding heart Douglas fir Huckleberry Incense cedar Mountain mahogany	Oregon grape Rhododendron Sword fern Vine maple	Western hemlock Western red cedar Wild iris Willow sp.
Wood products	Alder stick (large) Bolts and shakes Corral poles Fence stays Fuelwood Hobby wood	Large poles Marginal logs Pitchwood Posts (corner) Posts (line) Pulpwood	Rails (split) Round wood Small poles Tepee poles (4 in. x 16 ft.) Whip stock (misc.)

Botany

Key Points

- Rare plants and fungi are not evenly distributed or predictable across the landscape, even when good potential habitat exists.
- There are 134 plant and fungi species that are listed as bureau special status species that exist on approximately 4,000 acres of BLM-administered lands and that consist of approximately 5,000 known populations.
- Of the 134 bureau special status species, 32 occur only on BLM-administered lands.

The BLM administers diverse ecosystems across the planning area. These lands include habitat and populations of some of the rarest plant and fungi species in the Pacific Northwest, including:

- 134 species that occur on BLM-administered lands within the planning area (not including the West Eugene Wetlands or the Cascades-Siskiyou National Monument);
- 59 species that have 20 or fewer populations;
- 32 species that occur *only* on BLM-administered lands; and
- 21 species that have five or fewer populations.

Since the landscape and the habitats of the planning area are extraordinarily diverse, they include a unique combination of geology, climate, and topography and these contribute to the presence of many rare and locally endemic plant and fungi species. Southwest Oregon and northern California have some of the highest rates of plant endemism in the United States (Della Salla et al. 1999). These rare species, also called bureau special status species, are distributed throughout the planning area and are found in nearly every habitat type.

Over 4,500 plant species are found in Oregon and the majority of the species occur within the planning area. Most of these plant species are considered common and are of no conservation concern from the standpoint of being threatened with, or trending toward, extinction. However, approximately 7% (324) of these species are considered bureau special status species and are of conservation concern due to the small number of known populations, loss of habitat, or the threats to their existence that are posed by human activity or other biological factors.

Habitats

The flora in Oregon is shaped by geologic history, topography, regional climatic factors, and natural disturbances. The geographic extent of the planning area is so broad that a wide range of conditions shape the diversity of plant communities and habitats. For example, rare plant and fungi species are known to occur on BLM-administered lands in the following physiographic provinces in the stated numbers:

- 38 within the Coast Range province
- 13 species within the Eastern Cascades and Willamette Valley provinces
- 59 within the Western Cascades province

In the planning area, over 250 plant species are endemic to serpentine soils with about 10% being considered rare (Kruckeberg 1984). Crinite mariposa-lily (*Calochortus coxii*) and Howell's mariposa-lily (*Calochortus howellii*) are examples of rare, narrow endemics found only on soils influenced by a serpentine substrate. Approximately 88 rare plant species and nearly two-thirds of the total known populations that occur on BLM-administered lands occur in the Klamath province.

Many plants are associated with the unusual habitat types that are generally shaped by the unusual features, climate, and hydrologic influences that exist throughout the planning area. The innumerable unusual habitats within the planning area range from rock substrates and outcrops of different origins with variable soil types and conditions (including sand dunes) to seasonal and permanent wetlands, vernal pools, fens, bogs, and marshes. The range of unusual habitats also includes the forest communities of conifer and mixed hardwoods and the communities of steppe juniper and sage. These habitats include a wide range of conditions and, because they have persisted over time, have become refuges for unusual plant communities (Franklin and Dyrness 1973). Many uncommon and rare species have adapted to these unique conditions over time and generally occur infrequently on associated habitat types.

Rare plant and fungi species are generally not evenly distributed or predictable across the landscape, even when good potential habitat exists. Some species are generally associated with a specific plant series, habitat type, or an ecological feature that narrows their potential habitat. However, other rare species are associated with broader and less defined habitat types. Kaye et al. (1997) describes types of rarity, patterns, distribution, and threats to rare plant species in Oregon.

Biological factors (e.g., reproductive strategies, inbreeding depression, pollinators and pollination, consumption by herbivores, weed invasion, habitat connectivity, disease, predation, habitat change, and global climate change) play important roles in determining the distribution and abundance of a species. Some rare Oregon species appear to be lingering remnant populations from historic plant communities at the edge of their range with few remaining populations (e.g., Baker Cypress). Others are narrow endemics adapted over long periods of time to specific habitats or substrates, such as the serpentine endemic group. Other rare species may be isolated populations that are diverging morphologically from metapopulations, or may be the result of cross-pollination between two or more species (e.g., Gentner's fritillary (*Fritillaria gentneri*)). Other rare species of lichen and bryophytes appear to be more mobile within widespread ranges (e.g., *Usnea longissima*), but adapted to narrow environmental conditions. Other species in Oregon are rare because of a loss of habitat due to an expanding human population and the introduction and spread of invasive plants (USDA, USFWS 2003a; USDA, USFWS 1998a).

Searches for rare plants have occurred on more than 433,000 acres in the past six years and resulted in the discovery of more than 1,600 new populations in the past three years alone. Over 85% of all populations (and the greatest increase in new populations over the past three years), occurs in the Medford District, which includes the Klamath Mountains. At the opposite end of the range, approximately 1% of all populations occur in the Lakeview District in the Klamath Falls Resource Area.

Areas of high special status species richness (the number of different species in an area) and density (the number of one species in an area) can be mapped across the landscape as hot spots (greater richness and density) and cold spots (lesser richness and density). Hot spots occur at fine spatial scales (such as special habitat features—like meadows, wetlands, rock outcrops) and at larger geographic regions, which are helpful for large-scale planning. Areas of high levels of endemism at the broader landscape level, such as the Klamath- Siskiyou region or the Eugene Wetlands area, are easily identified. Cold spots result from low occurrence levels of rare species and populations, or areas where survey intensity is lower. See *Figure 55 (Special status species density shown as hot spots and cold spots)*.

Figure 55. Special status species density shown as hot spots and cold spots

Natural disturbances (wildfires, storms, and floods) occur frequently and change plant community and habitat conditions for rare plant and fungi species. Many factors determine whether a population will survive the disturbance, such as:

- the type, duration, and intensity of the disturbance;
- the season;
- the species habit and life-cycle requirements; and
- the adaptability of a species to a changed environment.

Some rare plant species (e.g., Bradshaw’s desert parsley (*Lomatium Bradshawii*)) are adapted to frequent, low-intensity fires and respond positively (Kaye et al. 2001). Such species as Gentner’s fritillaria, Kincaid’s lupine, and coral seeded allocarya (*plagiobothrys* sp.) can respond positively to the increased light and moisture from the loss of overtopping and competing vegetation, and the increase in nutrients that are available after a wildfire. On the other hand, many rare lichen, bryophytes, and fungi, along with some vascular plants, are consumed in a fire and these populations can be lost, along with their habitat and hosts, unless they are protected in a niche or island where the fire was absent or less severe (S. Copeland, unpublished data).

Floods and debris flows can alter riparian and aquatic plant communities and can also alter the rare plant populations that occur in the disturbed areas. These types of events are very dynamic with some rare plant populations benefiting and others being lost. Although, initially, floods may appear to destroy the existing riparian and aquatic vegetation, they also deposit sediment, distribute seed, and reduce excess and nonnative vegetation, which provides vigor to resprouting and reseeding shrubs, perennial and annual grasses, and forbs. For example, many populations of rare species of juncus and sedges, along with popcorn flowers (*plagiobothrys*), are associated with streams and wetlands and adapted to periodic floods with their prolific seed production.

Special Status Species

Some species are both state and federally listed species. Special status species are rare plant and fungi species that include all federally listed, Oregon state-listed, proposed, and candidate species, as well as, bureau sensitive species, bureau assessment species, and bureau tracking species. Bureau tracking species have no management associated with them and are not further discussed in this draft environmental impact statement. The special status species list is based on federal listings, state listings, and the Oregon Natural Heritage Information Center rankings of species.

There are currently 324 plant and fungi species that occur in the planning area that are on the special status species list. However, only 134 species (41%) have documented populations on BLM-administered lands. The remaining 190 species (59%) are suspected or likely to occur on BLM lands because known sites occur nearby, their range coincides with the planning area, or suitable habitat exists on BLM-administered lands. Only 95 of 230 vascular plants (14 of which are federally listed and candidate species) are known on BLM-administered lands, as well as, 14 of 47 mosses and liverworts (i.e., bryophytes), 15 of 26 lichens, and 10 of 21 fungi.

Table 81. Number of documented and suspected plant and fungi special status species

Special Status Plants and Fungi Species	Total Species	Vascular Plants	Bryophytes	Lichens	Fungi
Suspect	324	230	47	26	21
Documented	134	95	14	15	10

Special status species occupy approximately 4,000 acres of the approximately 2.5 million acres of BLM-administered lands within the planning area, which is itself approximately 22 million acres. Those 4,000 acres have approximately 5,000 populations of the 134 documented special status species, along with five additional species that occur in the West Eugene Wetlands and the Cascade-Siskiyou National Monument.

Approximately 74% of the occupied habitat (the 4,000 acres that are occupied by special status species) and 76% of the populations (the 5,000 populations of the documented special status species) occur on O&C lands, while 26% of the occupied habitat and 24% of the populations occur on public domain lands. See *Figure 56 (Populations and occupied habitat of bureau special status species on O&C and public domain lands within the planning area)*.

Figure 56. Populations and occupied habitat of special status species on O&C and public domain lands within the planning area

Federally Threatened, Endangered, and Candidate Species

There are 13 species that are listed under the federal Endangered Species Act that occur within the planning area, along with one federal candidate species—for a total of 14 federally listed and candidate species. Only 5 of the 13 federally listed species occur on BLM-administered lands, along with the one federal candidate species. There are eight species that are not documented on BLM-administered lands or do not occur on lands where management activities are proposed, but they are suspected and included because the range of the species overlaps public lands and suitable habitat exists. See *Table 82 (Federal status of federally listed plant species within the planning area)*. Also see *Appendix E. Botany*.

Table 82. Federal status of federally listed plant species within the planning area

Federal Status	Federally Listed Plant Species	
	Scientific Name	Common Name
FTO	<i>Castilleja levisecta</i>	Golden paintbrush
FTO	<i>Howellia aquatilis</i>	Water howellia
FTO	<i>Lupinus sulphureus</i> ssp. <i>kincaidii</i>	Kincaid's lupine
FTO	<i>Sidalcea nelsoniana</i>	Nelson's checker-mallow
FEO	<i>Arabis mcdonaldiana</i>	McDonald's rock-cress
FEO	<i>Astragalus applegate</i>	Applegate's milk-vetch
FEO	<i>Erigeron decumbens</i> var. <i>decumbens</i>	Willamette valley daisy
FEO	<i>Fritillaria gentneri</i>	Gentner's fritillary
FEO	<i>Lilium occidentale</i>	Western lily
FEO	<i>Limnanthes floccosa</i> ssp. <i>grandiflora</i>	Large-flowered wooly meadowfoam
FEO	<i>Lomatium bradshawii</i>	Bradshaw's desert parsley
FEO	<i>Lomatium cookii</i>	Cook's lomatium
FEO	<i>Plagiobothrys hirtus</i>	Rough popcorn flower
FCO	<i>Calochortus persistens</i>	Siskiyou mariposa-lily

FTO (federally threatened Oregon)   FEO (federally endangered Oregon)   FCO (federal candidate Oregon)

The federally listed and candidate species are vascular plants and they occur in every BLM district within the planning area. In general, federally listed plant species are adapted to special habitats within narrow geographic ranges, although some are broader and wider ranging. Individual population sizes are generally small and the area of occupied habitat is small. See *Appendix E. Botany* for a list of federally listed species, the number of known sites, the area occupied in acres, and the general habitat descriptions.

Oregon State Threatened, Endangered, and Proposed Species

The BLM policy for special status species applies to state-listed species that are under the authority of the Sikes Act. Species listed by the state of Oregon occur in every BLM district within the planning area and all are vascular plants. There are 29 plant species, along with 50 candidate species, that are listed under the Oregon Endangered Species Act. Of the Oregon listed species, 11 are also federally listed. In general, most of these species are narrow endemics that occur within restricted geographic areas or unique habitats. The populations of state-listed species are few and normally small in size. See *Appendix E. Botany*.

Bureau Sensitive Species and Bureau Assessment Species

Bureau sensitive species receive the same level of protection as federal candidate species under the BLM's special status species policy. Bureau assessment species are species of concern in Oregon, and impacts to populations and individual species are considered along with other resource considerations on a case-by-case basis.

There are 116 bureau sensitive species (of which are 19 state-listed species) and 194 bureau assessment species within the planning area. Of those 310 species, 216 are vascular plants (not including the 14 species that are federally listed and candidate species), 47 are mosses or liverworts (bryophytes), 26 are lichens, and 21 are fungi.

The vascular plants occur in a variety of habitat types and substrates including aquatic, riparian, and terrestrial. Bryophytes and lichen are associated with a variety of habitats (including rock, soils, and riparian, although primarily conifer and hardwood communities). Fungi are mycorrhizal and associated with host species in conifer and hardwood forest communities. The habitat groups (listed in the last section of this *Botany* section) delineate species by habitat types. Additional habitat descriptions can be found in *Appendix E. Botany*.

Conservation Plans

The following sections outline the recovery plans, conservation agreements, and conservation strategies that exist for rare plant species.

Recovery Plans for Federally Listed Plant Species

Recovery plans have been written for nine species within the planning area that are listed under the federal Endangered Species Act. Some recovery plans were written more than 15 years ago. The content, style, and vocabulary varies greatly between earlier and later plans. The primary conservation components of each recovery plan that applies to land management activities have been extracted and listed in *Appendix E. Botany*.

Table 83. Federally listed plant species with recovery plans

Scientific Name	Common Name
<i>Arabis mcdonaldiana</i>	McDonald's rock-cress
<i>Astragalus applegatei</i>	Applegate's milk-vetch
<i>Castilleja levisecta</i>	Golden paintbrush
<i>Fritillaria gentneri</i>	Gentner's fritillary
<i>Howellia aquatilis</i>	Water howellia
<i>Lilium occidentale</i>	Western lily
<i>Lomatium bradshawii</i>	Bradshaw's desert parsley
<i>Lupinus sulphureus</i> sp. <i>kincaidii</i>	Kincaid's lupine
<i>Plagiobothrys hirtus</i>	Rough popcorn flower
<i>Sidalcea nelsoniana</i>	Nelson's checker-mallow

Conservation Agreements

Conservation agreements outline mutual conservation goals that are necessary to reduce, eliminate, or mitigate specific threats to species that are at risk. They provide general guidance for the management of species. There are four interagency conservation agreements between the BLM and other agencies (usually involving the U.S. Fish and Wildlife Service) for species within the planning area. See *Table 84 (Plant species with conservation agreements)*. Three of the agreements are single-species agreements and one agreement covers a suite of rare species that occur in serpentine Darlingtonia wetlands and fens.

Table 84. Plant species with conservation agreements

Scientific Name	Common Name
Single-species agreements	
<i>Calochortus coxii</i>	Crinite mariposa lily (Oregon State listed as endangered)
<i>Calochortus umpquaensis</i>	Umpqua mariposa lily (Oregon State listed as endangered)
<i>Lupinus sulphureus</i> sp. <i>kincaidi</i>	Kincaid's lupine (federally listed as threatened)
Multispecies agreement for the serpentine Darlingtonia wetlands and fens of southwestern Oregon and northwestern California	
<i>Epilobium oreganum</i>	Oregon willow-herb
<i>Gentiana setigera</i>	Mendocino gentian
<i>Hastingsia bracteosa</i>	Large-flowered rushlily (Oregon State listed as threatened)
<i>H. atropurpurea</i>	Purple-flowered rushlily
<i>Viola primulifolia</i> sp. <i>occidentalis</i>	Western bog violet

Conservation Strategies

Conservation strategies are more detailed than conservation agreements. They not only contain the information that is included in a conservation assessment, but they also provide specific details on species populations and habitat management. Conservation strategies have been written for five species within the planning area. See *Table 85 (Plant species with conservation strategies)*.

Table 85. Plant species with conservation strategies

Scientific Name	Common Name
<i>Aster gormanii</i>	Gorman's aster
<i>Cimicifuga elata</i>	Tall bugbane
<i>Frasera umpquaensis</i>	Umpqua gentian
<i>Phacelia argentea</i>	Silvery phacelia (Oregon State listed as threatened)
<i>Rorippa columbiae</i>	Columbia cress

See *Appendix E. Botany* for a complete list of conservation strategies and conservation agreements, which includes species, key conservation components that apply to land management actions, participating agencies, and field units.

Survey and Manage

Survey and manage is a mitigation measure for little known or rare species that was adopted as a set of standards and guidelines in the 1995 resource management plans of the districts within the planning area to direct management.

For comprehensive information regarding the species, refer to the:

- *January 2004 Final Supplemental Environmental Impact Statement To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines;* and the
- *January 2007 Supplement to the July 2006 Draft Supplement to the 2004 Final Supplemental Environmental Impact Statement To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines.*

For the management direction, refer to the:

- *January 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.*

The information in these environmental impact statements is incorporated by reference.

See *Table 86 (Distribution of survey and manage species)* for the total number of survey and manage species within the area of the Northwest Forest plan (NWFP), the number that occur on BLM-administered lands, the number that are also bureau sensitive species (BSS), the number that are also bureau assessment species (BAS), and the number that have been removed from the survey and manage list in Oregon.

Table 86.   Distribution of survey and manage species

Survey and Manage Species	Total Survey and Manage	Vascular Plants	Bryophytes	Lichens	Fungi
Number that occur within the area of the NWFP	254	10	17	40	187
Number that occur on BLM lands	246	10	13	39	184
Number that are also BSS	20	3	0	2	15
Number that are also BAS	21	3	8	10	0
Number that have been removed from Oregon listing	8	2	2	1	3

Habitat Groups and Rare Plant and Fungi Species

One method of grouping rare plant and fungi species is by the habitat associations that are based on biotic and abiotic features. See *Figure 57 (Number of special status species by habitat group)*. There are 324 special status plant and fungi species within the planning area from approximately 14 life-forms (e.g., forb, grass, tree, lichen, and fungi) that are found in numerous habitat-specific substrates, plant communities, and environments. There are nine habitat groups that were formed based on aggregating together similar habitat types that exist throughout the planning area. Each of the 324 species was placed into one or more groups. Each species was included in the broadest number of habit groups based on the variety of habitats and conditions that are associated with the species. See *Appendix E. Botany*.

Figure 57. Number of special status species by habitat group

The habitat groups used in this analysis include:

- conifer and mixed evergreen forests (CF)
- maritime zone (MZ)
- oak and hardwood woodlands (OHW)
- riparian and aquatic (RI)
- rocky areas, outcrops, and scree (RK)
- seasonal wetlands, fens, and vernal pools (SW)
- serpentine areas (SE)
- shrub communities (SC)
- upland meadows and grasslands (MG)

The above habitat groups relate to biotic and abiotic conditions as follows:

- Four habitat groups (CF, MG, OHW, and SC) relate to broad vegetative community types.
- Two habitat groups (RI and SW) relate to hydrologic and aquatic dependencies.
- Two habitat groups (RK and SE) relate to parent material substrates (one specifically to serpentine areas).
- One habitat groups (MZ) relates to wind and rain and is defined as taxa that is normally associated with coastal conditions within approximately 10 miles of the coast.

Invasive Plants

Key Points

- Invasive plant infestations are numerous and many are well-distributed on BLM-administered lands within the planning area.
- Invasive species are introduced and spread through a variety of mechanisms, including land management activities.

Invasive plants are alien plant species whose introduction causes economic or environmental harm, or harm to human health. Noxious weeds are a subset of invasive plant species. Noxious weeds are plant species that are designated by federal or state law, and generally possess one or more of the following characteristics:

- aggressive and difficult to manage
- parasitic
- carrier (or host) of serious insects or disease
- nonnative, new to, or not common to the United States

Invasive plants have been introduced into the planning area by various means. Some introductions were intentional—to make use of ornamental or erosion-control species. Examples include Scotch broom and purple loosestrife. Other species were introduced unintentionally—by air, water, or transportation routes. Frequently, invasive plants are introduced by the movement of contaminated seed, agricultural materials, or animals; the use of contaminated equipment; the spreading of infested gravel, road fill, and topsoil; and the sale of invasive species for ornamental purposes (USDI, BLM 1996).

Once introduced, these invasive species are spread primarily by vehicles, human activities, water, and wildlife. The initial infestations are often along roads and trails, landings, campgrounds, and other areas of high disturbance (Hansen and Clevenger 2005). Occasionally, infestations are also introduced into relatively undisturbed areas (USDI, BLM 2005a, 3-39).

More than 130 invasive plant species have been documented within the planning area. Of these, 61 are also listed as noxious weeds in Oregon. See *Table 87 (Number of invasive plant and noxious weed species on BLM-administered lands within the planning area)*. Several of the other identified invasive plants are also listed as noxious weeds in other states.

Table 87. Number of invasive plant and noxious weed species on BLM-administered lands within the planning area

Plant Category	Planning Area	BLM Districts					
		Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath Falls
Invasive Plants	136	74	64	81	51	50	50
Noxious Weeds	61	26	28	28	29	36	28

An accurate accounting of the total acreage and distribution of invasive plant infestations and treatments is unavailable for the following reasons:

- No central source exists for compiling invasive plant infestation and treatment information within Oregon.
- There is no requirement for county, private, or corporate land owners to report invasive plant information.

Despite the limited reporting on weed locations, a good picture of the distribution of noxious weed species is available on a species-by-species basis by WeedMapper (a website).

The condition of invasive plant infestations on BLM-administered lands within the planning area can be characterized by analyzing a few invasive species. The following representative list of invasive species is used to describe the condition of invasive plants on BLM-administered lands within the planning area.

WeedMapper
An interagency cooperative effort with Oregon State University to collect spatial information on the distribution of noxious weeds in the state of Oregon. See www.weedmapper.org.

- Canada thistle
- meadow knapweed
- dyer's woad
- Scotch and French brooms
- false brome
- spotted and diffuse knapweeds
- knotweeds
- yellow starthistle
- leafy spurge

Each of these species or species groups has a unique distribution pattern and strategy for spreading and resisting different treatment methods. Many of the identified invasive species are well-distributed across the planning area. Some are limited in distribution and others have very few sites on BLM-administered lands. Although each species is unique, these sample invasive species represent a range of life histories and methods of introduction and spread sufficient to describe the condition of invasive species on BLM-administered lands within the planning area.

Canada Thistle

Canada thistle, a perennial with an extensive root system, occurs in a wide variety of open, moist, disturbed habitats including roadsides, streambanks, pastures, meadows, waste areas, campgrounds, clear-cuts, roads, fires, and landslides (Hansen 2005; Turner 1999; Titus 1998; Jensen 1991; Schoenberger 1982; Neiland 1958). Canada thistle is rarely found in undisturbed forests (Heckman 1999; Bailey 1998; Hutchison 1992; Chen 1996; Dewey 1991; Parendes 2000; Young 1967). A study at Yellowstone National Park revealed that Canada thistle was found in habitats with varying levels of disturbance and that there is a direct relationship with species abundance and the level of disturbance (Allen 1999; Turner 1997).

Canada thistle spreads sexually by seed and vegetatively by root and stem fragments. Most seeds are spread by animals, hay, contaminated crop seed, machinery, and irrigation water. Fewer are dispersed by wind (Nuzzo 2000). The majority of the seeds germinate

the year they are produced. Seeds are generally viable for less than 5 years, but could remain viable for up to 20 years in soil (Nuzzo 2000; Donald 1994).

Once germinated, Canada thistle seedlings require space to grow and relatively high levels of light (Nuzzo 2000; Donald 1994). Once established, Canada thistle spreads rapidly by vegetative growth in the root and underground stems systems. Within one season a plant can grow up to 20 feet horizontally in good growing conditions (Magnusson 1987).

Canada thistle may establish in natural areas as part of the initial plant community after logging (Jensen 1991; Kellman 1969; Chen 1996; Young 1967), fire (Schoenberger 1982), grazing, and road building (Meier 1997).

A study in northern Idaho documented the establishment of Canada thistle following clear-cutting activities with varying levels of soil displacement. Timber harvesting activities with high levels of soil disturbance favor the establishment of forbs, including Canada thistle, to the detriment of tree seedling establishment (Jensen 1991). Canada thistle establishment may take two or more seasons after disturbance events (Doyle 1998; Willard 1995; Jensen 1991).

Canada thistle is well-distributed across the state and is present on BLM lands in every district within the planning area. See *Figure 58 (Distribution of Canada thistle)* (WeedMapper 2004a).

Figure 58. Distribution of Canada thistle

Source: WeedMapper 2004a

Dyer's Woad

Dyer's woad is an invader of rangelands and pastures. Dyer's woad behaves as a winter annual, biennial, or short-lived perennial. It is a prolific seed producer. The seeds are toxic to other plants and may remain viable in the soil for several years. This species only reproduces by seed (Kadrmass 2002; Forest Health Technology Enterprise Team *Update Team*. Spring 1997).

Dyer's woad is spread by the transport of contaminated livestock, machinery, and soil; the sowing of contaminated seed; and the feeding of contaminated hay. Natural movements of wind and water also contribute to the spread of dyer's woad (Kadrmass 2002).

The apparent distribution of dyer's woad in western Oregon is limited to the southeastern portion of the planning area. Dyer's woad infestations are reported from the Klamath Falls Resource Area of the Lakeview District and the Medford District. See *Figure 59 (Distribution of dyer's woad)* (WeedMapper 2004a).

Figure 59. Distribution of dyer's woad

Source: WeedMapper 2004a

False Brome

False brome, a perennial grass, reproduces by producing large quantities of seed. The seeds are dispersed by water, gravity, animals, and are often spread long distances by vehicles, off-highway vehicles, people, and road construction and maintenance equipment (Kaye 2003; False-brome Working Group Newsletter 2004).

False brome is shade tolerant but can be easily crowded out by other shrubs and forbs. It grows in a wide variety of habitats including dry meadows and along streams, roads, trails, and under forest canopies. Infestations spread along roads, trails, and down streams (Kaye 2003; False-brome Working Group Newsletter 2004).

False brome has been reported on BLM lands in the Eugene, Salem, and Medford districts, and is also known to occur on nonfederal lands in southwestern Oregon and just over the crest of the Cascade Mountains in Jefferson County. See *Figure 60 (Distribution of false brome)* (WeedMapper 2004a).

Figure 60. Distribution of false brome

Source: WeedMapper 2004a

Knotweeds

The knotweeds are long-lived perennials that create dense infestations in disturbed areas, like stream banks, roads, and in waste areas. Roots and rhizomes can reach depths of 7 feet and distances of more than 20 feet from the parent plant. These infestations become dense and outcompete most native plant communities (Soll 2007; Seiger 1991).

Knotweeds favor habitats that are mostly light, but can persist in areas of partial shade, particularly where the overstory is dominated by broadleaf tree species. Knotweed infestations spread downstream during flood events, and are introduced along roads and waste areas as a result of human activity (Soll 2007; Seiger 1991).

Knotweeds are present on the BLM-administered lands in all of the planning area, except the Klamath Falls Resource Area of the Lakeview District. See *Figure 61 (Distribution of Japanese and giant knotweed and the Himalayan knotweed)* (WeedMapper 2004a). These figures only reflects the sites that have been reported. Considerable effort has gone into inventorying the invasive knotweed species in some watersheds. It is likely that these figures underrepresent the actual distribution of knotweeds within the planning area.

Figure 61. Distribution of Japanese and giant knotweed (left) and the Himalayan knotweed (right)

Source: WeedMapper 2004a

Japanese and giant knotweed

Himalayan knotweed

Leafy Spurge

Leafy spurge is known to occur in a wide variety of habitats including agricultural, urban areas, grasslands, shrublands, and forests. This species is most vigorous in full sunlight and dry habitats but can also inhabit woodlands, prairies, and other habitats. The root system of leafy spurge is extensive and can reach depths beyond 12 feet into the soil profile and reach more than 30 feet from side to side. Infestations tend to grow into dense stands, easily outcompeting native plant communities (WeedMapper 2004b; Global Invasive Species Database 2005).

Leafy spurge can be introduced to new locations by accidentally including seeds in agricultural seed mixes and may be used as an ornamental in landscapes. Infestations can grow from a single established plant at a rate of 4 feet per year (Global Invasive Species Database 2005).

The distribution of leafy spurge in Oregon is primarily east of the crest of the Cascade Mountains and has been reported on BLM lands in both the Medford District and Klamath Falls Resource Area of the Lakeview District. See *Figure 62 (Distribution of leafy spurge)* (WeedMapper 2004a).

Figure 62. Distribution of leafy spurge

Source: WeedMapper 2004a

Meadow Knapweed

Meadow knapweed was introduced into Oregon as a forage plant and today invades a variety of habitats within the planning area including roadsides, pastures, meadows, native prairies, oak savannahs, and forest openings. In western Oregon, meadow knapweed is becoming more common in clear-cuts (Coombs et al. 2004). This species outcompetes native plant communities—reproducing by seed and spreading by both natural processes and human activity (WeedMapper 2004).

The reported distribution of meadow knapweed in Oregon is primarily west of the crest of the Cascade Mountains and has been documented on BLM lands in every district within the planning area. See *Figure 63 (Distribution of meadow knapweed)* (WeedMapper 2004a).

Figure 63. Distribution of meadow knapweed

Source: WeedMapper 2004a

Scotch and French Brooms

Scotch and French brooms are pioneer species known to displace native plant species and increase the costs of timber production. They readily invade disturbed sites in natural areas, dunes, recreational areas, dry riverbeds, utility right-of-ways, open habitats, and forest lands. Scotch broom is shade intolerant but, given a chance, it invades areas soon after logging, clearing, and burning (Coombs et al. 2004). French broom has similar characteristics (Oregon Department of Agriculture 2007; Hoshovsky 1986).

Scotch and French brooms reproduce primarily by long-lived and hard-coated seeds. Mature plants produce a multitude of seeds that can remain viable in the soil for more than 50 years (Soll 2007; Coombs et al. 2004 160-161). The seeds are transported in soils, down streams, on machinery, and sometimes by birds and other animals that carry the seeds to new isolated areas (Watterson 2006; Hoshovsky 1986).

Scotch broom infestations are present across Oregon, except in the southeastern portion of the state. In western Oregon, the species is well-distributed north to south and is reported on BLM lands in every district within the planning area. French broom infestations are currently limited to western Oregon and are reported to occur on BLM lands in the Coos Bay, Eugene, Medford, and Roseburg districts. See *Figure 64 (Distribution of French and Scotch brooms)* (WeedMapper 2004a).

Figure 64. Distribution of Scotch broom (left) and French (right) brooms

Source: WeedMapper 2004a

Scotch broom

French broom

Spotted and Diffuse Knapweeds

Spotted and diffuse knapweeds are tap-rooted biennials or short-lived perennials that are successful in outcompeting desirable species and native plant communities by growing into dense infestations in open habitats (WeedMapper Team 2004c, 2004d).

Spotted and diffuse knapweed seeds are often spread by being carried along on vehicle frames and shoes to new roadside or trail environments (Sheley et al. 1998). In British Columbia, logging trucks, off-highway vehicles, and trail bikes are documented sources of knapweed spreaders. These knapweeds are also spread along waterways in crop seed and in hay (Strang et al. 1979). Undisturbed infestations spread their seed by wind and water. The seeds can persist in the soil for more than five years (Coombs et al. 2004 198-199).

Transportation corridors, water ways, gravel pits, and industrial areas are common sites for diffuse knapweed infestations (Coombs et al. 2004 198-199; Roche and Roche 1988). Diffuse knapweed is also known to invade well-managed rangelands (Sheley et al. 1998).

Diffuse and spotted knapweeds have similar distribution patterns within the planning area but diffuse knapweed is reported less frequently. See *Figure 65 (Distribution of diffuse knapweed and spotted knapweed)* (WeedMapper 2004a). Both species are spread throughout the state. Diffuse knapweed has been documented on BLM lands in all of the districts within the planning area, except for Coos Bay and Medford. Spotted knapweed occurs in all of the districts within the planning area, except for Eugene and Roseburg.

Figure 65. Distribution of diffuse knapweed (left) and spotted knapweed (right)

Source: WeedMapper 2004a

Diffuse knapweed

Spotted knapweed

Yellow Starthistle

Yellow starthistle is an invasive winter annual or, rarely, a biennial or short-lived perennial forb, which grows best in full light and dry conditions and is almost always found in disturbed areas or open grasslands that are dominated by annuals.

Yellow starthistle infestations can reach more than 6 million plants per acre (Callihan 1993). At this density, yellow starthistle effectively displaces native plants; reduces wildlife habitats, species diversity, and land values; and limits access to recreational areas.

Seeds of yellow starthistle are dispersed short distances by wind and longer distances by animals and people. Yellow starthistle seeds may remain viable for up to 10 years (Callihan 1993). Seeds are most often distributed long distances by such human activities as the movement of livestock, the movement of seeds on the undercarriage of vehicles and on road maintenance equipment, and the use of contaminated hay and crop seed (Healy 2000; DiTomaso 2001). Yellow starthistle infestations have also been spread from gravel out of infested gravel pits to roadsides and other management activity sites (Roche 1988).

The yellow starthistle distribution pattern in Oregon is clustered in the northeast and southwest but is present in every physiographic province in the state. See *Figure 66 (Distribution of yellow starthistle)* (WeedMapper 2004a). Infestations of yellow starthistle are reported on BLM lands in all of the districts within the planning area, except Salem.

Figure 66. Distribution of yellow starthistle

Source: WeedMapper 2004a

Infestations of Invasive Species

Reported weed sites for the invasive species that are described above show high densities of reported invasive plant sites in portions of all of the planning area. See *Figure 67 (Reported infestations of representative invasive species within the planning area)* and *Figure 68 (Distribution categories of invasive species for the fifth-field watersheds within the planning area)*.

Figure 67. Reported infestations of representative invasive species within the planning area

Figure 68. Distribution categories of invasive species for the fifth-field watersheds within the planning area

The highest density fifth-field watersheds (shown in black) are those that have reported infestations in more than 25% of the square miles within them. The lightest gray areas represent fifth-field watersheds with reported infestations in 1% or fewer of the square miles within them, and the white areas show fifth-field watersheds with no reported infestations. The most expansive high-density invasive plant area is located in the Medford District and extends north into the Roseburg and Coos Bay districts.

Roads, trails, high recreation use areas, urban areas, and gravel sources can serve as the primary source locations for many invasive plant species (USDA, U.S. Forest Service 2005, 3-18). These source locations are present on both BLM- and non-BLM-administered lands throughout the planning area.

Common methods of introduction (USDI, BLM 1996a) include the movement of:

- contaminated seed, feed grain, other plant materials;
- contaminated equipment across uncontaminated lands;
- wildlife;
- livestock;
- gravel, road fill, and topsoil; and
- the selling and trading of plants and seeds as ornamentals.

Once introduced, invasive plants are spread primarily by vehicles, humans, livestock, wind, water, and wildlife. Disturbed sites, like trailheads, landings, recreation areas, logging sites, and roads regularly support infestations (Watterson 2006; USDA, U.S. Forest Service 2005, 3-39).

Invasive plants are generally introduced and spread by human and management activities that result in ground disturbances and increased light levels. Examples are:

- Knotweed infestations are introduced along roads and waste areas as a result of human activity and then spread downstream during flood events (Hutchison 1992; Seiger 1991).
- False brome, knapweeds, Scotch broom, and other species also spread downstream once they are introduced into stream systems (Watterson 2006).
- Logging trucks, off-highway vehicles, and trail bikes have been documented sources of spreading knapweed (Strang 1979).
- Transportation corridors, waterways, gravel pits, and industrial areas are common sites for diffuse knapweed infestations (Roche 1988).

The association between disturbance and increased light levels, created by management activities (like logging and road maintenance activities), and the vigor of infestations are well-documented (Allen 1999; Turner 1997). The likelihood of successful invasions is increasingly high with more extensive ground disturbance activities. The factors that are associated with timber harvesting activities that increase the chances of invasion include (Nuzzo 2000; Parendes 2000; Heckman 1999; Bailey 1998; Doyle 1998; Titus 1998; Outcalt 1981; Chen 1996; Donald 1994; Kellman 1969; Nieland 1958):

- increased light levels reaching the forest floor;
- increased soil temperatures; and
- soil disturbances, which can increase the germination rates of seeds in a seed bank or create seed beds.

Harvesting methods and the size of logging units increases the susceptibility to invasive plant introductions. Timber harvesting activities and methods that disturb more soil and leave less postharvest shade would be more susceptible to invasive plant introduction and spread (USDA, U.S. Forest Service 2005, 3-14, 3-5).

Knotweeds, false brome, and Scotch broom tolerate moderate levels of shade. Spotted and meadow knapweeds, Canada thistle, dyer's woad, and yellow starthistle can be described as being fairly shade intolerant.

Infestations are introduced and spread readily in areas with frequent human activity, such as wildland urban interface and high recreational use areas (USDA, U.S. Forest Service 2005, 3-23, 3-25). These areas have more intensive disturbance activities occurring in higher concentrations than do areas with less human activity.

Invasive plants are more likely to spread throughout a landscape where disturbance activities are evenly distributed than in landscapes where the disturbance activities are spatially confined (USDA, U.S. Forest Service 2005, 3-14, 3-15, Appendix D 7-17).

Wildlife

Key Points

- The populations for the northern spotted owl in the Roseburg, Coos Bay, and Medford districts, and the Klamath Falls Resource Area of the Lakeview District, have been stable since 1985, while populations have declined in the Salem and Eugene districts.
- The habitat for the northern spotted owl within the planning area has increased since 1995, while the habitat for the marbled murrelet has remained relatively unchanged.
- The populations for the marbled murrelet in Oregon have declined approximately 50% from 1992 to 1995 and have experienced no change from 1997 to 2006.

Within the planning area, the BLM manages habitats that range from coastal beaches to montane forests and great basin sagebrush. There are several thousand vertebrate and invertebrate species that occur in the western and montane forests of Oregon. There are 11 species that are protected under the federal Endangered Species Act. A subset of individual species is specifically addressed in this draft environmental impact statement because of their importance in the analysis of the alternatives, the consultation with the U.S. Fish and Wildlife Service, or high public interest.

Northern Spotted Owl

The northern spotted owl (*Strix occidentalis caurina*) was federally listed as threatened by the U.S. Fish and Wildlife Service in June 1990 (Federal Register 1990, 26114-26194). The U.S. Fish and Wildlife Service issued a recovery plan as a draft in 1992, but did not issue a final recovery plan (USFWS 1992). A new recovery planning effort is currently underway and the final recovery plan is scheduled for completion in November 2007. Critical habitat was designated for the northern spotted owl in January 1992 and includes 3,257,000 acres of federal lands in Oregon, including 1,009,000 acres of land that is administered by the BLM (Federal Register 1992a, 1796-1838). A draft rule for the redesignation of critical habitat is expected in the summer of 2007.

The northern spotted owl was listed as threatened throughout its range “due to loss and adverse modification of suitable habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms” (Anderson et al. 1990). More specifically, significant threats to the northern spotted owl included the following (Federal Register 1992a, 1796-1835):

- low or declining populations
- limited or declining habitat
- distribution of habitat or populations
- isolation of provinces
- predation and competition
- lack of coordinated conservation measures
- vulnerability to natural disturbance

These threats were characterized for each province within the range of the northern spotted owl as severe, moderate, low, or unknown. The following were identified as a severe or moderate threats to the northern spotted owl in all or most of the provinces, and represent the greatest concern to the conservation of the northern spotted owl:

- declining habitat in all 12 provinces
- isolation of provinces in 11 provinces
- declining populations in 10 provinces

The following were identified as severe or moderate threats to the northern spotted owl in many of the provinces, which suggests a concern throughout the majority of its range:

- limited habitat in nine provinces
- low populations in eight provinces

Vulnerability to natural disturbances was rated as low in five provinces. Since the listing of the northern spotted owl, new information suggests that hybridization with the barred owl is less of a threat (Kelly and Forsman 2004) and competition with the barred owl is a greater threat than previously anticipated, as detailed below (Courtney et al. 2004).

The following recent documents summarize the condition of the northern spotted owl across its range and are incorporated by reference:

- *Status and Trends in Demography of Northern Spotted Owls, 1985-2003* (Anthony et al. 2006)
- *Scientific Evaluation of the Status of the Northern Spotted Owl* (Courtney et al. 2004)
- *Northern Spotted Owl Five-year Review: Summary and Evaluation* (USDI, USFWS 2004a)
- *Status and Trends of Northern Spotted Owl Population and Habitat* (Lint 2005)

Anthony et al. (2006) analyzed information gathered from 14 demographic study areas across the range of the northern spotted owl—11 include federal lands, 1 is located on private timberlands, and 2 are on tribal forest lands. The primary objectives of Anthony's analysis were:

- Estimate the age-specific survival and fecundity rates and their sampling variances for territorial owls on individual study areas.
- Determine if there were any trends in the apparent survival or fecundity rates among study areas.
- Estimate the annual rates of population change and the sampling variances for individual study areas and across study areas.
- Compare the demographic performance of the northern spotted owls on the eight areas that are the basis of the monitoring plan for the Northwest Forest Plan (Lint et al. 1999) to that of owls on other areas.

Courtney et al. (2004) was contracted by the U.S. Fish and Wildlife Service to “produce a report on the status of the northern spotted owl, summarizing and evaluating new information available since its listing, and any new understanding for information that existed at the time of listing” (USDI, USFWS 2004a). The U.S. Fish and Wildlife Service used the Courtney et al. (2004) report to conduct their five-year status review of the northern spotted owl as required under section 4(c) of the Endangered Species Act. The status review sought to answer three questions (USDI, USFWS 2004a):

1. Is the northern spotted owl a valid subspecies under the Endangered Species Act?
2. Is there new information about the threats or population status of the northern spotted owl?
3. If so, does the new information suggest that a change in listing status may be warranted?

In 2004, the U.S. Fish and Wildlife Service determined that the listing of the northern spotted owl as a threatened species was still warranted (USDI, USFWS 2004a). Even though some risk factors had declined (e.g., habitat loss due to timber harvesting and existing regulations), other factors had continued unchecked (e.g., habitat loss due to wildfire and population decline) and new risk factors with uncertain effects had developed since 1990 (e.g., the barred owl (*Strix varia*), West Nile virus, and sudden oak death) (USDI, USFWS 2004a).

Lint et al. (2005) was one component of the effectiveness monitoring strategy of the Northwest Forest Plan and reports on the effects of the first 10 years of implementing the plan on the population and habitat of the northern spotted owl. The report established baselines for 1994 and then reported on the change from the subsequent 10 years of Northwest Forest Plan implementation. A summary of the findings in the report includes:

- The estimated decline of the northern spotted owl population varied from 0 to 10% across the study areas in the Northwest Forest Plan area. The presence of barred owls (*Strix varia*), weather, past and present harvesting of habitat, and wildlife and insect infestations that alter habitat are all possible contributors to these declines.
- Approximately 74% of the federal lands within the range of the northern spotted owl are capable of providing suitable habitat. Approximately 50% of the habitat-capable area was providing suitable owl habitat.
- Precipitation, owl age, and habitat influence the survival and productivity of the northern spotted owl.
- The barred owl is present throughout the range of the northern spotted owl, so the likelihood of competitive interactions between the species raises concerns as to the future of the northern spotted owl.
- Barred owls, West Nile virus, and the management of suitable habitat for the northern spotted owl in fire-prone areas are likely to be future management concerns.

The Endangered Species Act requires the U.S. Fish and Wildlife Service to designate critical habitat to the maximum extent prudent and determinable concurrently with listing a species as endangered or threatened. Critical habitat units have been identified based on the need to protect current primary constituent elements, as well as to provide for the future development of primary constituent elements necessary for the conservation of the northern spotted owl. See *Figure 69 (Designated critical habitat units for the northern spotted owl within the planning area)*. These elements include nesting, roosting, foraging, and dispersal habitat designated by the U.S. Fish and Wildlife Service in 1992 (Federal Register 1992a, 1797). The U.S. Fish and Wildlife Service designated 1,009,000 acres of northern spotted owl critical habitat on BLM-administered lands (see *Appendix G. Wildlife*). The land use allocations under the current resource management plans are not aligned with designated northern spotted owl critical habitat, and the resource management plans do not include management direction specific to critical habitat units.

Figure 69. Designated critical habitat units for the northern spotted owl within the planning area

Northern spotted owl suitable habitat is the common term for those forest stands that provide for foraging, roosting, and nesting for the northern spotted owl. Thomas et al. (1990, 164) described it as a “multi-layered, multispecies canopy dominated by large (greater than 30 inches diameter at breast height) conifer overstory trees, and an understory of shade-tolerant conifers or hardwoods; a moderate to high (60 to 80%) canopy closure; substantial decadence in the form of large, live conifer trees with deformities—such as cavities, broken tops, and dwarf mistletoe infections; numerous large snags; ground cover characterized by large accumulations of logs and other woody debris; and a canopy that is open enough to allow owls to fly within and beneath it.”

The habitat classifications that are used for the analysis of effects for the planning area is based on five habitat criteria:

- quadratic mean diameter
- canopy cover
- presence of snags
- presence of down wood
- multilayered or single-layered canopies

See Table 88 (*Classification schedule for the habitat of the northern spotted owl*).

In this analysis, northern spotted owl habitat is classified and mapped as:

- nonhabitat;
- dispersal habitat only (habitat capable of providing for the dispersal needs of the owl, but not nesting, roosting, and foraging); or
- suitable habitat (nesting, roosting, and foraging habitat).

Table 88. Classification schedule for the habitat of the northern spotted owl

Quadratic Mean Diameter	Canopy Cover (%)	Presences of Snags ^a	Presence of Down Woody Debris (dwd) ^b	Single-Layered or Multilayered Canopy	Habitat Category
11-20	0-40	absent	absent	n/a ^c	non
11-20	0-40	present	absent	n/a	non
11-20	0-40	absent	present	n/a	non
11-20	0-40	present	present	n/a	non
0-11	0-100	n/a	n/a	m/a	non
20-30	0-40	absent	absent	single	non
20-30	0-40	present	absent	single	non
20-30	0-40	absent	absent	multiple	non
20-30	0-40	present	absent	multiple	non
20-30	0-40	absent	present	single	non
20-30	0-40	present	present	single	non
20-30	0-40	absent	present	multiple	non
20-30	0-40	present	present	multiple	non
30-100	0-40	absent	absent	single	non
30-100	0-40	present	absent	single	non
30-100	0-40	absent	absent	multiple	non
30-100	0-40	present	absent	multiple	non

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Quadratic Mean Diameter	Canopy Cover (%)	Presences of Snags ^a	Presence of Down Woody Debris (dwd) ^b	Single-Layered or Multilayered Canopy	Habitat Category
30-100	0-40	absent	present	single	non
30-100	0-40	present	present	single	non
30-100	0-40	absent	present	multiple	non
30-100	0-40	present	present	multiple	non
11-20	40-60	absent	absent	n/a	dispersal
11-20	40-60	present	absent	n/a	dispersal
11-20	40-60	absent	present	n/a	dispersal
11-20	60-100	absent	absent	n/a	dispersal
11-20	60-100	present	absent	n/a	dispersal
20-30	40-60	absent	absent	single	dispersal
20-30	40-60	present	absent	single	dispersal
20-30	40-60	absent	absent	multiple	dispersal
20-30	40-60	absent	present	single	dispersal
20-30	60-100	absent	absent	single	dispersal
20-30	60-100	absent	absent	multiple	dispersal
30-100	40-60	absent	absent	single	dispersal
30-100	40-60	present	absent	single	dispersal
30-100	40-60	absent	absent	multiple	dispersal
30-100	40-60	present	absent	multiple	dispersal
30-100	60-100	absent	absent	single	dispersal
30-100	60-100	absent	absent	multiple	dispersal
11-20	40-60	present	present	n/a	dispersal
11-20	60-100	absent	present	n/a	suitable
11-20	60-100	present	present	n/a	suitable
20-30	40-60	present	absent	multiple	dispersal
20-30	40-60	present	present	single	dispersal
20-30	40-60	absent	present	multiple	dispersal
20-30	60-100	present	absent	single	suitable
20-30	60-100	present	absent	multiple	suitable
20-30	60-100	absent	present	single	suitable
20-30	60-100	present	present	single	suitable
30-100	40-60	absent	present	single	dispersal
30-100	40-60	present	present	single	dispersal
30-100	60-100	present	absent	single	suitable
30-100	60-100	absent	present	single	suitable
20-30	40-60	present	present	multiple	suitable
20-30	60-100	absent	present	multiple	suitable
20-30	60-100	present	present	multiple	suitable
30-100	40-60	absent	present	multiple	suitable
30-100	40-60	present	present	multiple	suitable
30-100	60-100	present	absent	multiple	suitable
30-100	60-100	present	present	single	suitable
30-100	60-100	absent	present	multiple	suitable
30-100	60-100	present	present	multiple	suitable

^a Snag presence (4 snags per acre that are greater than 10 in.)

^b dwd presence (2% ground cover)

^c n/a (has no bearing on habitat category)

Suitable habitat currently comprises 49% of habitat-capable acres on BLM-administered lands within the planning area. See *Table 89 (Summary of current northern spotted owl habitat on BLM-administered lands within the planning area by province)*.

Table 89. Summary of current northern spotted owl habitat on BLM-administered lands within the planning area by province

Province	Habitat-Capable (acres)	Suitable Habitat		Total Dispersal Habitat	
		(acres)	(%)	(acres)	(%)
Coast Range	742,500	315,200	42	641,800	86
West Cascades	634,500	308,300	49	543,800	86
Klamath	773,000	431,600	56	681,800	88
East Cascades	46,700	30,700	66	39,400	84
Totals	2,196,700	1,085,800	49	1,906,800	87

In 1994, about 7.4 million acres of suitable northern spotted owl habitat were estimated to exist on federal lands managed under the Northwest Forest Plan. See *Appendix G. Wildlife* for details. As of April 12, 2004, the U.S. Fish and Wildlife Service had consulted on the proposed removal of 575,447 of these acres (7.8% of 7.4 million acres) as a result of all management activities. Of the total acres consulted on for removal, approximately 190,429 acres (2.6% of 7.4 million acres) occurred on federal lands. Of the total federal acres consulted on for removal, approximately 167,134 acres (2.3% of 7.4 million acres) were removed as a result of timber harvesting.

From 1994 through April 12, 2004, habitat lost due to natural events was estimated at approximately 186,931 acres. See *Appendix G. Wildlife* for details. About two-thirds of this loss was attributed to the 2002 Biscuit Fire, which burned more than 500,000 acres in southwest Oregon (Rogue River basin) and northern California. This fire resulted in a loss of approximately 113,451 acres of northern spotted owl habitat, including habitat within five late-successional reserves. Approximately 18,630 acres of northern spotted owl habitat were lost due to the B&B Complex and Davis fires in the Eastern Cascades province.

From 1994 through July 19, 2005, the U.S. Fish and Wildlife Service has consulted on the removal or downgrading of 46,945 acres (1.49 %) of critical habitat due to management-related activities. The majority of these acres (33,008 acres) have been concentrated in the Western Cascades and Klamath provinces. In addition, natural events (including fire and insect outbreaks) have resulted in the removal or downgrading of 42,679 acres. See *Appendix G. Wildlife* for details. In general, fires have had more of an impact to northern spotted owl critical habitat in the interior provinces of Washington and California and the southern and interior provinces of Oregon than the coastal provinces. At the time of listing there was recognition that large-scale wildfire posed a threat to the northern spotted owl and its habitat (Anderson et al. 1990). New information suggests fire may be more of a threat than previously thought (Lint 2005; Moeur et al. 2005).

Moeur et al. 2005 estimated an increase of approximately 1.25 to 1.5 million acres of medium and large older forest (greater than 20 inches diameter at breast height, single and multilayered canopies) on federal lands in the Northwest Forest Plan area between 1994 and 2003. The increase occurred primarily in the lower end of the diameter range for older forest. In the higher end of the diameter range (greater than 30 inches diameter at breast height) the area increased from 102,000 to 127,000 acres.

The estimates of changes in habitat were based on change-detection data for losses due to harvesting and fires, and remeasured inventory plot data for increases due to ingrowth. Transition into and out of medium and large older forest over the 10-year period was extrapolated from inventory plot data based on a subpopulation of U.S. Forest Service land types and applied to all federal lands. Because size class and general canopy layer descriptions do not necessarily account for the complex forest structure that is often associated with northern spotted owl habitat, the significance of these increases in acres to northern spotted owl conservation remains unknown.

The types of forest that are used by the northern spotted owl have been studied recently and study results show the following:

- “Studies consistently showed that mature/old forest patch area was an important predictor of forest occupancy by northern spotted owls. While a fragmentation index was negatively associated with site occupancy in some studies, a trade-off between large patches of mature/old forest and juxtaposition of land cover types appear to benefit Spotted Owls in other studies”(Courtney et al. 2004, 5-13).
- Studies in the Klamath province in southern Oregon reinforce Courtney et al. (2004) finding that the apparent survival and reproductive rate of owl territories are positively associated with older forest types closer to the activity center (Dugger et al. 2005).
- Olson et al. (2004) found that survival in the Oregon Coast Range had a quadratic relationship with the amount of late- and mid-seral forest near nesting centers. Reproductive rates fluctuated biennially and were positively related to the amount of edge between late- and mid-seral forests and other habitat classes. Olson et al. (2004) conclude that their result indicates that while mid- and late-seral forests are important to owls, a mixture of these forest types with younger forest and nonforest may be best for owl survival and reproduction in their study area.
- Survival decreased dramatically when the amount of nonhabitat exceeded approximately 50% (Dugger et al. 2005). Northern spotted owl territories with habitat fitness potentials (i.e., expressed as a lambda estimate for the territory) of less than 1.0 were generally characterized by less than 40 to 50% old-forest habitat near the territory center (Dugger et al. 2005). The authors conclude that they found no support for either a positive or negative direct effect of intermediate-aged forest on either the survival or reproduction of the northern spotted owl.

There have been 1,333 known northern spotted owl sites located on BLM-administered lands since 1984. Surveys are currently being conducted primarily where they are

required for timber sale clearances and within the demography study areas (Coast Range, Tyee, Klamath, and South Cascades) that overlap BLM-administered lands. There are 645 sites (48%) that have survey data indicating occupancy between 2000 and 2004.

Numerous studies, summarized in Courtney et al. (2004), illustrate that the northern spotted owl feeds predominantly on small mammals. Northern flying squirrels and woodrats are usually the predominant prey both in biomass and frequency (Barrows 1980; Forsman et al. 1984; Ward 1990; Bevis et al. 1997; Forsman et al. 2001, 2004) with a clear geographic pattern of diet, paralleling differences in habitat (Thomas et al. 1990).

- Northern flying squirrels are generally the predominant prey item in the more mesic Douglas fir and western hemlock forests characteristic of the northern portion of the range, whereas woodrats are generally the predominant prey item in the drier mixed conifer and mixed evergreen forests typically found in the southern portion of the range (Forsman et al. 1984; Thomas et al. 1990; Ward et al. 1998; reviewed by Courtney et al. 2004). These prey items were found to be codominant in the southwest interior of Oregon (Forsman et al. 2001, 2004). Zabel et al. (1995) showed that northern spotted owl home ranges are larger where flying squirrels (*Glaucomys sabrinus*) are the predominant prey and are smaller where woodrats (*Neotoma* sp.) are the predominant prey.
- Other prey species, such as the red tree vole (*Arborimus longicaudus*), red-backed voles (*Clethrionomys gapperi*), mice, rabbits and hares, birds, and insects, may be seasonally or locally important (reviewed by Courtney et al. 2004). For example, Rosenberg et al. (2003) showed a strong correlation between the annual reproductive success of northern spotted owls (number of young per territory) and abundance of deer mice (*Peromyscus maniculatus*), despite the fact that they only made up $1.6\% \pm 0.5\%$ of the biomass consumed. However, it is unclear if the causative factor behind this correlation was prey abundance or a synergistic response to weather (Rosenberg et al. 2003). The secondary species play important roles locally and seasonally.
- Forest heterogeneity and structure effect prey species occurrence and abundance. Ward (1990) found that northern spotted owls foraged in areas that had lower variance in prey densities (prey were more predictable in occurrence) within older forests and near ecotones of old forest and brush seral stages. Habitat components such as snags, down wood, shrub and herbaceous components, and edge are all important to prey species and therefore the northern spotted owl (Courtney et al. 2004). Where woodrats are the predominant prey in southwestern Oregon, studies suggest that some amount of forest heterogeneity may benefit owls as a result of increased prey abundance (Franklin and Gutierrez 2002; Ward et al. 1998).

Sudden oak death presents a potential influence on northern spotted owl habitat, but there is inadequate information to analyze the affects on habitat. Sudden oak death is a recently recognized disease that is killing tanoak (*Lithocarpus densiflorus*), oaks (*Quercus* sp.), and other plant species in California. The disease has been confirmed in one location in

Curry County in southwestern Oregon (Kanaskie et al. 2006). The disease is caused by the introduced pathogen, *Phytophthora ramorum*. Widespread infections could affect suitable northern spotted owl habitat in southwestern Oregon through the removal of subdominant canopy and shrub species; impacting habitat structure and prey base numbers. However, there is inadequate information on the potential spread and influence on forest structure and northern spotted owl prey species to analyze effects (see the *Incomplete and Inadequate Information* section in *Chapter 4*).

The conservation needs of the northern spotted owl include:

- providing large blocks of suitable habitat that is distributed across a variety of ecological conditions and is spaced so as to facilitate owl movement between the blocks;
- providing dispersal habitat within and between large blocks; and
- providing habitat within areas of concern for genetic interchange between owl populations (Raphael 2006; Lint 2005; Courtney et al. 2004; USFWS 1992; Thomas et al. 1990).

Northern spotted owl conservation is predicated on providing blocks of suitable habitat that support clusters of owls. A cluster is at least 20 breeding pairs of owls that support each other demographically and thereby maintain a stable population (Thomas et al. 1990, 24). The Interagency Scientific Committee strategy (Thomas et al. 1990), 1992 draft northern spotted owl recovery plan (USDI, USFWS 1992), northern spotted owl critical habitat designation (Federal Register 1992a, 1796), and the Northwest Forest Plan (USDA, USDI 1994b) used this principle in developing systems of large blocks of habitat.

Several studies have suggested that some amount of forest heterogeneity or intermingling of forest types may improve foraging habitat, especially where woodrats are the predominant prey as described above. However, there is a strong association of nesting and roosting habitat with older, structurally complex forests (Olson 2004; Ward et al. 1998). As noted by Raphael (2006, 128): “no new evidence suggests that large blocks of habitat are not critical to the persistence of the owl.” Therefore, large blocks of suitable habitat remain a fundamental conservation need of northern spotted owls throughout the planning area (Courtney et al. 2004, 5-9 to 5-12, 9-11).

In addition to large blocks of suitable habitat, owl conservation requires habitat within and between blocks that supports roosting, protection from predators, and foraging to allow for successful dispersal among blocks (FSEIS, Appendix G 16, G-9; Thomas et al. 1990). Owls not only leave their territories and move across the landscape as juveniles dispersing from their natal territories but also as single adults seeking mates or new territories (Forsman et al. 2002). As owls fly across the landscape, they require stands that have room beneath the branches to provide:

- protection from predators and weather;
- foraging opportunities, including prey base and hunting perches; and
- potential nesting sites.

Data on the movements of 1475 adult and juvenile northern spotted owls found that the median movement distance was between 22.9 to 24.5 km for females and 13.5 to 14.6 km for males; only 8.9% of juveniles dispersed distances greater than 50 km (Forsman et al. 2002). Northern spotted owls have not been shown to disperse across the types of large nonforested lowlands found within the planning area, including the Willamette Valley, Umpqua Valley, and Rogue Valley (Forsman et al. 2002). In a study on habitat use by dispersing juvenile northern spotted owls in the Coast Range, Klamath, and Western Cascades provinces (Miller et al. 1997), mature and old-growth forest were used slightly more than expected based on availability during the transient phase and nearly twice its availability during the colonization phase. Closed pole-sapling-sawtimber habitat was used roughly in proportion to availability in both phases; open sapling and clear-cuts were used less than expected based on availability during colonization.

Dispersal habitat is comprised of both suitable habitat and additional habitat that supports only owl dispersal. The quality of dispersal quality increases with the portion of that habitat that is comprised of suitable habitat. Thomas et al. (1990) noted that “[h]abitats between blocks function better to allow owls to move (disperse) through them the more nearly they resemble suitable habitat ...” (p. 23).

The science on the northern spotted owl does not provide a specific threshold for the quantity, quality, and distribution of dispersal habitat against which this analysis could evaluate the effect of alternatives. Thomas et al. (1990, 27, 327) suggested that if 50% of the land base in a regulated forest supported forest stands with a minimum 11-inch average diameter at breast height and 40% canopy cover, then that land base would support owl dispersal (the so-called 50-11-40 rule). The 50-11-40 rule as presented in Thomas et al. (1990) was measured at the quarter-township scale (approximately 5,760 acres). The 50-11-40 rule does not present a definitive threshold for evaluating dispersal habitat, because it does not reflect dispersal quality (NWFP FSEIS, Appendix G, 18, G-24), and because its application to the scattered federal land ownership is problematic.

In the Northwest Forest Plan FSEIS, the 50-11-40 rule was incorporated into several alternatives, although not the selected alternative. However, in contrast to the recommendation of Thomas et al. (1990), the Northwest Forest Plan alternatives applied the 50-11-40 rule as “50% of the federal forest landscape” (NWFP FSEIS, 2-27, emphasis added), instead of 50% of the entire landscape. In the current analysis, applying the 50-11-40 rule to the planning area as “50% of the federal forest landscape” would have dramatically different results than applying the rule as “50% of the forest landscape” on all ownerships, because BLM-administered lands are typically interspersed among nonfederal lands.

Forsman et al. (2002) demonstrated the importance of forested bridges linking the Coast Range, West Cascades, and Klamath provinces. These bridges have been identified by one term or another since 1988 (USDA, U.S. Forest Service 1988). The movement records provide evidence that northern spotted owls are currently dispersing across the landscape and genetic or demographic isolation of local populations is not likely because dispersal between reserves is likely to be a common occurrence even if the landscapes

between these reserves consists of highly fragmented forests (Lint 2005; Forsman et al. 2002). Forsman et al. (2002) pointed out three areas through which dispersing northern spotted owls moved between the provinces:

- between Cottage Grove and Drain, Oregon (South Willamette-North Umpqua);
- between Canyonville and Grants Pass, Oregon (Rogue-Umpqua); and
- south of Ashland, Oregon (Ashland).

These three areas of concern were identified but not specifically delineated by the USDA (1988), the USDA (1991), Anderson et al. (1991), Tweten (1992), and the USDI (1992) because of “poor distribution and quality of existing habitat in some areas; high level of natural and man-made fragmentation; and localized deficiencies in habitat connectivity” (USDA 1991, 3&4:27). These three areas of concern were not mapped or described in detail prior to this analysis, but they have been identified and discussed in ESA (Endangered Species Act) consultation documents between the BLM and the U.S. Fish and Wildlife Service. The areas of concern are mapped here for the purposes of this analysis.

Figure 70. Areas of concern for the northern spotted owl

Northern spotted owl populations are currently being affected by other factors besides habitat, especially competition with barred owls, and may be affected in the future by West Nile virus.

Barred owls compete with northern spotted owls through a variety of mechanisms including prey overlap (Hamer et al. 2001), habitat overlap (Hamer et al. 1989; Dunbar et al. 1991; Herter and Hicks 2000; Pearson and Livezey 2003), and agonistic encounters (Leskiw and Gutiérrez 1998; Pearson and Livezey 2003). New information on encounters between barred owls and northern spotted owls comes primarily from anecdotal reports that corroborate the initial observations that barred owls react more aggressively towards northern spotted owls than the reverse (Courtney et al. 2004). The evidence of barred owl predation on northern spotted owls, however, is limited and circumstantial (Leskiw and Gutiérrez 1998; Johnston 2002). Information collected to date indicates that encounters between these two species tend to be agonistic in nature, and that the outcome is unlikely to favor the northern spotted owl (Courtney et al. 2004).

Kelly et al. (2003) also found that in northern spotted owl territories where barred owls were detected, northern spotted owl occupancy was significantly lower ($P < 0.001$) after barred owls were detected within 0.8 km of the territory center. Occupancy was only marginally lower ($P = 0.06$) if barred owls were located more than 0.8 km (0.5 mi) from northern spotted owl territory centers. In a Roseburg, Oregon study area, 46% of northern spotted owls moved more than 0.8 km (0.5 mi), and 39% of northern spotted owls had not relocated again in at least two years after barred owls were detected within 0.8 km (0.5 mi) of the territory center. Observations provided by Gremel (2000) from the Olympic National Park are consistent with those of Kelly et al. (2003). He documented significant displacement of northern spotted owls following barred owl detections “coupled with elevational changes of northern spotted owl sites on the east side of the park” (Courtney et al. 2004). Pearson and Livezey (2003) reported similar findings on the Gifford Pinchot National Forest where unoccupied northern spotted owl sites were characterized by significantly more barred owl sites within 0.8 km, 1.6 km, and 2.9 km (0.5, 1.0, and 1.8 miles) from the territory center than in occupied northern spotted owl sites. Since barred owl presence is increasing within the range of northern spotted owls, Olson et al. (2005) suggests that further declines in the proportion of sites occupied by northern spotted owls are likely.

Olson et al. (2005) showed that barred owl presence had a negative effect on northern spotted owl detection probabilities, and it had either a positive effect on local extinction probabilities (at the territory scale) or a negative effect on colonization probabilities for three study areas in Oregon. Olson et al. (2005) conclude that future analyses of northern spotted owls must account for imperfect and variable detectability and barred owl presence to properly interpret results. Thus, some proportion of seemingly vacant territories may be an artifact of reduced detection probabilities. Nonetheless, previously occupied territories that were apparently vacant of both northern spotted owls and barred owls suggests that factors other than barred owls alone are contributing to declines in northern spotted owl abundance and territorial occupancy (Courtney et al. 2004).

Although the barred owl currently constitutes a significantly greater threat to the northern spotted owl than originally thought at the time of listing (Courtney et al. 2004), at present it is unclear whether forest management influences the outcome of interactions between barred and northern spotted owls (Courtney et al. 2004; summarized by Lint 2005). Gutierrez et al. (2004) identified three clearly plausible outcomes:

- Barred owls will replace the northern spotted owl throughout its range.
- Barred owls will replace the northern spotted owl in the northern, more mesic portion of its ranges.
- Barred and northern spotted owl populations will reach equilibrium in most but not all of the present northern spotted owl range.

West Nile virus is known to be fatal to many species of birds, including the northern spotted owl, and has been documented in wild bird populations in Oregon. There is no known connection between forest management and West Nile virus. The future impacts of West Nile virus are unknown and if the northern spotted owl is especially susceptible, it could cause widespread mortality (Courtney et al. 2004).

Marbled Murrelet

The marbled murrelet (*Brachyramphus marmoratus*) was federally listed as threatened by the U.S. Fish and Wildlife Service in October 1992 (Federal Register 1992b, 45328-45337). A recovery plan was finalized in 1997 (USDI, USFWS 1997). The recovery plan outlines the conservation strategy for the species. A draft rule for the revision of critical habitat was published in September 2006.

The short-term actions that are necessary to stabilize the population include:

- maintain occupied habitat
- maintain large blocks of suitable habitat
- maintain and enhance buffer habitat
- decrease risks of nesting habitat loss due to fire and windthrow
- reduce predation
- minimize disturbance

The long-term conservation needs include:

- increase productivity (abundance, the ratio of juveniles to adults, and nest success) and population size
- increase the amount (stand size and number of stands), quality, and distribution of suitable nesting habitat
- protect and improve the quality of the marine environment
- reduce or eliminate threats to survivorship by reducing predation in the terrestrial environment and anthropogenic sources of mortality at sea

The U.S. Fish and Wildlife Service (USDI, USFWS 1997) estimates recovery of the marbled murrelet will require at least 50 years.

Six conservation zones were designated in the marbled murrelet recovery plan (USDI, USFWS 1997). The recovery objectives for the marbled murrelet are measured in each conservation zone with the objective of ensuring a well-dispersed population of marbled murrelets. Recovery Zone 3 (in its entirety) and the northern half of conservation Zone 4 overlay the planning area. See *Figure 71 (Marbled murrelet conservation zones)* (USDI, USFWS 1997). Conservation Zone 3 extends from the Columbia River, south to North Bend, Oregon; extending 1.2 miles out to sea and approximately 35 miles inland (coinciding with conservation Zone 1, as designated by the Northwest Forest Plan (USDA, USDI 1994)). Conservation Zone 4 extends from North Bend, Oregon to the southern end of Humboldt County, California; extending 1.2 miles out to sea and approximately 35 miles inland (coinciding with conservation Zone 1, as designated by the Northwest Forest Plan (USDA, USDI 1994)).

Figure 71. Marbled murrelet conservation zones

The following recent documents summarize the condition of the marbled murrelet across its range and are incorporated by reference:

- the evaluation report for the five-year status review of the marbled murrelet in Washington, Oregon, and California (McShane et al. 2004);
- the marbled murrelet five-year review (USDI, USFWS 2004b); and
- the status and trends of populations and nesting habitat for the marbled murrelet (Huff et al. 2006).

A panel of scientific experts was convened by the U.S. Fish and Wildlife Service to evaluate, synthesize, and interpret the information pertaining to the relevant scientific issue concerning the marbled murrelet. The threats to marbled murrelets and any changes since the 1992 listing were also evaluated. The report was used in the five-year status review (USDI, USFWS 2004b) of the marbled murrelet. The status review sought to answer the following questions:

- Does the currently listed distinct population segment meet the criteria established in the U.S. Fish and Wildlife Service 1996 Distinct Vertebrate Species Policy?
- Is there new information about the threats or population status of the marbled murrelet?
- If so, does the new information suggest that a change in listing status may be warranted?

The U.S. Fish and Wildlife Service determined:

- The Washington, Oregon, and California populations do not constitute a discrete population from the remainder of the species and therefore does not constitute a distinct population segment.
- All of the threats to the species identified in the listing are still relevant, new information confirms the importance of predation in limiting nesting success, and new gill-netting regulations in California and Washington may reduce impacts to the species.

The marbled murrelet remains listed as a threatened species at this time (USDI, USFWS 2004b).

The Northwest Forest Plan established two management zones for the marbled murrelet. Zone 1 extended from the coast to approximately 35 miles inland. Zone 2 extended from the eastern boundary of Zone 1 to approximately 50 miles inland from the coast. Combined, these zones include 14,825 square miles. See *Figure 72 (Range of the marbled murrelet within the planning area)*.

Figure 72. Range of the marbled murrelet within the planning area

Systematic surveys in the Klamath province have indicated that marbled murrelets are likely confined to the hemlock-tanoak vegetation zone (USDA, USDI 2002). The portion formally considered part of the range of the marbled murrelet in the Medford District is highlighted in *Figure 72*.

The range of the marbled murrelet for this management plan increases approximately 6,010,000 acres in Zone 1 and 2,553,000 acres in Zone 2, and incorporates portions of the Salem, Eugene, Roseburg, and Medford districts, and incorporates the Coos Bay District in its entirety.

A report by Huff et al. (2006) regarding the effects of the first 10 years after the implementation of the Northwest Forest Plan on the population and habitat of the marbled murrelet was completed as part of the Northwest Forest Plan's 10-year effectiveness monitoring effort. The team reported:

- An estimated marbled murrelet population of 22,000 birds for coastal waters adjacent to the Northwest Forest Plan area.
- The available sampling effort was insufficient to detect significant population change.
- The highest densities of marbled murrelets occurred along the Oregon and northern Californian coasts.
- The lowest densities of marbled murrelets occurred from the Mendocino and Humboldt county line south to San Francisco Bay.

- Habitat models predicted that marbled murrelet nesting habitat is more likely at sites that:
  - are closer to the sea;
  - are on relatively flat terrain;
  - are topographically cooler;
  - have relatively fewer conifers that are greater than or equal to 10 inches (diameter at breast height);
  - have great base areas of trees that are greater than or equal to 10 inches (diameter at breast height); or
  - have greater basal areas of trees that are greater than or equal to 30 inches (diameter at breast height).
- Inland management Zone 2 (furthest from the coast) accounted for less than two percent of the estimated high-quality habitat on federally administered lands.
- Only 13% of the federal lands provide more than medium-quality nesting habitat for the marbled murrelet.

Nelson et al. (2006) completed a recent review of marbled murrelet biology and nesting habitat. The results included:

- Marbled murrelet are secretive, noncolonial nesters, who forage at sea and nest inland.
- The majority of marbled murrelets nest within 37 miles of the coast, although nests have been documented up to 52 miles inland in Washington and 47 miles inland in Oregon (Espinosa, pers. comm. 2007).
- The most important component in the nesting habitat for the marbled murrelet is the presence of large platforms—limbs or other structures that are at least 4 inches in diameter with a substrate capable of forming a nest cup (moss or other duff).
- Other important factors include vertical and horizontal cover location with respect to forest openings or edge, and height of platform. Platforms should be high enough to provide for jump-off departures and open enough to provide for stall landings, while still providing protection from predators and the weather.
- Nest trees documented in the Northwest Forest Plan area are greater than 19 inches (diameter at breast height) and greater than 98 feet tall. Nest trees are typically taller than the average nonnest tree.
- Vertical cover (cover above the nest) is typically above 70%.

Nest stands typically possess a high density of large trees with platforms, have multiple canopy layers, and are typically older. Studies summarized for Oregon indicate that the density of trees with platforms and the number of platforms in general were the most important variable in predicting marbled murrelet nesting habitat at the stand level.

Actual nests and behaviors indicate that marbled murrelets select old-growth forests for nesting. The proportion of older forest (mature and old growth) on the landscape and size of the forest patch were greater in occupied sites than unoccupied. Marbled murrelets nest in landscapes with larger stands with less edge, farther from logged areas than random watersheds. Habitat modeling efforts have shown that distance from the coast is an important factor in determining marbled murrelet occurrence. Patches of suitable nesting trees of only a few acres and with only a few suitable nesting trees are thought to be capable of supporting marbled murrelet nesting. The resolution and attributes of the vegetation maps used in this planning effort limited the identification of small stands with only a few suitable nesting trees.

For this plan revision, marbled murrelet nesting habitat was modeled as those stands in the mature (with multilayered canopy) and structurally complex structural stages of forest within the range described in *Figure 72 (Range of the marbled murrelet within the planning area)*.

Mature stands in the western hemlock and tanoak retention zones are those that contain more than 23 trees per acres with a diameter at breast height greater than or equal to 20 inches. In the Douglas fir zone, mature stands are those with more than 11 trees per acre with a diameter at breast height greater than or equal to 20 inches.

There are approximately 373,000 acres of marbled murrelet nesting habitat within the planning area. See *Table 90 (Summary of marbled murrelet nesting habitat on BLM-administered lands within the planning area)*.

Table 90. Summary of marbled murrelet nesting habitat on BLM-administered lands within the planning area

BLM Districts	Habitat-Capable (acres)	Nesting Habitat	
		(acres)	(%)
Salem	215,000	77,000	36
Eugene	147,000	49,000	33
Roseburg	179,000	99,000	55
Coos Bay	302,000	123,000	41
Medford	47,000	25,000	53
Totals	890,000	373,000	42

Studies to determine the characteristics of marbled murrelet nesting habitat at the landscape scale include:

- McShane et al. (2004, 4-103) reported that “[a]t the landscape level, areas with evidence of occupancy tended to have higher proportions of large, old-growth forest, larger stands and greater habitat complexity, but distance to the ocean (up to about 37 miles [60 km]) did not seem important.”
- Elevation had a negative association in some studies with marbled murrelet habitat occupancy (Burger 2002). Hamer and Nelson (1995) sampled 45 nesting trees in British Columbia, Washington, Oregon, and California and found the mean elevation to be 1,089 feet (332 m).

- Multiple radar studies (Burger 2001; Cullen 2002; Raphael et al. 2002; Steventon and Holmes 2002) in British Columbia and Washington have shown radar counts of marbled murrelets to be positively associated with total watershed area, increasing amounts of late-seral forests, and with increasing age and height class of associated forests.
- The radar counts of marbled murrelets are also negatively associated with increasing forest edge and areas of logged and immature forests (McShane et al. 2004).
- There are also several studies concluding marbled murrelets do not pack into higher densities within remaining habitat when nesting habitat is removed (Burger 2001; Manley et al. 2001; Cullen 2002).

Studies about the relationship between the proximity of human-modified habitat and an increased abundance of avian predators and increased predation on marbled murrelet nests include:

- Luginbuhl et al. (2001, 565) reported in a study, which used simulated marbled murrelet nests, that “[c]orvid numbers were poorly correlated with the rate of predation within each forested plot.” Luginbuhl et al. (2001, 569), conclude, “that using measurements of corvid abundance to assess nest predation risk is not possible at the typical scale of homogenous plots (0.5 to 1.0 km² in our study) [0.19 to 0.39 mi²]. Rather this approach should be considered useful only at a broader, landscape scale on the order of 5 to 50 km² [1.93 to 19.31 mi²] (based on the scale of our fragmentation and human-use measures)”.
- Artificial marbled murrelet nest depredation rates were found to be highest in western conifer forests where stand edges were close to human development (De Santo and Willson 2001; Luginbuhl et al. 2001).
- Bradley (2002) found increased corvid densities within 3 miles of an urban interface (probably due to supplemental feeding opportunities from anthropogenic activities).
- Golightly et al. (2002) found extremely low reproductive success for marbled murrelets nesting in large old-growth blocks of redwoods in the California Redwoods National and State Parks. Artificially high corvid densities from adjacent urbanization and park campgrounds are suspected to be a direct cause of the high nesting failure rates for marbled murrelets in the redwood parks (Golightly et al. 2002).
- If the surrounding landscape has been permanently modified to change the predators’ numbers or densities due to agriculture, urbanization, or recreation, and predators are causing unnaturally high nest failures, then reproductive success of the marbled murrelet may remain depressed. Because corvids account for the majority of depredations on marbled murrelet nests and corvid density can increase with human development, corvid predation on marbled murrelet habitat is a primary impact consideration. The threat of predation on marbled murrelet populations (both nests and adults) appears to be greater than previously anticipated (McShane et al. 2004).

The present population estimates for the marbled murrelet include 9,500 ($\pm 3,000$) in Oregon and 23,700 ($\pm 5,200$) within the conterminous United States (Huff et al. 2003; Strong 2003a; Strong 2003b). Spiech and Wahl (1995) concluded that marbled murrelet populations in Puget Sound are lower now than they were at the beginning of this century, and total estimates for Washington are still about 9,800 marbled murrelets (Huff et al. 2003). Ralph and Miller (1995) estimated the California population to be approximately 6,500 birds, and this estimate remains within the statistical confidence interval (Strong 2003a and Strong 2003b).

The estimates of marbled murrelet populations that are based on monitoring data have fluctuated between approximately 5,800 and 7,800 birds in conservation Zone 3 and between approximately 3,600 and 4,900 birds in conservation Zone 4. See *Table 91 (Marbled murrelet population estimates for conservation Zones 3 and 4)* and *Figure 73 (Marbled murrelet population estimates in conservation Zones 3 and 4)*. Conservation Zones 3 and 4 overlay the planning area. See *Figure 71 (Marbled murrelet conservation zones)* (USDI, USFWS 1997). Estimates are based on at-sea monitoring (USFWS, pers. comm. 2006).

Table 91. Marbled murrelet population estimates for conservation Zones 3 and 4

Year	Conservation Zones			
	Zone 3		Zone 4	
	Density*	Number of Birds	Density*	Number of Birds
2000	10.9	6,724	10.9	4,880
2001	12.2	7,538	8.6	3,851
2002	10.2	6,271	10.8	4,816
2003	9.5	5,866	10.0	4,495
2004	12.6	7,781	9.3	4,169
2005	9.5	5,843	8.1	3,642
2006	10.3	6,375	8.9	3,968

*Density equals the number of birds per square mile.

Figure 73. Marbled murrelet population estimates in conservation Zones 3 and 4

Studies on the demographic trends of the marbled murrelet include:

- Beissinger (1995) constructed a demographic model of the marbled murrelet and concluded that the population may be declining at rates of 4 to 6% per year, but this estimate is hampered by the possibility that the age-ratio data used in the model are reflective of a relatively temporary decline due to unusual ocean conditions (Ralph et al. 1995).
- Boulanger et al. (1999) found that change in adult survivorship is the single most important factor when projecting demographic trends for marbled murrelets.
- Similarly, Strong and Carten (2000) suggest that there may have been a 50% decline from 1992 to 1996 in the Oregon population, but the population appears to have stabilized since then (Strong 2003a; Strong 2003b).
- Ralph et al. (1995) summarized some of the reasons for variability in population estimates among researchers, including differences in methodology, assumptions, spatial coverage, and survey and model errors.
- Lank et al. (2003) states that “[r]egardless of the approaches taken to estimate [(sic) vital rate] parameter values, the output from the Leslie Matrix models representing survivorship and fecundity values for all populations in Washington, Oregon and California (Beissinger and Nur 1997) suggest negative population growth rates.” Present at-sea surveys for effectiveness monitoring have a 95% chance of detecting annual population changes of $\pm 20\%$ or greater.

McShane et al. (2004) produced a demographic model of marbled murrelet populations in Washington, Oregon, and California by each of the six conservation zones. Similar to previous studies, they found that populations in all conservation zones are in decline with mean annual rates of decline between 2.1% and 6.2%. The highest rates of decline were in Zone 6 at the southern extent of the range. Furthermore, they conclude it is likely that populations in Zone 5 and 6 could become nonviable in the near future.

At the conservation zone scale, marbled murrelet abundance is positively correlated with the estimated amount of inland habitat (McShane et al. 2004). The precise number of acres of nesting habitat in Washington, Oregon, and California is unknown. However, suitable habitat for the marbled murrelet on federal lands is estimated at 2,223,048 acres of which 154,838 acres (7%) are classified as remnant habitat within the listed range of this species (McShane et al. 2004). Approximately 93% of the suitable habitat occurs on federal lands. The BLM in Oregon manages approximately 249,000 acres of nesting habitat. See *Table 92 (Summary of critical habitat units and marbled murrelet nesting habitat on BLM-administered lands within the planning area)*. There are 177 known occupied marbled murrelet sites on BLM-administered lands. Surveys are currently being conducted in conjunction with timber sales.

The recovery plan identified the primary threats to the species as:

- predation
- loss of nesting habitat
- by-catch in gill nets
- oil pollution both chronic and from major spills

More recently, McShane et al. (2004) has concluded that all of these threats are still present, although loss of nesting habitat, particularly on federal lands, has declined, and the new gill-netting regulations in northern California and Washington have reduced the threat from by-catch in gill nets. The threat from oil pollution continues to be unpredictable and effects are variable. New information on predation indicates a high threat level due to limiting marbled murrelet nesting success (Hebert and Golightly 2003; Peery et al. 2004; Luginbuhl et al. 2001; Marzluff and Restani 1999).

Marbled murrelets, adult and chicks, appear to be fairly tolerant of disturbance, both visual and auditory. Several studies noted changes in adult feeding behaviors, but not nest abandonment. Chicks appear to be very tolerant of visual and auditory disturbance, habituating very quickly. The predominant response of marbled murrelet chicks to disturbances is to freeze or flatten out in the nest cup. Noise disturbance to nest sites is thought to be minimal, although much is unknown (Nelson et al. 2006).

The recovery plan states that four of the six zones must be functional in order to effectively recover the marbled murrelet in the short- and long-term (e.g., to maintain viable populations that are well-distributed). However, based on the newest population estimates, it appears only three of the zones contain relatively robust numbers of marbled murrelets (Zones 1, 3, and 4). Zones 1 and 4 contain the largest number of marbled murrelets compared to the other four zones, but areas of concern remain. Of the population in Zone 4, 10% was killed in oil spills in 1997 (Bentivoglio et al. 2002; Ford et al. 2002).

Marbled murrelets in conservation Zones 3, 5, and 6 are also experiencing significant declines in reproduction, numbers, and distribution, resulting in reduced population viability. Marbled murrelets have suffered variously from past oil spills, which killed a large number of birds (Zone 3) (Ford et al. 2002), extremely small population sizes (Zones 5 and 6), and alarmingly low reproductive rates (Zone 6) (Peery et al. 2002). In at least two of these four zones (Zones 5 and 6), these factors taken singly or in combination have brought the status of the species to a point where recovery in Conservation Zones 5 and 6 may be precluded (Beissinger 2002). The poor status of marbled murrelet populations in the southern zones emphasizes the importance of supporting marbled murrelet populations in Zones 1 and 2 in order to achieve marbled murrelet recovery objectives.

Critical habitat was designated for the marbled murrelet in January 1996 and encompasses 1,515,300 acres of land in Oregon; 1,338,200 acres of federal land (Federal Register 1996a, 26256-26320). The U.S. Fish and Wildlife Service is currently reviewing the critical habitat designation. Critical habitat includes those lands that may be needed for a species' eventual recovery and delisting. Critical habitat units were identified based upon the need to protect current and provide for future development of the primary constituent elements necessary for the conservation of the marbled murrelet. The primary constituent elements include individual trees with potential nesting platforms and forested areas within 0.5 miles that possess a canopy height of at least one-half the site-potential tree height (Federal Register 1996a, 26264). Approximately 463,000 acres of critical habitat occur on Bureau of Land Management managed lands. See *Table 92 (Summary of*

critical habitat units and marbled murrelet nesting habitat on BLM-administered lands within the planning area) and Figure 74 (Critical habitat for the marbled murrelet within the planning area).

Table 92. Summary of critical habitat units and marbled murrelet nesting habitat on BLM-administered lands within the planning area

Critical Habitat Unit	Habitat-Capable (acres)	Nesting Habitat	
		(acres)	(%)
CA-01-e	14	10	71
OR-01-b	1	1	100
OR-01-c	7,217	5,025	70
OR-02-a	--	--	--
OR-02-b	11	1	9
OR-02-c	3,526	1,898	54
OR-02-d	25,937	6,731	26
OR-02-e	38,666	20,858	54
OR-03-a	41	41	100
OR-03-c	8,530	4,012	47
OR-04-a	1,300	802	62
OR-04-b	1,084	940	87
OR-04-c	13,388	8,012	60
OR-04-d	20,073	11,097	55
OR-04-e	50,534	27,656	55
OR-04-f	20,109	12,220	61
OR-04-g	15,368	8,354	54
OR-04-i	79,983	40,807	51
OR-04-j	56,450	30,882	55
OR-04-k	25,919	16,083	62
OR-06-a	39	26	67
OR-06-b	49,904	28,609	57
OR-06-c	4,608	3,524	76
OR-06-d	16,178	8,792	54
OR-07-a	2,366	1,252	53
OR-07-b	2,171	990	46
OR-07-d	1,840	845	46
OR-07-f	15,611	8,616	55
OR-07-g	2,086	984	47
Totals	462,953	249,069	

Figure 74. Critical habitat for the marbled murrelet within the planning area

Sage Grouse

Sage grouse (*Centrocercus urophasianus*) were once found throughout most of the sagebrush (*Artemisia sp.*) habitat of eastern Oregon (Hagan 2005). There are currently no known populations within the planning area. However, there is currently suitable habitat and the potential to restore additional lands to a suitable condition within the planning area (specifically, the Klamath Falls Resource Area of the Lakeview District). There are currently 28,000 acres of sage grouse habitat and four historic leks within the Klamath Falls Resource Area.

The major threat to the species is habitat modification and its resultant effects on reproductive capacity and predation (Holloran and Anderson 2005; Gregg et al. 1994; Hagan 2005). Within Oregon, since the 1940s, the sage grouse population has exhibited an overall decline (Hagan 2005; Gregg et al. 1994). Population indices in the last decade have shown a stable to slightly increasing population (Hagan 2005).

From 2002 until 2004, the U.S. Fish and Wildlife Service received multiple petitions to list one or more sage grouse populations. In 2005, they came out with a combined finding that the petitions were not warranted (Federal Register 2005a, 2244). Concurrent with the status reviews, there was an assessment of the nationwide condition of the sage grouse. Connelly et al. (2004) compiled a comprehensive review of the status of the sage grouse and sagebrush habitats entitled *Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats*.

The Oregon Department of Fish and Wildlife, in conjunction with the BLM and other land management organizations, produced the *Greater sage-grouse conservation assessment and strategy for Oregon: a plan to maintain and enhance populations and habitat* (Hagan 2005). The information contained within the Oregon conservation assessment regarding natural history and habitat condition is incorporated by reference. The following is a brief synopsis:

- Sage grouse are a sagebrush obligate species. Sagebrush provides important habitat components necessary for their nesting and diet. There are three main habitat requirements for the sage grouse: breeding (lekking and nesting), brood rearing, and over-wintering habitat.
- Males attract females by displaying (strutting) on open sites called leks. Leks are used annually. Leks are typically devoid of or contain short vegetation. Adjacent sagebrush provides escape cover.
- Females use areas rich in forbs to facilitate egg development. Nesting habitat consists of a sagebrush community containing sagebrush and a herbaceous understory of grasses and forbs. Nests are typically located under sagebrush plants.
- Cover, both overhead and vertical, are critical to nesting success. Good habitat provides concealment from predators, herbaceous forage for prelaying and nesting females, and insect forage for chicks.

- Once broods move off the nest, they move to a more open sagebrush habitat—a habitat that still maintains a rich growth of grasses and forbs, and at least 15% canopy closure. Chicks feed on forbs and invertebrates. Later in the summer broods move to moister habitats where succulent vegetation is still available.
- Winter diets consist mainly of sagebrush. Sage grouse may congregate in areas of higher canopy closure and taller big sagebrush.
- Oregon sagebrush habitats have been reduced 21% from the late 1800s. The lack of connectivity (contiguity) between patches compounds the loss of habitat. High viability patches are those that have greater than 2,500 acres of contiguous habitat.
- The greater loss of sagebrush habitat in eastern Oregon has been due to the conversion of such habitat to agricultural and grazing uses. Fire and seeding with nonnative species continue to play a significant role in converting sagebrush habitat to grasslands. Roads and utility corridors play an additional role in habitat degradation by providing corridors and perches for predators, spreading nonnative vegetation, and introducing disturbances. Human disturbances, both low-keyed bird-watching and intense off-highway vehicle use, may cause lek and nest abandonment.

Bald Eagle

The bald eagle of North America (*Haliaeetus leucocephalus*) is listed under the Endangered Species Act as threatened in Oregon. Breeding and wintering populations occur throughout the planning area and are addressed in the Pacific States Bald Eagle Recovery Plan (USDI, USFWS 1986). In 1999, the bald eagle was proposed for delisting in the contiguous 48 states. A recovery plan was completed in 1986 (USDI, USFWS 1986). The planning area includes portions of six bald eagle management zones (10, 11, 12, 13, 22, and 23) (USDI, USFWS 1986, 29).

Bald eagles in the Pacific Northwest nest predominantly in conifer stands adjacent to or near large rivers or other large bodies of water (USDI, USFWS 1986; Anthony et al. 1982; Buehler 2000; Federal Register 2006a, 71 FR 8239).

- Distances to water bodies from nests varies but could extend up to 1,378 yards in portions of the planning area (USDI, USFWS 1986; Buehler 2000; Anthony et al. 1982). Vessely et al. (2001) modeled potential nesting habitat up to 3 km (1.9 miles) away from water.
- Nesting habitat can encompass a wide range of stand types but they all can be described as having a variety of canopy layers and some component of large diameter or old-growth trees. Anthony et al. (1982) found that the diameter of nesting trees vary by forest types, but, invariably, they were some of the largest trees in the stand. The average diameters of nesting trees varied between:
  - 41 inches (diameter at breast height) in Oregon mixed conifer stands
  - 46 inches in ponderosa pine forests
  - 69 inches in Douglas fir forests.

- Douglas fir is the dominant species for nesting trees west of the Cascade Mountains, while ponderosa pine is dominant east of the Cascade Mountains (Anthony et al. 1982).

Fish, waterfowl, jackrabbits, and carrion provide the most common source of food for eagles in the Pacific Northwest (USDI, USFWS 1986). Nesting sites, roosts, and wintering areas tend to be associated with sources of food (Anthony et al. 1982; USDI, USFWS 1986; Buehler 2000; Federal Register 2006a, 8242), although overwintering area locations may also be driven by remoteness (Federal Register 2006a, 8239; USDI, USFWS 1986).

There are 3,600 miles of stream and 291,000 acres of ponds and lakes that provide foraging habitat for the bald eagle. There are approximately 1,630,000 acres of BLM lands that are capable of growing eagle nesting and roosting habitat in the planning area (those forest-capable lands within 4 miles of foraging waters) and approximately half of those are currently providing bald eagle nesting and roosting habitat. See *Table 93 (Potential bald eagle nesting habitat within the planning area)*.

Table 93. Potential bald eagle nesting habitat within the planning area

BLM Districts	Habitat-Capable (acres)	Nesting Habitat	
		(acres)	(%)
Salem	377,379	192,786	51
Eugene	169,928	71,399	42
Roseburg	264,901	134,901	51
Coos Bay	231,863	97,106	42
Medford	536,924	279,736	52
Klamath Falls	166,179	50,761	31
Totals	1,747,174	826,689	50

Communal roosts are selected for and favor those stands that have a high degree of stratification (Anthony et al. 1982). Roost trees are the largest trees in the stand or have open branching patterns, provide visibility, and may be close to a consistent food source (Anthony et al. 1982; Buehler 2000).

There are 149 bald eagle nesting trees located on BLM lands within the planning area. These nests are contained within 89 known territories (Isaacs and Anthony. 2005). Monitoring data indicates that bald eagle numbers have increased steadily since 1973 (Isaacs and Anthony 2005). The bald eagle was proposed for delisting in 1999 (Federal Register 1996b, 36454). See *Table 94 (Summary of the 2005 monitoring data for the bald eagle)* for the current population data for the management zones that overlap the planning area (Isaacs and Anthony 2005).

Table 94. Summary of the 2005 monitoring data for the bald eagle

Bald Eagle Conservation Zones	Breeding Areas Surveyed (number)	Breeding Areas Occupied ^a (number)	Occupied Breeding Areas with Known Outcomes	Successful Breeding Areas ^b (%)	5-year Average of Successful Breeding Areas (%)	Young/Breeding Areas (number)	5-Year Average of Young/Breeding Areas (number)	Young/Successful Breeding Pairs (number)
10 – Columbia River (OR)	12	11	71	70.0	63.8	1.00	1.04	1.43
11 – High Cascades	69	64	63	61.9	65.7	0.94	1.01	1.51
12 – Willamette Basin	63	61	55	70.9	68.8	1.15	1.17	1.62
13 – Oregon Coast	93	91	90	72.2	70.0	1.11	1.10	1.54
22 – Klamath Basin	134	129	119	60.5	62.2	0.87	0.96	1.43
23 – CA/OR Coast	25	22	20	70.0	67.3	1.05	1.05	1.50

^aWhere one or two adults and a nest were observed.

^bBreeding areas where 1 or more nestlings or fledglings were observed.

There are 161 bald eagle management areas designated on BLM lands within the planning area. They range in size from 4 to 960 acres and total 16,220 acres. See *Table 95 (Bald eagle management areas within the planning area)*. Bald eagle management areas were carried forward from the previous plan and were created for sites found since 1994. Bald eagle management areas are designed to protect existing nest sites, winter and communal roosting areas, and potential nesting habitat.

Table 95. Bald eagle management areas within the planning area

BLM District	Number of Areas	Acres
Salem	10	2,227
Eugene	73	8,266
Roseburg	25	3,682
Coos Bay	26	769
Medford	21	1,091
Klamath Falls	22	1,931
Totals	177	17,966

Western Snowy Plover

The Pacific Coast population of the western snowy plover (*Charadrius alexandrinus nivosus*), hereafter referred to as the snowy plover, is listed as threatened under the federal Endangered Species Act (Federal Register 1993, 12864) and by the state of Oregon (ODFW 2006). The primary threats to the snowy plover were identified as the loss and degradation of habitat from human activities (Federal Register 1993, 12864). The snowy plover occurs along the Pacific Coast from British Columbia, Canada to Baja California, Mexico; and at interior areas in Oregon, California, Nevada, Utah, New Mexico, Colorado, Kansas, Oklahoma, and north-central Texas (Federal Register 1993, 12864; Page et al. 1995). The coastal population is genetically distinct from the interior population (Federal Register 1993, 12864; Federal Register 2006b, 20607).

The coastal population occurs within the geographic boundaries of the Salem, Eugene, and Coos Bay districts. The BLM manages snowy plover nesting and wintering habitat only on the Coos Bay District. The Coos Bay District manages 436 acres of snowy plover nesting and overwintering habitat, which is located on the Coos Bay North Spit (138 acres) and the New River Area of Critical Environmental Concern (298 acres). See *Figure 75 (Locations of the Pacific coast population of the western snowy plover on BLM lands within the planning area)*.

Figure 75. Locations of the Pacific coast population of the western snowy plover on BLM Lands within the planning area

Snowy plovers nest above the high tide line on “wide-open sandy beaches, river mouths, or dredge spoils, often with scattered driftwood or vegetation. Driftwood, wrack, and native dune plants often harbor snowy plover food sources, and provide cover for chicks hiding from predators” (OPRD 2004, 42-43) Much open sand habitat was lost in Oregon when European beachgrass was introduced in the early to mid 1900s. European beachgrass created extensive vegetated foredunes that narrowed beaches and provided thick cover for predators.

The Coos Bay North Spit has been the most productive snowy plover breeding area since intensive monitoring began in the early 1990s. Unique to Oregon, snowy plover habitat on the Coos Bay North Spit is found along the beach as well as inland of the ocean foredune on old dredge material deposits and restored open sand habitat. Through time much of this habitat was lost or degraded due to beachgrass encroachment. Most of the BLM-administered lands in this area are designated as an area of critical environmental concern. The North Spit Plan (USDI, BLM 2005a) contains direction for plover management. The management measures were developed in cooperation with the U.S. Fish and Wildlife Service and Oregon State agencies. Management measures include recreational restrictions, predator control, outreach activities, and habitat restoration.

In cooperation with the Army Corps of Engineers, the Oregon Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service, the BLM has restored and maintained approximately 76 acres of habitat inland of the ocean foredune. A variety of methods have been used to remove European beachgrass and other invasive plant species from these habitat restoration areas (including heavy equipment, saltwater treatments, hand pulling, and herbicides). In addition to the habitat restoration areas, snowy plovers also nest on the adjacent ocean beach.

Snowy plover numbers have increased on the Coos Bay North Spit since active management measures and monitoring began in the early 1990s. The total number of fledglings has risen from a low of 3 in 1990 to a high of 35 in 2004 (Lauten et al. 2006). Plover reproductive success is measured by the number of chicks fledged per male and is currently estimated of 1.57 fledglings per male at the Coos Bay North Spit, which is approximately 10% below the 15-year average of 1.71 fledglings per male (Lauten et al. 2006).

Snowy plovers also use a long, relatively isolated stretch of beach from the southern portion of Bandon’s beaches to Floras Lake. This approximately 16 mile length of beach is managed under several jurisdictions (including 5.75 miles that are included in the BLM New River Area of Critical Environmental Concern). The New River Area of Critical Environmental Concern Management Plan (USDI, BLM 2004a) contains direction for plover management. Management measures were developed in cooperation with the U.S. Fish and Wildlife Service and Oregon State agencies. Management measures include recreation restrictions, predator control, outreach activities, and habitat restoration.

Approximately 120 acres of habitat (nearly 2.75 miles in length) have been restored and maintained using heavy equipment, burning, and hand pulling to remove European beachgrass and other invasive plant species. In addition, the BLM cooperatively

manages approximately 1 mile of ocean beach and inland snowy plover habitat north of Floras Lake.

Over the past several years, locations of snowy plover activity have varied in the New River area. In general, numbers have increased on the New River spit, including the area of critical environmental concern since active management measures and monitoring began in the early 1990s. The total number of fledglings associated with the New River spit has risen from a low of zero in 1993 to a high of 21 in 2004 (Lauten et al. 2006). Snowy plover reproductive success is measured by the number of chicks fledged per male. This fledgling rate has increased through time and is currently at 1.33 chicks per male at New River, which is 49% higher than the 15-year average of 0.89 fledglings per male (Lauten et al. 2006). Predation is a greater problem at this location than other Oregon snowy plover sites (Lauten et al. 2006). The New River area is the only location with nonnative red fox present in the area. The beaches also abut extensive ranch lands with sheep and cattle operations.

The final rule for listing the snowy plover (Federal Register 1993, 12864) and the draft recovery plan (Federal Register 2001a) provides comprehensive discussions of the following threats to the snowy plover:

- loss or degradation of habitat through
- over utilization for commercial, recreational, scientific, or educational purposes
- disease and predation
- inadequacy of existing regulatory mechanism
- other natural or manmade factors affecting their continued existence

The state of Oregon describes threats to the snowy plover as habitat degradation, introduction of nonnative vegetation, beach development, resource extraction, human disturbance, and predation (OPRD 2004).

Beaches are unstable habitats—they change with each winter storm event and are constantly broken down and renewed. Human activities (building jetties and seawalls, and stabilizing dunes) modify or eliminate these natural destabilizing cycles (OPRD 2004). The introduction of European beachgrass (*Ammophila arenaria*) has stabilized foredunes and prevented the replenishment of the open sand areas thus diminishing the availability of snowy plover habitat and changing the natural vegetative and sand dynamics (OPRD 2004; Federal Register 2001a). Beachgrass also provides cover for predators, which benefit from its dense growing habit.

Nest losses due to predation at some sites on the Oregon coast have been as high as 68% (Sterns et al. 1990 and Hogan 1991; Federal Register 1993, 12871). Predator numbers are thought to increase with increased human presence for a number of reasons. Trash near nesting areas attracts such predators as crows, ravens and rats; European beachgrass, and the subsequent vegetation changes to dune plant communities results in increased hiding cover; and greater human presence may lead to an increase in human disturbance, which flushes adult and snowy plover chicks from nests and increases their vulnerability to predation.

Human activity has been documented as a major threat to the breeding success of the snowy plover (OPRD 2004). Human disturbance, either on foot or in off-highway vehicles, may flush birds from nests, resulting in nest abandonment or lengthening of the incubation period, as birds stay off of the eggs for extended periods of time; may result in trampled or crushed birds or eggs; and may separate broods from adults.

Critical habitat was designated for the Pacific coast population of the snowy plover in 2005 (Federal Register 2005b, 26970). The primary constituent elements for the designated critical habitat units are:

- sparsely vegetated areas above daily high tides that are relatively undisturbed by the presence of humans, pets, vehicles, or human-attracted predators;
- sparsely vegetated sandy beach, mud flats, gravel bars, or artificial salt ponds that are subject to daily tidal inundation, but not currently under water, that support such small invertebrates as crabs, worms, flies, beetles, sand hoppers, clams, and ostracods; and
- surf or tide cast organic debris (such as seaweed or driftwood) located on open substrates (such as those mentioned above) (Federal Register 2005b, 56994).

The latter provide essential habitat for invertebrate food sources, and provide shelter from predators and inclement weather. Two critical habitat units contain BLM lands—OR 9 and OR 10—which overlay BLM-administered lands in the Coos Bay District. See *Table 96 (Critical habitat for the Pacific coast populations of the western snowy plover)* and *Figure 75 (Locations of the Pacific coast population of the western snowy plover on BLM lands within the planning area)*.

Table 96. Critical habitat for the Pacific coast populations of the western snowy plover

Critical Habitat Units	Total Area (acres)	Federal Area (acres)	BLM Area (acres)	Habitat Capability (number of breeding birds)
OR 9 (Coos Bay North Spit)	278	278	138	54
OR 10A (Bandon to Floras Creek)	632	304	178	54

Special Status Species

BLM special status species are those species that include federal- and state-listed species, proposed and candidate species, and BLM sensitive and assessment species. Some species are both state and federally listed.

The primary objectives of the BLM special status species policy are:

- to conserve listed species and the ecosystems on which they depend;
- to ensure that actions requiring authorization and approval by the BLM are consistent with the conservation needs of special status species and do not

contribute to the need to list any special status species under the provisions of the Endangered Species Act; and

- to use all methods and procedures necessary to improve the condition of special status species and their habitats to a point where their special status recognition is no longer warranted.

There are two categories of BLM-designated special status species:

- **Sensitive Species.** In Oregon and Washington, BLM sensitive species are those taxa that are eligible for listing as federal-listed, federal-candidate, state-listed or state-candidate (plant) status.
- **Assessment Species.** Plant and vertebrate species that are not included as federal threatened, federal endangered, federal proposed, federal candidate, state listed, or BLM sensitive, and are on List 2 of the Oregon Natural Heritage Database.

As of March 14, 2005, 117 special status animal species (amphibians, reptiles, birds, invertebrates, and mammals) are documented or suspected to occur within the planning area. See *Appendix G. Wildlife*. The numbers vary, but between 28 and 57 species occur in each district. See *Table 97 (Animal special status species in BLM districts within the planning area)*.

Table 97. Animal special status species in BLM districts within the planning area

Status*	District					
	Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath Falls
Amphibians and Reptiles						
FE	0	0	0	0	0	0
FT	0	0	0	0	0	0
FC	0	0	0	0	1	1
BS	4	3	1	1	2	1
BA	4	2	1	2	2	1
Totals	8	5	2	3	5	3
Birds						
FE	0	1	0	1	1	0
FT	3	3	3	4	3	2
FC	0	1	0	1	1	0
BS	10	11	5	14	12	10
BA	4	4	3	8	4	5
Totals	17	20	11	28	21	17
Invertebrates						
FE	1	1	0	0	0	0
FT	1	0	0	0	1	0
FC	1	2	0	1	1	0
BS	17	12	8	14	14	9
BA	0	0	0	0	0	0
Totals	20	15	8	15	16	9
Mammals						
FE	1	0	0	3	0	0
FT	0	0	0	1	0	0
FC	0	1	0	1	1	1
BS	2	1	2	1	1	1
BA	4	4	5	5	4	5
Totals	7	6	7	11	6	7
Total All	52	46	28	57	48	36

*Status Codes:

FE (federally listed as endangered); FT (federally listed as threatened); FC (candidate for federal listing); BS (bureau sensitive species); BA (bureau assessment species)

The federally listed threatened and endangered animal species addressed individually inhabit significant portions of the planning areas. There are other threatened and endangered animal species that either occur on the periphery of the planning area (i.e., in the ocean) or inhabit habitats that constitute a very small portion of the planning area. See *Table 98 (Documented or suspected federally listed animal species within the planning area that are not typically found in forested habitat)* and *Table 99 (Habitat requirements for federally listed animal species within the planning area that are not typically found in forested habitat)*.

Table 98. Documented or suspected federally listed animal species within the planning area that are not typically found in forested habitat

Status*	Scientific Name	Common Name
FC	<i>Eremophila alpestris strigata</i>	Streaked horned lark
FC	<i>Euphydryas editha taylori</i>	Whulge checkerspot (butterfly)
FC	<i>Polites mardon</i>	Mardon skipper (butterfly)
FC	<i>Rana pretiosa</i>	Oregon spotted frog
FT	<i>Branchinecta lynchi</i>	Vernal pool fairy shrimp
FT	<i>Eumetopias jubatus</i>	Steller sea lion
FT	<i>Speyeria zerene hippolyta</i>	Oregon silverspot butterfly
FE	<i>Balaenoptera musculus</i>	Blue whale
FE	<i>Eschrichtius robustus</i>	Gray whale
FE	<i>Icaricia icarioides fenderi</i>	Fender's blue butterfly
FE	<i>Megaptera novaeangliae</i>	Humpback whale
FE	<i>Pelecanus occidentalis californicus</i>	California brown pelican

*Status Codes:

FC (federal candidate for listing); FT (federally listed as threatened); FE (federally listed as endangered)

Table 99. Habitat requirements for federally listed animal species within the planning area that are not typically found in forested habitat

Common Name	Habitat Conditions
Streaked horned lark	- Found in the Willamette Valley - Nesting habitat included native prairies and a wide range of agricultural fields (Marshall et al. 2003)
Whulge checkerspot (butterfly)	- Low-elevation upland prairies - Host plant is narrow-leaved plantain (<i>Plantago lanceolata</i>) (ODFW 2006)
Mardon skipper (butterfly)	- Meadow habitats - Host plants are native fescues (ODFW 2006)
Oregon spotted frog	- Permanent ponds, marshes and meandering streams through meadows - Bottom of dead and decaying vegetation - Springs and other slow moving water (ODFW 2006)
Vernal pool fairy shrimp	- Small, cooler ephemeral pools (ODFW 2006) - Found on BLM lands in the Medford District - Recovery plan (USDI, USFWS 2005) and designated critical habitat (Federal Register 2006c, 7118-7166) available
Steller sea lion	- Marine habitats include coastal waters near shore and over the continental slope - Sometimes rivers are ascended in pursuit of prey - Terrestrial habitats include beaches that are commonly used as rookeries and haulouts (NatureServe 2006)

Common Name	Habitat Conditions
Oregon silverspot butterfly	• Salt spray meadows • Host plants early blue and western blue violets (<i>Viola sp.</i>) (ODFW 2006) • Recovery plan (USDI, USFWS 2001b) and designated critical habitat (Federal Register 1980, 44935-44938) available
Blue whale	• Mainly pelagic • Generally prefers cold waters and open seas (NatureServe 2006)
Gray whale	• Mostly in coastal and shallow shelf waters • Young are born in lagoons and bays (NatureServe 2006)
Fender's blue butterfly	• Seasonally wet native prairies • Host plant is Kincaid's lupine (<i>Lupinus sulphureus kincaidii</i>) (ODFW 2006) • Draft critical habitat (Federal Register 2005c, 66492-66540) available
Humpback whale	• Pelagic and coastal waters • Sometimes frequenting inshore areas such as bays (NatureServe 2006)
California brown pelican	• A coastal marine species rarely found inland • Roosts on sandy shores and offshore rocks • Nests on islands and offshore rocks (Marshall et al. 2003)

Bureau sensitive and assessment species have been grouped according to habitat requirements to facilitate effects analysis. See *Table 100 (Bureau sensitive species and bureau assessment species found within the planning areas and grouped by habitat requirements to facilitate analysis)* and *Appendix G. Wildlife*. For many groups, habitat requirements are similar to those of species receiving individual analysis. Therefore, any additional analysis for those groups would be redundant.

Table 100. Bureau sensitive species and bureau assessment species found within the planning areas and grouped by habitat requirements to facilitate analysis

Habitat Association or Group	Common Name
Species effects that are common to all alternatives. Includes species that are associated with special habitats or features. Also includes accidental or occasional migrants where impacts are unlikely.	Yellow rail
	American peregrine falcon
	Rhinoceros auklet
	Cassin's auklet
	Tufted puffin
	Upland sandpiper
	Fork-tailed storm petrel
	Aleutian Canada goose
	Dusky Canada goose
	American white pelican.
	Red-necked grebe
	Trumpeter swan
	Ferruginous hawk
	Common nighthawk (Willamette Valley population)
	Tule goose
	Merlin
	White-tailed kite
	Insular blue (butterfly)
	Hoary elfin (butterfly)
	Newcomb's littorine snail
	Larch mountain salamander
	American grass bug
	Siskiyou short-horned grasshopper
	Diminutive pebblesnail
	Fall creek pebblesnail
	Keene creek pebblesnail
	Klamath pebblesnail
	Nerite pebblesnail
	Crater lake tightcoil (snail)
	Montane pea clam
	Evening fieldslug
	Crowned tightcoil (snail)
	Robust walker
	Pacific walker
	Toothed pebblesnail
	Townsend's big-eared bat
	Spotted bat
	Fringed myotis*
	Pallid bat (Pacific Pallid and Pallid considered the same)

Habitat Association or Group	Common Name
Neotropical Birds	Purple martin
	Yellow breasted chat
	White-headed woodpecker
	Three-toed woodpecker
	Black-backed woodpecker
	Grasshopper sparrow
	Tricolored blackbird
	Burrowing owl
	Flammulated owl
	Lewis woodpecker
	Oregon vesper sparrow
	Western meadowlark
	Streaked horned lark
Snag Dependent	Fringed myotis
	Pallid bat (Pacific Pallid and Pallid considered the same)
Older Forest Associates	Red tree vole
	Northern goshawk
	Johnson's hairstreak (butterfly)
	Survey and manage species
Aquatic and Riparian Associates	Haddock's rhyacophilan caddis fly
	Cope's giant salamander
	Scott's apatanian caddis fly
	Cascade torrent salamander
	Columbia torrent salamander
	Willamette floater (mussel)
	Harlequin duck
	Foothill yellow-legged frog
	Oregon spotted frog
	Scale lanx (snail)
	Rotund lanx (snail)
	Northwestern pond turtle
	Painted turtle

Habitat Association or Group	Common Name
Forest Floor Associates	Puget Oregonian
	Tillamook westernslug
	Salamander slug
	Spotted tail-dropper
	Bald hesperian
	Oak springs hesperian
	Oregon giant earthworm
	Roth's blind ground beetle
	Oregon slender salamander
	Traveling sideband (snail)
	Klamath tailedropper
	Modoc sideband (snail)
	Siskiyou hesperian
	Chase sideband (snail)
	California slender salamander
	Oregon shoulderband (snail)
	Black salamander
	Siskiyou mountains salamander
	Sisters hesperian
Gophers	Pistol river pocket gopher
	Gold beach pocket gopher

Fisher

The west coast population of the fisher (*Martes pennanti*) was petitioned for listing under the federal Endangered Species Act in 2000. In 2004, the U.S. Fish and Wildlife Service found that listing was “warranted but precluded” by higher priority actions (Federal Register 2004, 18770). Subsequently, the fisher was added to the U.S. Fish and Wildlife Service’s candidate species list (Federal Register 2004, 18770). Within the planning area, the fisher has been documented to occur in two districts and suspected to occur in two others. See *Appendix G. Wildlife*.

Fisher historically occurred throughout the Cascades, Coast Range, and the Siskiyou and Blue mountains of Oregon (Bailey 1936). They have declined since the late 1800s and early 1900s as a result of overtrapping, loss of habitat, and predator control programs (Aubry and Lewis 2003). Aubry and Lewis (2003) recognized two disjunct populations of fisher within the planning area—one in the southern Cascade Range and another in the northern Siskiyou Mountains. The southern Cascade fisher population is separated from the northern Siskiyou Mountains population by Interstate 5, large expanses of nonhabitat (nonforested and agricultural lands), and the populated Rogue River Valley.

Genetic studies found the population in the southern Cascades originated from animals that were introduced from British Columbia and Minnesota at various times from

the 1960s through the early 1980s (Aubrey and Lewis 2003). Genetic analysis has determined that “[t]he high degree of relatedness among fishers in the southern Cascade Range (R-.56) is consistent with the hypothesis that this population is small and isolated” (Aubry et al. 2003).

Small population sizes and isolation make the “Oregon populations vulnerable to extirpation” (Federal Register 2004, 18789). Recent survey efforts in southwestern Oregon have detected fisher in the landscape between the southern Cascade and other northern Siskiyou Mountains population centers, but the extent of connectivity between the two populations is still believed to be limited (Aubrey et al. 2004; Aubrey and Lewis 2003; Federal Register 2004, 18771).

Forest structure and associated prey are thought to be the critical features of habitat requirements for the fisher (Buskirk and Powell 1994). Powell (1993) (as cited in Federal Register 2004, 18773) stated “that forest type is probably not as important to fishers as the vegetative and structural aspects that lead to abundant prey populations and reduced fisher vulnerability to predation, and they may select forest that have low and closed canopies.” The fisher uses different forest structures for the various stages of life:

- natal sites (where young are born and weaned)
- maternal habitat (where young are raised)
- resting sites
- foraging habitat

Aubry and Raley (2002) found that female fishers use trees (alive or dead) with hollows created by heart rot for natal sites. Natal den trees ranged from 61 to 138 cm (24 to 54 inches) in diameter (average 93 cm (37 inches)) (Aubry and Raley 2002). Elsewhere along the Pacific coast, natal dens are typically located in the largest diameter trees. Weir and Harestad (2003) reported natal dens in cottonwoods that were averaging 103 cm (40 inches) in diameter. The U.S. Fish and Wildlife Service (Federal Register 2004, 18774) cited studies in northern California reporting average diameters of natal den trees of 62.5 to 295 cm (24 to 116 inches). Maternal dens were located in cavities in live trees and snags between the bole and sloughing bark on mistletoe brooms, on a rodent nest, and in large hollow logs that were greater than 50 cm (20 inches) in diameter (Aubry and Raley 2002). Approximately 56% of natal and maternal den sites in the southern Cascade study were located in unmanaged forests, 38% in managed forests (some evidence of past harvest activities), and 6% in second growth forests (Aubry and Raley 2002).

Rest sites occur predominantly in live trees. Aubry and Raley (2002) found that mistletoe brooms were used more than any other platform or microsite. Snags and down logs were also used for resting sites (Aubry and Raley 2002; Zielinski et al. 2004; Yeager 2005). In the southern Cascades, resting sites were found in unmanaged forests 63% of the time, 25% in managed second growth, and 22% in managed forest (Aubry and Raley 2002). In the Klamath province of northern California, Yeager (2005) determined that rest sites were located in trees significantly larger diameter at breast height than the four largest tree on a plot (0.4 ha) (1 acre) centered on the rest site structure.

Trees providing rest sites in the Shasta-Trinity National Forest and the Hoopa Valley Indian Reservation averaged from 87 to 124 cm (34 to 40 inches) in diameter at breast height (Yeager 2005). Rest sites in the north coast study area (northern California) averaged approximately 118 cm (46 inches) in diameter (Zielinski et al. 2004). Resting structures need to be sufficiently large in diameter to provide resting substrates that can accommodate the large-bodied fishers. Trees must be old enough for ecological processes to form cavities of sufficient size to be of use to fishers (Zielinski et al. 2004). Zielinski et al. (2004) described resting locations in their coast study areas (northern California) as being best distinguished from random locations by having large trees, dense canopies, and large diameter snags.

Foraging habitat is a function of coarse woody debris and stand structural complexity, which translates into a diverse prey base (Weir and Harestad 2003; Buskirk and Powell 1994). The fisher is a predator of small- to medium-sized mammals and birds. They also feed on a variety of vegetable matter, including berries and nuts (Powell and Zielinski 1994). Fungal spores found in fisher scats indicate that fishers may also directly consume fungi (Zielinski *et al.* 1999). Throughout their range, fishers commonly feed on ungulate carrion (e.g., deer, elk, moose, and cattle), especially in the winter, when other prey species are less available.

Fishers may select prey based upon their availability (Banci 1989). Fishers tend to occur in habitat that provides both prey numbers and the opportunity to capture them (Powell 1993, as cited in Federal Register 2004, 18772; Weir and Harestad 2003).

Literature reviews have shown that home ranges for fishers vary up to 122 km² for males and 53 km² for females (Banci 1989; Powell and Zielinski 1994). Zielinski et al. (2003) found that home ranges averaged 5,806 ha (14,350 acres) for males and 1,498 ha (3,700 acres) for female fisher in their coastal study area (northern California). Approximately 76% of the home range was composed of mature and older Douglas fir and true fir habitat types (Zielinski et al. 2004). Fishers avoid habitats without overstory or shrub cover (Weir and Harestad 2003; Federal Register 2004, 18773).

Approximately 2.2 million acres of BLM-administered lands are commercial forest lands capable of growing into fisher natal (including denning) and foraging habitat. See Table 101 (*Available fisher natal and foraging habitat on BLM-administered lands within the planning area*). Within the planning area, fisher natal habitat comprises from 13 to 39% of the BLM forest lands. Foraging habitat constitutes 61% of the BLM forest lands, which varies from 45% in the Eugene District to 81% in the Klamath Falls Resource Area of the Lakeview District. The Medford District contains the most fisher foraging habitat at approximately 605,000 acres.

Table 101. Available fisher natal and foraging habitat on BLM-administered lands with in the planning area

BLM Districts	Habitat-Capable (acres)	Natal Habitat		Foraging Habitat	
		(acres)	(%)	(acres)	(%)
Salem	365,000	48,428	13	204,866	54
Eugene	296,000	51,052	17	135,093	45
Roseburg	399,000	154,948	39	226,978	57
Coos Bay	302,000	84,035	28	143,933	48
Medford	788,000	213,342	27	604,753	77
Klamath	47,000	7,840	17	38,484	81
Totals	2,197,000	559,646	25	1,354,107	61

In their finding on the petition to list the fisher, the U.S Fish and Wildlife Service concluded that habitat loss and fragmentation appeared to be significant threats to the fisher (Federal Register 2004, 18780). Timber harvesting is a primary threat (Powell 1993) by reducing the amount of suitable habitat, fragmenting the remaining landscape, and changing the forest structure. Timber management activities tend to simplify stands by reducing species diversity, removing snags and down wood, and creating simple canopy structures (Federal Register 2004, 18778-18779).

Land Birds

“The temperate rain forests of the Pacific Northwest support the highest abundance of birds of any coniferous forest system in North America” (Altman 1999). There are potentially 164 species of birds that could occur within the planning area. See *Table 102 (Bird occurrence within the montane and western forest habitat types of Oregon and Washington)* (Olsen et al. 2001).

Table 102. Bird occurrence within the montane and western forest habitat types of Oregon and Washington

Total number of bird species	Bird Occurrence			
	Montane Mixed Conifer	Southwest Oregon Mixed Conifer-Hardwood	Westside Oak and Dry Douglas fir and Woodlands	Westside Lowlands and Conifer-Hardwoods
164	107	161	119	120

Detailed descriptions of the habitat needs and conservation concerns land birds are detailed in *Birds of Oregon* (Marshall et al. 2003) and *Wildlife-Habitat Relationships in Oregon and Washington* (Johnson and O’Neil 2001), and in the numerous species accounts contained within the *The Birds of North America* (Poole and Gill 2002).

Threats facing land birds include loss of habitat, habitat fragmentation, declining populations, and forest simplification (Altman 1999; Marshal et al. 2003; Rich et al. 2004; Pashley et al. 2000). Past management practices (including clear-cutting,

commercial thinning, fire suppression, salvage, slash burning, and herbicide use) has tended to simplify the forest habitat (Altman 1999). More recent management has begun to improve habitat structure and diversity by recognizing the need to provide for diverse forest structures (including legacy trees, snags, down wood, multiple canopy layers, and variable densities of tree retentions).

The Oregon/Washington Partners in Flight has developed a tiered scheme of segregating species into management groups based on forest condition and habitat attribute. Focal species are then identified for each group (Altman 1999, 2000a, 2000b). “By managing for a group of species representative of important components in a functioning...forest ecosystem, many other species and elements of biodiversity also will be conserved” (Altman 1999).

Data is not available to analyze all the combination groups of forest conditions and habitat attributes. Habitat analysis will be conducted based on the four structural stages of forests and plant group combinations. See *Table 103 (Analytical groups of land birds with the planning area)* (Altman 1999, 2000a, 2000b). Eastside conifer forests are composed of the true fir, Douglas fir, conifer/hardwood, and mixed conifer plant groups in the Klamath Falls Resource Area of the Lakeview District. Westside conifers are comprised of all plant groups with the exception of junipers and hardwoods.

Table 103. Analytical groups of land birds within the planning area

Plant Group	Habitat Feature or Conservation Focus	Focal Land Bird Species
Structurally Complex Forests		
Eastside conifer	Large trees	Brown creeper
	Large snags	Williamson's sapsucker
	Multi-layered dense canopy	Hermit thrush
Westside conifer	Large snags	Vaux's swift
	Large trees	Brown creeper
	Conifer cones	Red crossbill
Mature Forests with Multilayered Canopies		
Westside Conifer	Large snags	Pileated woodpecker
	Large trees	Brown creeper
	Conifer cones	Red crossbill
	Closed canopy	Hermit warbler
	Deciduous canopy trees	Pacific-slope flycatcher
	Mid-story tree layers	Varied thrush
	Open mid-story	Hammond's flycatcher
	Deciduous understory	Wilson's warbler
	Forest floor complexity	Winter wren

Plant Group	Habitat Feature or Conservation Focus	Focal Land Bird Species
Young Forests (young stand initiation and pole stem exclusion*)		
Westside Conifer	Closed canopy	Hermit warbles
	Deciduous canopy trees	Pacific-slope flycatcher
	Open mid-story	Hammond's flycatcher
	Deciduous canopy trees	Black-throated gray warbler
	Deciduous understory	Wilson's warbler
	Forest floor complexity	Winter wren
	Deciduous subcanopy and understory	Hutton's vireo
Stand Establishment Forests		
Westside conifer	Residual canopy trees	Olive-sided flycatcher
	Snags	Western bluebird
	Deciduous vegetation	Orange-crowned warbler
	Nectar-producing plants	Rufous hummingbird

*Altman's seral stages (Altman 1999).

Habitat objectives from the land bird conservation strategies of the Oregon/Washing Partners in-Flight for the eastern Oregon forests include (Altman 2000a):

- “no net loss” of habitat;
- maintenance of existing large diameter trees; and
- maintain existing structurally complex forests.

Habitat objectives from the land bird conservation strategies of the Oregon/Washing Partners in-Flight for the western Oregon forests include (Altman 1999):

- retain existing old-growth forest;
- manage for more than 15% of the landscape to be comprised of old-growth forest;
- manage mature forests in the same manner as the landscape targets;
- maintain 20 to 40% of the landscape in a combination of pole and young forest structures;
- maintain 20 to 40% of the landscape in an early successional stage.

These objectives provide “benchmarks for measuring the success of management actions” in providing for land birds (Altman 1999).

Deer and Elk

Deer (*Odocoileus sp.*) and elk (*Cervus elaphus*) occur across the planning area. Two species of deer (Columbian white-tailed deer (*Odocoileus virginianus leucurus*) and mule and black-tailed deer (*Odocoileus hemionus*)) occur within the planning area. This includes two subspecies of *Odocoileus hemionus*. Columbian black-tailed deer (*Odocoileus hemionus columbianus*) occur west of the crest of the Cascades and mule deer (*Odocoileus hemionus*) occur east of the Cascades (ODFW 2003a; Verts and Carraway 1998). Two subspecies of elk are found within the planning area. Roosevelt elk (*Cervus elaphus roosevelti*) occurs west of the Cascades and Rocky Mountain elk (*Cervus elaphus nelsoni*) are found east of the Cascades (ODFW 2003b; Verts and Carraway 1998). For management purposes, the Oregon Department of Fish and Wildlife divides the range of the two subspecies along State Highway 97 (ODFW 2003b).

There are two populations of Columbian white-tailed deer in Oregon—one along the Columbia River in the Clatsop, Columbia, and Multnomah counties, and a second population in Douglas County (Verts and Carraway 1998; Federal Register 2003, 54647; USDI, USFWS 1983). These populations were one of the first species listed under the Endangered Species Act. In 2003, the U.S. Fish and Wildlife Service determined that (Federal Register 2003, 43658):

- the Columbia River and Douglas County populations were “distinct population segments,” and
- the Douglas County population had reached recovery goals and no longer warranted listing.

The Columbia River population is still listed as a federally endangered species (Federal Register 2003, 43658).

All subspecies of elk and of mule and black-tailed deer are classified as game animals by the state of Oregon.

Columbian White-tailed Deer

White-tailed deer inhabit more mesic habitats (Smith 1987; Verts and Carraway 1998). White-tailed deer in the Columbia River population are found on the islands of the Columbia River and on the bottomlands that are adjacent to the river (USDI, USFWS 1983). Preferred habitats are plant communities that provide both forage and cover, including the park forest community (Suring 1975; Suring and Vohs 1979; USDI, USFWS 1983). White-tailed deer in Douglas County are found in habitats that are associated with riparian areas (Ricca 1999; Ricca 2003; Smith 1987; USDI, USFWS 1983). The U.S. Fish and Wildlife Service (1983) suggests that the oak woodland/grassland ecotone is very important to white-tailed deer in Douglas County. Open areas, oak savannah, and grasslands are important for feeding (Ricca 1999, 2003).

White-tailed deer in both populations consume a variety of forbs, shrubs, grasses, and other plants (in order of preference) (Federal Register 2003, 43647; Whitney 2002).

The BLM manages 6,100 acres of Columbian white-tailed deer habitat on the North Bank Habitat Management Area, in the Roseburg District. See *Figure 76 (North Bank Habitat Management Area in the Roseburg District)* (USDI, BLM 2001a). This area was acquired in 1994 with the expressed purpose of providing secure habitat (habitat managed primarily for the Columbian white-tailed deer).

Figure 76. North Bank Habitat Management Area in the Roseburg District

Mule/Black-tailed Deer

Mule deer occur across a broad range of habitat types from the Coast Range and Cascade Mountains to the desert shrublands, generally occupying open habitat types (Verts and Carraway 1998; ODFW 2003a). Black-tailed deer prefer dense communities early in the forest sere (Verts and Carraway 1998; Brown 1961; Bender et al. 2004). Hanley (1984) found that where black-tailed deer overlapped elk, they preferred the more xeric habitat. During summer, both mule and black-tailed deer may be found at higher elevations—migrating to lower elevations in the fall and winter (McCullough 1960 (Verts and Carraway 1998); ODFW 2003a). In the Coast Range, where winters are less severe, seasonal migration does not occur. Cover is an important habitat component for each subspecies and is found in stands of dense vegetation (Kremsater and Bunnell 1992; ODFW 2003a).

Both subspecies are characterized as browsers, which forage in the younger seral stages

(Hanley 1984; Verts and Carraway 1998; Anderson and Wallmo 1984). Forbs are an important component of the summer diets of mule deer. In winter, sagebrush (*Artemisia sp.*), bitter-brush (*Purshia tridentata*), rabbit-brush (*Chrysothamnus sp.*), juniper (*Juniperus sp.*), mountain- mahogany (*Cercocarpus sp.*), and winterfat (*Eurotia lanata*) are common components (Verts and Carraway 1998).

Winter range and associated forage are important components for those mule and black-tailed deer herds that migrate (ODFW 2003a). The BLM has identified 193,000 acres of winter range to be managed with consideration for deer. See *Table 104 (Deer management areas within the planning area)* and *Figure 77 (Deer habitat management areas on BLM lands within the planning area)*. Threats to deer include loss of forage habitat, loss of cover, and unregulated road use. Unregulated road use also causes an increase in deer vulnerability during hunting seasons, increases the potential for illegal kills, and provides opportunities for other disturbances to foraging, fawning, breeding, and resting habitat.

Table 104. Deer management areas within the planning area

BLM Districts	Deer Habitat Management Areas	Season of Concern	Gross Area (acres)	BLM (acres)
Coos Bay	Camp Creek	Summer	12,554	12,518
	Edson Butte	Summer	4,113	4,079
	Millicoma Tree Farm N Edge	Summer	607	601
	Millicoma Tree Farm NE Edge	Summer	6,112	6,095
	Rock Creek	Summer	6,865	6,834
Klamath Falls Resource Area (Lakeview District)	Bly	Winter	17,461	4,513
	Bly Mt	Winter	46,008	6,311
	Hogback	Winter	17,998	2,311
	Horton Windy	Winter	24,973	7,952
	Keno Worden	Winter	8,393	557
	Lorella	Winter	14,585	4,070
	South Bryant	Winter	7,768	2,718
	South Gerber	Winter	41,370	4,893
	Stukel	Winter	12,506	1,812
	Swan Lake	Winter	20,789	6,549
	Topsy Pokegama	Winter	30,578	13,485
Medford	DHMA Ash Deer Winter Little Applegate	Winter	14,244	11,094
	DHMA Ash Deer Winter Little Butte Creek South3	Winter	83,911	25,662
	DHMA BFRA Burnt Peak	Winter	3,602	1,771
	DHMA BFRA Elk Creek	Winter	43,036	19,039
	DHMA BFRA Salt Creek	Winter	40,813	17,487
	DHMA BFRA Shady Cove West	Winter	17,239	7,673
	DHMA Camel Hump	Winter	14,107	8,892
	DHMA -GP-Williams-Important Deer Area	Winter	55,341	29,188
	DHMA Monument East	Winter	16,605	10,355
	DHMA Monument West	Winter	6,460	6,422
		Totals	568,038	222,880

Figure 77. Deer habitat management areas on BLM lands within the planning area

Elk

Elk are found across a wide range of habitats within the planning area. The dominant factors for elk occurrence are the availability of forage and access to cover (Harper et al. 1987; Verts and Carraway 1998). Early seral habitat provides important foraging habitat (Verts and Carraway 1998; Witmer and Wisdom 1986; Hanley 1984). Like deer, elk will migrate from high elevation summer habitat to low elevation winter range in areas with harsh winter conditions. However, elk in the Coast Range do not display this migratory behavior (Verts and Carraway 1998; ODFW 2003b).

Elk forage on grasses, forbs, shrubs, and trees (ODFW 2003b; Hanley 1984; Verts and Carraway 1998; Findholt et al. 2004). Forage value decreases with distance from cover (Witmer and Wisdom 1986; ODFW 2003b). Cover was originally thought to provide both a hiding function and to ameliorate the effect of harsh weather (ODFW 2003b). Recent work in northeastern Oregon has shown that this is not the case (Cook et al. 1998). No positive effects of thermal cover were demonstrated. In fact, possible negative effects may occur (Cook et al. 1998). Cook et al. (2004) reviewed three other studies that looked at the effects of thermal cover and all studies failed to find any benefits.

Threats to elk include loss of forage habitat, loss of cover, and unregulated road access. Unregulated roads also cause an increase in elk vulnerability during hunting seasons, increases the potential for illegal kills, provides opportunities for other disturbances during critical calving periods and winter, and causes elk to move away from available forage (ODFW 2003b; Rowland et al. 2000; Wisdom et al. 2004; Rowland et al. 2004; Cole 1996; Cole et al. 1997).

The BLM has identified 118,000 acres of winter range to be managed with consideration for deer and elk. See *Table 105 (Elk management areas within the planning area)* and *Figure 78 (Elk habitat management areas on BLM lands within the planning area)*.

Table 105. Elk management areas within the planning area

BLM Districts	Elk Habitat Management Areas	Season of Concern	Gross Area (acres)	BLM (acres)
Salem	Bummer Ridge Elk Emphasis Area	General	3,647	3,641
	Luckiamute Elk Emphasis Area	General	1,977	1,968
Coos Bay	Camp Creek	Summer	12,554	12,518
	Edson Butte	Summer	4,113	4,079
	Millicoma Tree Farm N Edge	Summer	607	601
	Millicoma Tree Farm Ne Edge	Summer	6,112	6,095
	Rock Creek	Summer	6,865	6,834
Medford	Ehma Bfra Burnt Peak	Winter	3,602	1,771
	Ehma Bfra Camel Hump	Winter	14,107	8,892
	Ehma Bfra Elk Creek	Winter	43,036	19,039
	Ehma Bfra Salt Creek	Winter	41,593	17,479
	Ehma Bfra Shady Cove West	Winter	17,239	7,673
	Ehma Glendale Mule Creek Important Elk Area	Winter	20,882	19,372
	Ehma-Gp-Far Out-Important Elk Area	Winter	9,323	8,869
	Ehma-Gp-Peavine-Important Elk Area	Winter	27,447	26,303
	Glendale Elk Valley Important Elk Area	Winter	24,220	14,266
		Totals	237,325	159,400

Figure 78. Elk habitat management areas on BLM lands within the planning area

Fish

Key Points

- There are eight anadromous fish populations and two resident fish population segments that occur on BLM-administered lands within the planning area that are listed as threatened or endangered under the Endangered Species Act. Habitat degradation is a factor of decline for most of these populations, and is a major risk factor that continues to threaten all of the population segments.
- Large wood, stream temperature, sediment, and water flow have the greatest influence on the ability of aquatic habitat to support fish populations.
- The abundance and survival of salmonids is often closely linked to the abundance of large woody debris in stream channels. The current amount of large woody debris in streams is low and is hindering the recovery of salmonid populations.
- The fine sediments that are in the streams on BLM-administered lands are generally at levels that would not reduce the availability of fish-spawning habitat.
- The past land use practices that most severely degraded fish habitat—splash damming and stream cleaning—no longer occur. Additionally, improvements in road construction and grazing practices have reduced or eliminated adverse affects to fish habitat on BLM-administered lands.

Aquatic ecosystems within the planning area include (USDA, USDI 1994):

- large river systems (e.g., the Rogue, Umpqua, and Columbia rivers)
- small headwater streams originating from glaciers in the Cascade Range
- coastal rain-influenced streams
- lakes and ponds
- wetlands

Past management activities have degraded aquatic and riparian conditions and contributed to declines in fish populations. Improvements have been made, but additional opportunities exist across the landscape to continue improving conditions and further contribute to restoring the impaired ecological processes. The BLM's ability to contribute to reducing the threats to fish species and improving habitat conditions varies with the amount and location of BLM land ownership. The BLM is rarely the predominant landowner within a fifth-field watershed. Therefore, threats to listed species may continue regardless of the BLM's contribution to improving habitat trends because of the other influences on the populations and their habitat.

The analysis in this section focuses on the current condition of listed fish species. There are also several nonlisted fish species that are identified by the BLM as special status species (the Oregon coast coho salmon, Columbia River/Southwest Washington coastal cutthroat trout, Jenny Creek sucker, and Jenny Creek redband trout). Habitat for these special status fish species is affected by the same processes that affect the listed fish species. Therefore, the description of current conditions for listed fish species provides a sufficient description of conditions for the special status fish species. (There is also some specific discussion and data presented related to Oregon coast coho because of the wealth of information available on this species.)

Within the planning area, there are eight anadromous fish population segments that are listed as threatened or endangered under the Endangered Species Act. There is less than one stream mile with bull trout on BLM-administered land. There are two resident fish populations that are listed as threatened or endangered under the Endangered Species Act that are unique to the Klamath Basin (the Lost River sucker and the shortnose sucker). The Oregon chub is a resident species that is listed as threatened or endangered and occurs within the planning area, but it occurs only on private land.

Evolutionary significant unit

A population of an organism that is considered distinct for the purposes of conservation under the Endangered Species Act. Such a distinct population can be a species, subspecies, variety, geographic race, or population.

See Figure 79 (Listed fish populations and evolutionary significant units within the planning area) for the evolutionary significant unit boundaries within the planning area. See Appendix H. Fish.

Figure 79. Listed fish species and evolutionary significant units within the planning area

Fish populations are cyclic by nature and trends can be driven by a variety of factors. Those fish species within the planning area that have been listed as threatened or endangered have been listed as a result of the following factors (Good et al. 2005):

- habitat degradation and loss,
- hydropower development,
- overharvest, and
- hatchery propagation.

Currently, the shortnose sucker and the Lost River sucker occupy only a fraction of their historic range and are restricted to a few areas in the Upper Klamath Basin (i.e., the drainages of the

Upper Klamath, Tule, and Clear lakes). Poor water quality, reduced suitable habitat for all sizes and ages, and the impacts of nonnative fishes continue to threaten remaining shortnose sucker and Lost River sucker populations (USDI, USFWS 2003d). Although a number of factors have contributed to the decline of these species, habitat degradation is considered the primary cause. Streams, rivers, and lakes have been modified by channelization and dams. Grazing in the riparian zone has eliminated streambank vegetation, and has added nutrients and sediment to river systems (USDI, USFWS 2003d).

A biological review team, consisting of scientists from the National Marine Fisheries Service and the Southwest Fisheries Science Centers, updated biological information for the listed salmon and steelhead evolutionary significant units and made conclusions regarding the current and future major risk factors for each evolutionary significant unit. See *Table 106 (Major risk factors by evolutionary significant unit)*.

Table 106. Major risk factors by evolutionary significant unit

Evolutionary Significant Unit (species)	Major Risk Factors
Bull trout	• Barriers • Habitat degradation
Lower Columbia River chinook salmon	• Habitat degradation • High hatchery production
Lower Columbia River chum	Unknown
Lower Columbia River coho	• Habitat degradation • High hatchery production
Lower Columbia River steelhead	• Dams • Habitat degradation • High hatchery production
Shortnose and Lost River suckers	Freshwater habitat degradation
Southern Oregon and northern California coho	Freshwater habitat degradation
Upper Willamette River chinook salmon	• Dams • Habitat degradation • High hatchery production
Upper Willamette River steelhead	• Dams • Habitat degradation

Habitat degradation is a factor of decline for all the listed fish species and is a major risk factor that continues to threaten fish populations.

Recovery plans have been established for populations of the bull trout (draft recovery plan), the Lost River sucker, and the shortnose sucker. Recovery plans are in progress for the other population segments.

Critical habitat is designated for the following fish species within the planning area (Federal Register 2005d):

- Lower Columbia River Chinook salmon (threatened)
- Lower Columbia River steelhead (threatened)
- Columbia River chum salmon (threatened)
- Upper Willamette River Chinook salmon (threatened)
- Upper Willamette River steelhead (threatened)
- Southern Oregon and northern California coast coho salmon (threatened)

This analysis determines the effect of each alternative on fish habitat using current fish distribution data. The fish distribution is greater than the critical habitat distribution; therefore, the designated critical habitat is included for this analysis.

The BLM can contribute to improving fish habitat, but the BLM within the planning area is rarely the predominant landowner in a fifth-field watershed. Therefore, limiting factors (habitat and nonhabitat) for listed species may continue regardless of the BLM's contribution to improving habitat trends because of the other influences on the populations and their habitat.

Survival traits of fish (Reeves et al. 1995) include:

- straying of adults
- multiple life histories
- high fecundity
- mobility of juveniles

The BLM can contribute to the survival of anadromous salmonids. For example, replacing culverts can increase fish distribution by improving mobility.

Some streams have a higher potential than others to provide high-quality habitat for salmonids. High intrinsic potential is a scientific, topographical approach used to determine the potential of a stream to provide high-quality habitat for salmonids. See *Appendix H. Fish*. The Coastal Landscape Analysis and Modeling Study developed intrinsic potentials to prioritize stream reaches throughout the Coast Range province for restoration and protection (Coastal Landscape Analysis and Modeling Study). Using attributes of topography and flow, streams are ranked by their intrinsic potential to provide habitat for chinook, coho salmon, and steelhead. High intrinsic potential streams have not been determined for bull trout, Lost River suckers, or shortnose suckers.

The BLM's ability to influence aquatic habitat and fish populations depends not only on the overall amount of land ownership in a watershed, but also on the location of the ownership relevant to areas that can influence high intrinsic potential streams. See *Figure 80 (Percentage of miles of fish-bearing streams on and off BLM lands within the planning area)* and *Figure 81 (Percentage of miles of high intrinsic potential streams on and off BLM land per evolutionary significant unit within the planning area)*. Analysis from the Coastal Landscape Analysis and

Modeling Study also revealed that high-quality steelhead streams are located primarily on federally managed lands (Forest Service and BLM), whereas the majority of the best potential habitat for coho salmon is on private lands that are managed for such uses as agriculture and urbanization (Burnett et al. 2007).

Figure 80. Percentage of miles of fish-bearing streams on and off BLM lands within the planning area

Figure 81. Percentage of miles of high intrinsic potential streams on and off BLM land per evolutionary significant unit within the planning area

Aquatic ecosystems are dynamic environments and change over time from natural disturbances. The recognition that such dynamic processes as periodic large disturbances can have large impacts on aquatic ecosystems represents a relatively new perspective (Naiman et al. 1992). This perspective implies that aquatic ecosystems and their conditions vary because of such periodic events as wildfires and large storms, and the subsequent floods, hillslope failures, landslides, and debris flows (Haynes et al. 2006). This analysis focuses on the key ecological processes that shape fish habitat over time, rather than static conditions at one point in time.

The following are examples of key ecological processes that shape aquatic and riparian habitat in the planning area:

- tree growth and mortality, which affect stream shade and large wood delivery
- hydrology (water flow and temperature)
- sediment routing

Large wood, stream temperature, sediment, and flow have the greatest influence on the ability of aquatic habitat to support fish populations (Meehan 1991; OWEB 1999). In forested landscapes, the important delivery mechanisms of large wood and sediment to stream channels are landslides, debris flows, and floods. In nonforested landscapes, the important processes are water flow, water temperature, and sediment routing.

Large Wood

Past management practices throughout the Pacific Northwest have reduced the abundance of large woody debris in channels throughout the region. Historically, large wood source areas did not produce large wood all the time, but rather fluctuated both spatially and temporally. Natural disturbances like fires, wind, and floods do not affect all of the landscape equally. Because of the dynamic spatial effects of natural disturbance regimes, large wood loading and stream habitat features across natural landscapes vary greatly. At any one time, some stream channels may have large amounts of large wood and highly complex habitats, but other channels, even in the same watershed, may lack wood and have simplified habitats (Reeves et al. 1995). Prior to the twentieth century, large channels and large rivers, like the Willamette River as described by Sedell and Froggatt (1984), were full of wood or blocked by wood jams and accumulations.

Wood loading in large Pacific Northwest rivers has generally declined to 1/100th of historical amounts (Sedell and Froggatt 1984). Rivers were cleared of large wood during settlement to improve access for transportation. Large wood was later removed from rivers and streams as a stream-cleaning regime, because log jams were believed to obstruct fish migration. Smaller streams were cleared through a splash-damming process in which a dam-break flood was induced to transport trees. These torrents scoured sediment and wood from streambeds and banks and left many channels scoured to bedrock (Sedell and Luchessa 1984; Montgomery et al. 2003).

The decline in beaver populations from trapping also reduced the large wood found in streams and consequently reduced the complexity of aquatic habitats. Dam building by beavers provides accumulations of large wood and pools, which are an important component of high-quality habitat for fish species (ODFW 2005b; Pollock et al. 2003; Nickelson et al. 1992). By 1900, trapping had nearly extirpated beaver in the Pacific Northwest (Naiman et al. 1998). The decline in beaver populations resulted in incised channels, loss of riparian and wetland areas, and loss of channel complexity, which is important to fish and invertebrate production. For example, the greatest reduction in the productive capacity of coho smolt has been associated with the extensive loss of beaver ponds (ODFW 2005b). A 94% reduction in smolt production potential in a western

Washington basin is attributed to the loss of beaver pond habitat (ODFW 2005b).

In the twentieth century, mining, urbanization, agriculture, and logging began to change the physical and biological characteristics of streams by removing trees from upland and streamside areas, which increased sedimentation from ground disturbances and road construction and directly altered stream channels. Large fires and the subsequent salvage logging, such as the Tillamook Burn, removed both upland and riparian forests, which reduced stream shading, reduced future sources of large wood, and increased sedimentation.

Roads were often constructed along stream channels in the past. See *Figure 82 (Number of road and stream crossings in the Evans Creek Watershed)*.

Figure 82. Number of road and stream crossings in the Evans Creek Watershed

Large wood is an important component of aquatic habitats from headwater channels to estuaries in forested ecosystems (Dolloff and Warren 2003). Large wood accumulation within stream channels is necessary for many functions including:

- providing cover for fish
- sediment storage for food supply and spawning grounds
- nutrient retention
- pool formation
- formation of off-channel habitat

Woody material of all sizes from tiny fragments to intact trees plays a role in stream systems. Because decay rate and probability of displacement are a function of size, larger pieces have a greater influence on habitat and physical processes in stream channels than small pieces (Dolloff and Warren 2003). In general, pieces greater than 24 inches in diameter and 50 feet in length are considered large wood west of the Cascade Mountains, while pieces greater than 12 inches in diameter and 35 feet in length are considered large wood east of the Cascade Mountains (Foster et al. 1999; USDC, NOAA, NMFS 1996). For this analysis, trees greater than 20 inches in diameter are considered large wood because the structural stage classification of forests uses the density of trees greater than 20 inches in diameter as a threshold for the definition of mature&structurally complex forests (see the *Ecology* section of *Chapter 3*).

For many aquatic organisms, particularly fish, large wood is an important factor in creating and maintaining deep water or pool habitat. See *Figure 83 (Example of deep pool and habitat diversity caused by large wood)* and *Figure 84 (Example of a stream with high wood volume)*. Salmonids inhabit pools as refuges from high water velocities. Juvenile salmonids use pools and side channels created by wood as overwintering habitat. Large wood can capture and store sediment, which provides spawning habitat (Dolloff and Warren 2003). Large wood is also an important source of cover, which makes fish harder for predators to see. Stream complexity is important for many fish, particularly aggressive species like salmonids, which do not tolerate close proximity to each other. Wood partitions the habitat and visually isolates fish, which allows more fish per unit of available space (Dolloff 1986).

Figure 83. Example of deep pool and habitat diversity caused by large wood

Source: Roger Peters, USFWS

Figure 84. Example of a stream with high wood volume

Source: Gallo et al. 2005

One of the most important factors that can influence fish populations is the quantity of high-quality habitat (Nickelson 2001). The abundance and survival of salmonids is often closely linked to the abundance of large woody debris, particularly during winter (Meehan 1991). In general, streams with high amounts of large wood and complex habitats tend to have more fish species and higher populations than those lacking complexity (Dolloff and Warren 2003). It is generally accepted that improved habitat complexity correlates to improved fish survival and production (Hartman et al. 1996, 237, 243, 248; Reeves et al. 1993, 314; Bustard and Narver 1975, 684, 686; Tschaplinski and Hartman 1983, 452; Murphy et al. 1986, 1526; Hartman and Brown 1987, 262). Researchers have documented an increase in the density of salmon following the addition of wood to stream reaches. Roni (2000) reported a 180% increase during summer and 332% increase during winter in the density of juvenile coho following the addition of wood to 30 streams in Washington and Oregon. Similarly, Cederholm et al. (1997) showed a twentyfold increase in juvenile coho during winter in response to the addition of wood. Reeves et al. (1997) found that the number of steelhead did not increase in response to wood additions but that smolts were significantly larger.

Large wood is delivered to stream channels through a variety of complex ecosystem processes (Benda et al. 2003). The amount of large wood in stream channels is dependant on the amount of trees available on the landscape that can be delivered to a stream channel. Not all areas across the landscape have the potential to deliver trees to stream channels. Large wood source areas are defined as those areas on the landscape that are capable of delivering wood to stream channels, such as:

- streamside areas within a distance of one site potential tree height from the channel,
- valley floors and floodplains as streams migrate, and
- landslide and debris-flow prone intermittent channels.

Wood delivered from forests to stream channels occurs from both chronic and episodic events (Naiman et al. 2000).

- **Chronic events.** Events that occur frequently, such as tree mortality along stream banks. Trees eventually fall over, and, if they are close enough to a stream channel, land in the channel (McDade et al. 1990). Trees along stream edges are also undercut as a result of bank erosion and eventually fall into the stream. The majority of wood that falls into stream channels from adjacent forests occurs within a distance of one tree height away from the channel (FEMAT 1993, V-27).
- **Episodic events.** Events that typically occur sporadically and infrequently, such as landslides, debris flows, and floods. Although these events occur infrequently, they can deliver large amounts of wood to stream channels (Bilby and Bisson 1998; Benda et al. 2003; Naiman et al. 2000).

The relative importance of each delivery process varies by province, stream channel, riparian vegetation, position in the landscape, and time (Bilby and Ward 1989). Episodic processes deliver large amounts of wood during infrequent events (windstorms or mass movements), while chronic processes (suppression mortality and bank erosion) consistently provide small amounts of wood over extended time periods. Wind throw, debris flows, landslides, and avalanches are the primary delivery mechanisms in steep headwater channels (Bilby and Bisson 1998). Bank erosion and delivery from upstream sources contributes the majority of large woody debris in larger unconfined channels (Murphy and Koski 1989). See *Figure 85 (Relative importance and spatial variability of wood recruitment processes)* for the relative rates of wood recruitment from each process in the Coast Range province (Reeves et al. 2006).

Figure 85. Relative importance and spatial variability of wood recruitment processes

Headwater streams differ in susceptibility to debris flows. See *Figure 86 (Probability of debris flow from intermittent streams)* for an illustration of intermittent channels that are more likely to deliver large wood to fish-bearing stream channels.

Figure 86. Probability of debris flow from intermittent streams

Analysis from the Coastal Landscape Analysis and Modeling Study indicates that a small portion of the headwater stream network is important in producing landslides and debris flows that can provide large wood to streams (Miller and Burnett, in press).

Despite the high variability in the natural levels of large wood in streams, the amount of large wood in rivers and streams within the planning area is currently far outside the historic range and is hindering the recovery of wild salmonids (IMST 1999). Watershed monitoring completed within 55 watersheds in the area of the Northwest Forest Plan in 2004 concluded that large wood levels are below benchmark values in nearly 70% of the sample (Gallo et al. 2005).

Most riparian areas have been harvested at least once over the last 150 years (Dolloff and Warren 2003), and the trees in the resultant second-growth forests are generally too small to provide large wood to streams. The stand establishment and young structural stage classes generally have few trees greater than 20 inches in diameter. Trees in the mature&structurally complex structural stage class contain trees that are large enough to provide large wood. See *Figure 87 (Current riparian conditions by BLM district)* for the current riparian condition on BLM lands within the planning area. Within the riparian reserves that are allocated under the No Action alternative, 52% are in a mature&structurally complex structural stage class and 48% are in the stand establishment and young structural stage classes.

Figure 87. Current riparian conditions by BLM district

Red alder is an important source of nutrients for macroinvertebrates, and, subsequently, for fish (Romero et al. 2005). However, red alder stands in the Coast Range have increased in abundance since the 1930s (see the *Ecology* section in *Chapter 3*). Large conifer trees must also be available in the stream channel to trap and store the nutrients from the alder input (Findlae et al. 1973). During the same time period that alder have increased in the Coast Range, the amount of large conifers in stream channels and the amount available from riparian areas have declined. A lack of conifers along streams can contribute to simplified aquatic habitat, which is a limiting factor for many listed salmonids. Red alder cannot provide large, persistent stream structure as well as conifers can. Red alder that fall into streams are more likely to be broken down and transported out of the streams than are conifers (Hyatt and Naiman 2001). See *Figure 88 (Changes in western Oregon vegetation types)* for the difference in the abundance of hardwoods in the Coast Range from the 1930s to 1993.

Figure 88. Changes in western Oregon vegetation types

The BLM is rarely the predominant landowner within a fifth-field watershed within the planning area, and therefore the potential for large wood contribution from BLM-administered lands is generally less than from other land owners. To show the typical large wood contribution from BLM and non-BLM-administered lands, fifth-field watersheds were selected that represent a range of BLM ownership patterns and physiographic provinces. Of the 260 fifth-field watersheds within the planning area, 84 have no BLM-administered land. See *Table 107 (BLM land ownership patterns and representative watersheds)* and *Figure 89 (Representative watersheds)* for the range of BLM ownership in the watersheds that have some BLM-administered land and the representative watershed selected for that range.

Table 107. BLM land ownership patterns and representative watersheds

Land Ownership Categories	Watersheds (number)	Representative Watershed (actual percentage of BLM ownership)	Province	BLM District
Less than 1/3 BLM (0 to 33%)	138	Eagle Creek (6%)	Western Cascades	Salem
1/3 to 2/3 BLM (34 to 66%)	30	Applegate-McKee Bridge (34%)	Klamath	Medford
		Evans Creek (41%)	Klamath	Medford
		Upper Smith River (59%)	Coast Range	Coos Bay
Greater than 2/3 BLM (67 to 100%)	3	Rogue-Horseshoe Bend (93%)	Klamath	Medford

Figure 89. Representative watersheds

This analysis uses a large wood model to determine the maximum potential large wood contribution to fish-bearing streams from BLM-administered lands in the representative watersheds. The model uses topographic characteristics from the 10 meter digital elevation models to identify all debris-flow initiation points across the landscape (Benda and Miller 2003; Miller and Burnett, in press). See *Appendix H. Fish* for a complete description of the large wood model.

The model ranks all initiation points by their probability of initiating and transporting a debris flow to a fish-bearing channel. The model calculates a mean annual large wood contribution, which can be used to compare alternatives and can be compared against a maximum potential large wood contribution. The maximum potential large wood contribution is the maximum biological potential of the watershed to provide large wood to streams. It is calculated as the number of pieces of large wood per year that could be delivered to a fish-bearing stream in a fifth-field watershed if all forested acres in the watershed were capable of delivering large wood.

The maximum potential large wood contribution reflects a maximum biological potential, and does not necessarily reflect average historic conditions. The average historic conditions at the province scale ranged from 79% in a mature&structurally complex structural stage class in the Coast Range and Western Cascades provinces to 45% in a mature&structurally complex structural stage class in the Eastern Cascades province (see the *Ecology* section in *Chapter 3*).

However, at the scale of an individual fifth-field watershed, the variability in historic amounts of mature&structurally complex structural stage class would have been extremely high, likely with long periods of time in which the watershed was nearly all in the mature&structurally complex structural stage class (Wimberley et al. 2000). These periods of time in which a fifth-field watershed would be nearly all in the mature&structurally complex structural stage class, which would correspond to the maximum large wood contribution calculated in the model, would represent the maximum potential for large wood delivery.

Periodic large disturbance events, such as wildfires, large storms, and the subsequent floods, hillslope failures, landslides, and debris flows, would deliver large wood to stream channels and alter the structural stage abundance of the forest. Delivery from disturbance events when the watershed would be nearly all in the mature&structurally complex structural stage class would provide accumulations of large wood in streams that would last longer than it would take the watershed to return to the mature&structurally complex structural stage class after the disturbance.

The model output of mean annual large wood contribution is not a prediction of actual instream conditions at a specific point in time. The mean annual large wood contribution cannot be directly compared to large wood benchmarks that have been developed by the Oregon Department of Fish and Wildlife. The mean annual large wood contribution represents a potential contribution to instream wood based on forest conditions over time, whereas the large wood benchmarks are based on actual reference instream conditions. The model cannot predict actual instream conditions, because large wood input is episodic (delivery events are stochastic and unpredictable) and cumulative (large wood accrues over time). Therefore, this analysis summarizes large wood contribution in terms of the proportion of the maximum potential large wood contribution instead of a comparison with large wood benchmarks. See *Figure 90 (Current and maximum large wood contribution by ownership)* for the current mean annual large wood contribution and the maximum potential large wood contribution.

Figure 90. Current and maximum large wood contribution by ownership

In all representative watersheds, the current large wood contribution is lower than the maximum potential, because not all forests that are capable of delivery to streams are currently in the mature&structurally complex structural stage class. See *Figure 91 (Proportion of current large wood contribution compared to maximum potential)*. The proportion of current large wood contribution from BLM-administered land compared to the maximum potential from BLM-administered land varies widely (e.g., from 37% in Upper Smith River to 85% in Eagle Creek). In each watershed, the proportion of current large wood contribution of the maximum potential is higher on BLM-administered lands than non BLM-administered lands, which varies from 1% in Upper Smith River to 57% in Eagle Creek.

Figure 91. Proportion of current large wood contribution compared to maximum potential

In order to determine how the large wood contribution effects fish productivity, a fish productivity index approach was developed for this analysis. The analysis uses the mean annual large wood contribution to determine fish productivity using a population model developed for coho salmon by Lawson et al. (2004). This modified model provides the best information to evaluate the effects of large wood on fish productivity in the absence of species-specific population models. The linkage of mean annual large wood contribution with the fish population model allows for comparative analysis of the effects of the alternatives. However, it is an index and is not a prediction of the absolute population numbers and should be interpreted with caution, because other limiting factors for listed species, such as ocean conditions, fish harvesting, and hatcheries, continue to influence populations.

For this analysis, the fish population model is modified to be dependant on large wood contribution. For each watershed, the fish productivity index is estimated based on the surface area of the available stream habitat weighted by the intrinsic habitat potential value. The intrinsic habitat potential is based on topographical attributes of each stream reach including valley width, channel width, and channel gradient. This provides a comparison of potential fish production between BLM and other ownerships. As the proportion of the large wood contribution changes compared to the maximum potential large wood contribution, the fish productivity index would be modified based on the proportion. See *Figure 92 (Current and maximum potential fish productivity index)* for the current potential fish productivity from BLM-administered lands and non-BLM-administered lands compared to the maximum potential fish productivity for each watershed.

Figure 92. Current and maximum potential fish productivity index

In all of the representative watersheds, the current potential fish production is below the maximum potential fish production. See *Figure 93 (Proportion of current fish production compared to the maximum potential)*. Unlike the mean annual large wood contribution, the current fish production on non-BLM-administered lands is higher than on BLM-administered lands in Eagle Creek partly because non-BLM-administered lands include most of the high intrinsic potential streams in the watershed.

Figure 93. Proportion of current fish production compared to the maximum potential

Since 1995, the BLM has implemented instream habitat projects on 110 miles of streams with anadromous and listed fish within the planning area to improve stream complexity. See *Figure 94 (Miles of treated anadromous or listed fish streams by the BLM districts within the planning area)* for the total stream miles that have been treated by the BLM districts within the planning area and the percent treated of the total miles of anadromous or listed fish-bearing streams.

Figure 94. Miles of treated anadromous or listed fish streams by the BLM districts within the planning area

* Percentages are based on total "known" anadromous and/or listed fish stream miles that need in-stream treatment

Sediment

Streamside vegetation provides organic matter to stream channels when leaves, needles, and woody debris fall into the stream channel. The supply of organic material determines the amount of food produced for fish species in forested ecosystems. The effectiveness of riparian forests to deliver leaf and other particulate organic matter declines at distances that are greater than approximately one-half a tree height (59 to 112 feet) away from the stream channel (FEMAT 1993, V-27). The input and processing of organic material is better served by a heterogeneous landscape with varying amounts of forest cover, species composition, and age classes than by the creation of a single forest type across the landscape (IMST 1999). It is unknown what is the current condition and thresholds for the amount of organic input that would be adequate to maintain food supplies for fish.

There are 27 miles of stream listed by the Oregon Department of Environmental Quality as turbidity impaired that occur on BLM-administered lands. Fine sediment was measured in 55 sample stream channels as part of the watershed monitoring that was completed for the Northwest Forest Plan 10-year review in 2004. Sediment levels in nearly 64% of the sampled reaches were considered low (less than 11% embeddedness) and were not reducing fish-spawning or rearing habitat.

Fine sediments (sand, silt, and clay at less than 2 mm) enter and leave river channels naturally, but increased suspended sediment (turbidity) and sedimentation (embeddedness) can adversely affect fish (Anderson et al. 1996).

Increased concentrations of suspended sediment can have direct effects on fish behavior, physiology, and growth (Anderson et al. 1996). Sigler et al. (1984) found that turbidities of 25 nephelometric turbidity units caused a reduction in juvenile steelhead and coho growth. Fish may avoid high concentrations of suspended sediment and at lower concentrations cease feeding (Hicks et al. 1991). Bisson and Bilby (1982) found that juvenile coho salmon avoided water with turbidities that exceeded 70 nephelometric turbidity units.

Increases in sedimentation or embeddedness can reduce fish-spawning and rearing habitat, fish egg and fry survival, and food availability (Chamberlin et al. 1991; Hicks et al. 1991). Infiltration of fine sediment can reduce fish emergence from spawning beds. Generally, fine sediment levels that exceed 20% of the stream bed are considered detrimental to fish species (Everest et al. 1987; USDC, NOAA, NMFS 1997; Shelton and Pollock 1966; Cooper 1977). Cederholm et al. (1981) documented up to a 3.4% decrease in fish survival for each 1% increase in fine sediment.

The timing of the sediment inputs relative to the biological vulnerability of each fish species is more important than the absolute quantity of sediment. In most streams, there are periods when the water is relatively turbid, and this sediment is generally mobilized during large storms (Everest et al. 1987). Larger juvenile and adult salmonids and trout species appear to be little affected by ephemerally high concentrations of suspended sediments that occur during most storms (Cordone and Kelley 1961; Sorenson et al. 1977). If sediment is introduced to streams in the absence of a runoff event, then sediment deposition may create localized adverse impacts (Everest et al. 1987). The tolerances of fish species to sediment vary seasonally. For example, Noggle (1978) demonstrated that the tolerance of juvenile coho salmon to suspended sediment was highest in the fall when increased suspended sediment normally occurs in streams.

There is no model that can predict the exact mechanism of sediment delivery and instream routing. Therefore, it is not possible to quantify or accurately predict the affects that sediment delivery has on fish species. Fish species have the ability to cope with some level of sediment at various life stages. However, thresholds beyond which impairment occurs in the field have not been established, despite scientific efforts to quantify the relationship between fine sediment and fish species. This analysis assumes that a 3.4% decrease in fish survival could potentially occur for every 1% increase in fine sediment from management activities. This may be an overestimate of the actual effects to fish species, because:

- Fine sediment can be cleaned from the stream bottom gravel by scouring during peak flows. High velocity flows tend to carry sediment rapidly out of the drainages, particularly in the Coast Range province. Within the planning area, the amount of fine sediment stored and routed through stream channels is highly variable, and some aquatic systems may function with high background

levels of fine sediment. For example, in Evans Creek, a tributary to the Rogue River, a viable salmonid population exists even though the stream has a high sediment load.

- Spawning salmonids can improve their chances of reproductive success through behavioral adaptations (Everest et al. 1987). During redd construction (e.g., digging nests in the stream bottom) fish can remove large amounts of fine sediments from the gravel (Everest et al. 1987). Everest, Meehan, and Lotspeich found that chinook salmon in Evans Creek reduced fine sediments from 30% prior to spawning to 7.2% after spawning. Secondly, when a female salmonid has completed spawning and burying eggs, the redd is left with a large pit on its upstream perimeter and a mounded tailspill downstream that contains the eggs. The pit acts as a natural settling basin for fine sediments and may capture up to 0.25 cubic meters of sediment before they reach the tailspill where the eggs are buried (Everest et al. 1987).

Temperature

The water temperature in streams can affect the biological cycles of fish. See *Table 108 (Temperature standards for fish species)* for the temperature standards for several species within the planning area (ODEQ 2004).

Table 108. Temperature standards for fish species

Species	7-Day Average Maximum Temperature Standard (degrees Fahrenheit (°F))
Bull trout spawning and juvenile rearing	53.6
Lahontan cutthroat trout or redband trout	68.0
Salmon and steelhead spawning	55.4
Salmon and trout rearing and migration, shortnose and Lost River suckers	64.4

When stream temperatures rise above these levels fish become stressed. Food availability can decrease and the ability of fish to absorb oxygen decreases. There are currently 569 stream miles on BLM-administered lands (4% of all listed stream miles in Oregon) that are listed by the Oregon Department of Environmental Quality for temperature.

Stream Flow

Stream flow is an important element of fish habitat. Stream flow is highly variable in mountainous areas within the planning area and is strongly influenced by the form of precipitation (e.g., rain, snowmelt, or rain on snow) (Naiman and Bilby 1998). For fish species, flow affects many components of the aquatic system including:

- migration
- rearing
- sediment routing and deposition

The 2-year, 24-hour peak flow is typically the channel-forming flow for streams in mountainous areas within the planning area (Lisle 1981). When 5-year flows begin to occur at the 2-year, 24-hour interval, stream channels become unstable and streambank erosion increases (Harr 1992).

Water

Key Points

- Watersheds and subwatersheds (10 to 200 square miles) are the most relevant scale to include in the range of stream development and to describe hydrologic processes and the cumulative effects of forest management.
- The BLM typically manages only a small percentage of the land and streams within any particular fifth-field watershed.
- Streams that occur on BLM lands are mostly smaller, headwater streams that are important to determining the condition of larger streams and rivers.
- Stream temperature is the most common 303(d) water quality listing on BLM lands.
- Landsliding and road runoff are the primary routes of sediment delivery to stream channels.
- Changes to peak flows may occur through the removal of forest vegetation and the changes to infiltration and runoff caused by forest roads. Current studies indicate that forest management and road building interactions are complex, but generally have little to do with enhancing peak flows at a fifth-field watershed scale.

There are 143,044 miles of streams and rivers within the planning area. See *Table 110 (Miles of streams with BLM ownership within the planning area)*. They occur in a variety of landscapes from coastal rain-influenced streams to snowmelt-influenced streams in the Cascades Mountains and in eastern Oregon near Klamath Falls. Within this distribution, there are 20,407 miles of streams and rivers and 218,199 acres of lakes, ponds, and wetlands on BLM land. These water features support aquatic ecosystems under varying conditions according to past disturbance, topography, geomorphology, elevation, and physiographic province.

Large river basins are a mosaic of smaller watersheds linked by stream, riparian, and subsurface networks. Within basins, links among headwater tributaries and downstream channels are important paths for water, sediment, and disturbances.

The causes of changes to hydrologic processes include the removal of forest vegetation and changes to infiltration and the flow of surface and subsurface water. Changes in hydrologic processes are manifested in such water quality parameters as temperature, sediment, and water quantity.

Hydrologic features, including stream patterns, stream density, stream relief, stream bed and bank characteristics, and natural streamflow response, vary by physiographic province (FEMAT 1993, Appendix V-G). Riparian vegetation community types also reflect differences in geology, landforms, aspect, soil mineralogy and development, and influencing hillslope processes.

Climate factors, such as precipitation and temperature, interact with physiography to provide the setting for hydrologic processes and disturbance events.

There is great variation in the precipitation and temperature regimes within the planning area. See *Figure 95 (Normal annual precipitation)*. Typically, moisture-laden maritime fronts move onshore from the west. As these fronts move east they drop moisture as they encounter mountains. Temperatures vary with proximity to the ocean, changes in elevation, and latitude.

- The Coast Range provide intense rapid lift and receive annual precipitation depths varying from 40 to greater than 180 inches. Heavy precipitation amounts, combined with steep landforms, concave headwalls, thin soils, weak bedding planes, and weathering contribute to high landslide frequency. Snowfall seldom occurs in the Coast Range but, when it does, it is usually transitory and above 2,000 feet of elevation.
- The Willamette Valley has less precipitation because storm fronts have dropped much of their moisture as they moved over the Coast range. The mildness of the Willamette Valley and other western Oregon inland valleys causes snow to be rare even though moisture is relatively abundant.
- The western Cascades Mountains and eastern Cascade Mountains see an increase in precipitation as fronts gain moisture because they move over the valley. In the Cascade Mountains, temperatures are lower and moisture is still abundant, so snow is more frequent. Intermittent snow accumulation occurs in the western Cascade Mountains between 1,500 to 3,500 feet in the north and 2,000 to 4,500 feet in the south. Winter snow pack occurs in the eastern Cascade Mountains.
- Once over the Cascade Mountains, precipitation diminishes rapidly to less than 15 inches on the eastern edge of the planning area near Klamath Falls. Eastern Oregon receives a significant percentage of its winter precipitation in the form of snow, although the lower annual precipitation makes the actual snowfall amounts much lower than in the Cascade Mountains.

Figure 95. Normal annual precipitation

A drainage basin is an area of land that catches precipitation that falls within its perimeter, and moves the precipitation down slope as surface or subsurface flow under the influence of gravity to a creek, stream, or river, until the water drains into an ocean.

Hydrologic units (HUC) are a way of classifying drainage basins (Seaber et al. 2007) so as to nest them into a multilevel hierarchical drainage system.

- The largest hydrologic unit of classification divides the nation into 21 major geographic regions with an average size of 177,000 square miles. These geographic areas contain either the drainage area of a major river or the combined drainage areas of a series of rivers.
- The smallest hydrologic unit is called a subwatershed with a size range of 10 to 40 square miles in size.
- An intermediate unit is called a watershed. They are generally 20 to 200 square miles in size. There are 260 watersheds in the plan area. Of these, 176 watersheds contain BLM ownership.

See *Table 109 (Major river basins within the planning area)* for the major river basins within the planning area and the number of BLM watersheds within each basin province.

Table 109. Major river basins within the planning area

Hydrologic Unit Code (HUC)	River Basin	Total Area (square miles)	Proportion within the Planning Area	Number of Watersheds
170800	Lower Columbia: The drainage into the Pacific Ocean including downstream tributaries including the Sandy River (Oregon)	6,250	22%	24
170900	Willamette	11,400	12%	48
171002	Northern Oregon Coastal: The drainage into the Pacific Ocean from the Columbia River Basin boundary to the Umpqua River Basin boundary	4,312	100%	34
171003	Southern Oregon Coastal: The drainage into the Pacific Ocean from and including the Umpqua and Rogue River basins to the Smith River Basin boundary (California and Oregon)	12,582	100%	72
180102	Klamath: The Klamath River Basin (California and Oregon)	15,500	32%	23

Dunne et al. (2001) have proposed that watersheds and subwatersheds are the most relevant for describing hydrologic processes and the effects for cumulative watershed effects analysis.

- Geographic areas must be large enough to capture an assemblage of small source areas within mountainous terrain with varying forest environments. These headwater source areas contribute to a range of stream channels from juvenile steep gradient channels that are confined by hillslopes to more well-developed, low-gradient alluvial types with associated floodplains (Montgomery and Buffington 1997). Typically, the watershed scale is necessary to typify the complexity of stream development.
- In mountainous areas, streams gain size in a downstream direction and become perennial at a high enough watershed area and difference in relief where the water table stays above the surface.
- Downstream mainstem streams at the lower end of watersheds are normally low gradient, except for geologic disconformities, and are the receptors of the combination of nonpoint source pollution (e.g., temperature and sediment) that are associated with management activities. Typically, within the planning area, these mainstem streams involve less than 40% of the total stream network and are in areas where a cumulative effect upon water would occur.

The BLM typically manages only a small percentage of the land and stream miles within any particular watershed. See *Figure 96 (Contrasting BLM ownership in the Evans Creek and Eagle Creek watersheds)*. The combined actions across all ownerships determine the total impacts to the physical, chemical, and biological condition of downstream rivers. The intermingled land ownership pattern within the planning area can also make it difficult to separate out the amount of impact caused by any particular owner.

Figure 96. Contrasting BLM ownership in the Evans Creek and Eagle Creek watersheds

Stream type and size are important because:

- BLM lands are more heavily concentrated in headwaters, typified by small, typically steep gradient high-energy streams.
- Forest roads cross small streams more frequently, which are potential sediment delivery points.
- Many small streams on BLM lands do not flow continuously by late summer.
- Small streams are important in determining the condition of larger streams and rivers.
- Floodplains are associated with larger streams.
- The BLM often manages a small percentage of the riparian areas along larger streams.

See *Table 110 (Miles of streams with BLM ownership within the planning area)* for the miles of streams within the planning area by stream periodicity. See *Table 111 (Stream type descriptions)* for the primary stream type descriptions and their relative proportion within the planning area.

Table 110. Miles of streams with BLM ownership within the planning area

Stream Periodicity	Planning Area Streams (miles)	BLM Streams (miles)	BLM Stream Miles (%)
Perennial ^a	57,626	6,728	12
Intermittent ^b	85,418	13,679	16
Totals	143,044	20,407	14

^aPerennial streams have varying but continuous discharge year round. Their base level is at or below the water table.

^bIntermittent streams have a dry period, which is normally for three months or more. Their base level is above the water table.

Table 111. Stream type descriptions

Primary Stream Types	Gradient (feet/feet)	Confinement	Valley Bottom Type	Relative Proportion within the planning area
Cascade	> 20%	Confined	None	60%*
Steep	4 to 20%	Confined	None	
Step-pool	2 to 3.9%	Moderately confined	None or narrow ,and occasional floodplain feature	40%
Pool-riffle	< 2%	Unconfined	Narrow to wide and floodplains present	
Braided	< 4%	Unconfined	Wide and floodplains present	
Flat	< 2%	Confined	Narrow to wide	

*ODEQ estimates 85% in this category for 1 to 3 order streams (ODEQ 2004b).

Water Quality

High-quality water is essential for consumptive use and survival, growth, reproduction, and the migration of individuals that comprise aquatic and riparian communities (FEMAT 1993, V-14). This includes an abundance of cool (generally, less than 68°F), well-oxygenated water that is present at all times of the year, and is also free of excessive amounts of suspended sediments (Sullivan et al. 1987) and other pollutants (Cordone and Kelley 1961; Lloyd et al. 1987).

The Clean Water Act (§ 101(a)) was intended to restore and maintain the physical, chemical, and biological integrity of the nation's waters. The Oregon Department of Environmental Quality is responsible for developing water quality standards and determining where there is impairment of Oregon's streams and lakes as outlined in DEQ's 2004/2006 integrated report. By agreement with the Oregon Department of Environmental Quality, the BLM is recognized as a designated management agency for implementing the federal Clean Water Act (as amended by the Water Quality Act of 1987) on BLM-administered lands in Oregon. This includes the selection of appropriate best management practices to maintain water quality for the variety of ongoing forest activities.

Of the 143,044 miles of streams and rivers within the planning area, there are 10,611 miles of streams within the planning area that are listed as impaired (303(d) listed) for at least one water quality measure. Of these, 704 miles (7%) occur in watersheds with BLM ownership. See *Table 112 (Miles of BLM streams on the Oregon Department of Environmental Quality 303(d) list)* and *Figure 97 (303(d) Listed Streams in the Plan Area)*. The most common listing on BLM lands is for water temperature.

Table 112. Miles of BLM streams on the Oregon Department of Environmental Quality (ODEQ) 303(d) list

ODEQ 303(d) Listing	Stream Impairment Identified on BLM Streams (miles)	Affected BLM Fifth-Field Watersheds (number)
Temperature	569	81
Dissolved Oxygen	65	23
Bacteria	35	17
Sediment	27	5
Heavy Metals	8	2

Note: Based on ODEQ's 2002 303(d) list.

Figure 97. 303(d) listed streams within the planning area

Stream Temperature

Highly shaded streams often experience cooler stream temperatures due to the reduced input of solar energy (Brown 1969; Beschta et al. 1987; Holaday 1992; Lee et al. 2004). Increased stream temperatures can result from the removal of shade-producing riparian vegetation along fish-bearing streams and along smaller tributary streams that supply cold water to the fish-bearing streams (Beschta et al. 1987; Bisson et al. 1987).

The key factors that produce highly shaded streams include:

- The trees that are closest to a stream channel, including overhanging branches, provide the most shade.
- Narrower riparian areas with closely spaced trees have nearly the same shading effect as wider riparian areas with broadly spaced trees.
- There is little shade gained from trees that are more than 100 feet away from a stream's edge.
- The majority of riparian forests that are along perennial streams on BLM land are 40 to 150 years of age, and so are tall enough to offer shade.

Stream morphology, flow, climate, and geographic location also influence stream temperature.

Solar radiation is the most important source of radiant energy affecting stream temperature (Brown 1969; Beschta 1997). Effectiveness of streamside vegetation to provide shade varies with geomorphology, topography, orientation, extent of canopy opening above the channel, and forest structure (USDA, USDI 2005b).

Forest trees near stream channels and dense stands can block solar radiation and cast shadows across the stream. Angular canopy density is the measure of canopy closure as projected in a straight line from the stream surface to the sun,

as it varies through the day. The angular canopy density value for a given buffer depends on the spacing of forest crowns. As vegetation becomes more open through wider spacing, more width of vegetation is needed to achieve the same angular canopy density for the similar vegetation with closer spacing. Higher angular canopy density is achieved with lower sun angles and higher canopy density. See *Figure 98 (Angular canopy density and buffer widths for small streams within the planning area)* (Brazier and Brown 1972) for how angular canopy density varies with riparian area width.

Figure 98. Angular canopy density and buffer widths for small streams within the planning area

Angular canopy density is also related to the effective stream shade. See *Figure 99 (Angular canopy density and stream shade)* (Park 1991).

Figure 99. Angular canopy density and stream shade

Effective shade is the total solar radiation blocked from reaching the stream over a 24-hour period (USDA, USDI 2005b).

Effective shade is defined as:

$$\frac{\text{Total Solar Radiation} - \text{Total Solar Radiation Reaching the Stream}}{\text{Total Solar Radiation}}$$

Effective shade is influenced by slope steepness, vegetation species composition, tree height vegetation density, tree distance from the stream bank, and stream width. Thus, although riparian vegetation is a physical barrier between the stream and incoming solar radiation, only a portion of the riparian canopy contributes to effective shade (USDA, USDI 2005b). The relationship and interplay of the variables that affect effective shade can be simplified, to some degree, using geometry and computer models that simulate shade (Boyd 1996; Park 1993).

See *Figure 100 (Stream shade and change in water temperature)* for an illustration of the results of modeling to represent the downstream change in water temperature relative to effective shade (USDA, USDI 2005b). The figure illustrates that as effective shade increases beyond 40% there is a corresponding reduction in stream temperature to a point (e.g., approximately 80%) beyond which further reduction in stream temperature as a function of shade is not measurable (Boyd 1996). Furthermore, as was shown in *Figure 100*, for this 80% effective shade level, there is marginal improvement in shade for riparian areas wider than 100 feet, because the variables of total solar radiation reaching a stream is diminished by the blocking ability of a tree's canopy.

Figure 100. Stream shade and change in water temperature

One way these riparian management areas can be described is by assigning average primary and secondary shade zone distances. See *Table 113 (Shade zones)* for the primary and secondary shade zone distances of riparian trees as a function of tree height and slope steepness.

The period of greatest solar heating occurs between 10 AM and 2 PM. Vegetation that intercepts solar radiation between these hours is critical for providing stream shade (USDA, USDI 2005b). This vegetation constitutes the primary shade zone. During the morning and afternoon hours, trees outside the primary shade zone can also provide stream shade (USDA, USDI 2005b). This area is referred to as the secondary shade zone. See *Figure 101 (Relationship of primary and secondary shade zones)* for an illustration of these two shade zones (USDA, USDI 2005b).

Figure 101. Relationship of primary and secondary shade zones

Table 113. Shade zones

Shade Zones	Height of Riparian Tree	Shade Zone Distance from Edge of Stream		
		Slope < 30%	Slope 30 to 60%	Slope > 60%
Primary	< 20 ft.	12 ft.	14 ft.	15 ft.
	20 to 60 ft.	28 ft.	33 ft.	55 ft.
Secondary	> 60 to 100 ft.	50 ft.	55 ft.	60 ft.

Source: USDA, USDI 2005b

Site potential tree heights vary among tree species with mature conifers being substantially taller than mature hardwoods. Soil quality, aspect, elevation, and physiographic province are also important in determining site potential tree height capability. See *Figure 102 (Riparian tree heights by physiographic province and percent of BLM area)* for the range of tree heights for site potential conifers by each physiographic province within the planning area.

Both the young and mature structural stage classes of forests have tree heights and crown areas that provide effective shading. This is because the tree heights are tall enough to cast shadows from 20 to 100 feet and the stand density is normally higher than in older forests. Higher density leads to greater sun blocking ability and greater shade quality. Forests provide the most shade when tree crowns grow closed and somewhat less shade through stand competition and individual tree mortality as the trees mature over time.

Figure 102. Riparian tree heights by physiographic province and percent of BLM area

Disturbance plays an important role in the ecology of riparian forests. Climate variation, windstorms, landslides, floods, and insect and disease infestations are normal disturbance agents within the planning area. Natural fire has been suppressed during the last century and human-caused (prescribed) fire interacts with the landscape in different ways. These small and large disturbances over time have influenced the trajectory of forest stands. The historical percentage of old growth forest at a given time within the planning area ranged from 35 to 80% (Agee 1993).

The composition and pattern of riparian forestland varies within the planning area. In prelogged riparian forests in the Coast Range, less than 45% of riparian areas were in old forests (Ripple et al. 2000). Sample plots show that historic crown closure was greater than 70% with stands consisting of:

- 49% conifer,
- 30% conifer-dominated mixed stands,
- 19% hardwood-dominated and mixed stands, and
- 2% nonforest.

Nierenberg and Hibbs (2000) found that 52% of riparian areas on streamside terraces had no trees. This suggests that the floods and depositional materials control the dominance and the seral stage of vegetation close to the stream. With increasing distance from streams, the amount of hardwoods and nonforest decreases. This is evidence that hardwoods and shrubs are the largest contributing limiting factor to conifer growth in or near stream areas.

Although infrequent, large-scale natural disturbances do occur within riparian areas. From the sampled plots in the Coast Range, five disturbances occurred in the last 100 years for each mile of stream since a stand replacing fire (Nierenberg and Hibbs 2000).

Harvesting practices during the forest development period from the 1950s to 1980s often removed much of the standing marketable timber from riparian areas

along larger streams. This is because transportation systems were first developed along ridge tops and valley bottoms before more difficult midslope roads were attempted. During the 1970s, there was a large salvage program within riparian areas because the breaking up of debris jams was thought to be beneficial to fish migration. This thinking was reversed by the early 1980s, but much of the long-lasting stream structural forming large wood, such as western red cedar and Port Orford cedar, had been removed.

The Northwest Forest Plan 10-year monitoring report titled *Northwest Forest Plan – The First 10 Years (1994-2003): Synthesis of Monitoring and Research Results* (Haynes et al. 2006) reported that condition scores for 161 of the 250 sampled watersheds improved from 1994 to 2003. The change in watershed condition scores was attributed primarily to changes in the riparian vegetation; specifically, the number of large trees in the riparian areas. The number of large trees increased an estimated 2 to 4% during this time, which was most likely the result of tree growth into the greater than 20 inch diameter at breast height category (Gallo et al. 2005).

Shade in the riparian areas along perennial streams on BLM lands continues to improve, because there has been no regeneration harvesting (other than limited species conversion) in riparian areas in the last 20 to 30 years. The majority of thinning treatments along perennial streams in the past 10 years have left retention areas adjacent to waterbodies. This area beyond 100 feet has little effect on the increased shading of streams—particularly when a thinned forest stand is left to provide additional tree shading.

Dissolved Oxygen

High loading of fine organic matter, such as tree branches and needles, when combined with sediment and increased water temperature can deplete dissolved oxygen in small mountain streams (Wringler and Hall 1975). However, these streams are often steep with high turbulence, which quickly replenishes the dissolved oxygen (Ice 1978). A review of the oxygen requirements of aquatic organisms does not attribute changes in intergravel dissolved oxygen to management activities in the Pacific Northwest (Chapman and Mcleod 1987).

The growth and respiration of attached algae cause day and night fluctuations in dissolved oxygen concentrations. Algae photosynthesis releases oxygen into the water during the day and respiration consumes oxygen at night, which contributes to a dissolved oxygen depression. This cyclic process is limited to low-gradient river systems where nutrient inputs have caused extensive algae growth on the stream bottoms. It is most apparent during low flows, which may be aggravated by organic inputs and higher stream temperatures.

Bacteria

In forested and rangeland settings, the total coliform and fecal coliform bacteria are monitored depending on the extent of human and animal use. Many coliform bacteria include an array of aerobic and anaerobic bacteria, many of which are nonpathogenic or associated with human waste. Fecal coliform are bacteria that are found in the gut of warm-blooded animals. A variety of diseases may be spread by these bacteria. The presence of coliform bacteria in the water on BLM lands is associated with wild animals, concentrated livestock use, or poor waste disposal by recreation users. Dispersing activities away from water normally solves bacteria concentrations, because soils act as a filtering system.

Sediment

On-site soil loss is a natural weathering process. Fragmental rock, soil, and organic material that are detached can be redistributed by gravity, wind, and water. When this material arrives at, is eroded from, or is transported in a waterbody, it is known as sediment. Sediment moves in water when water velocities are great enough to cause suspension and entrainment (i.e., mobilization). Sediment moves as a suspended load in a water column or as larger particles rolling along the stream bottom. Sediment is freely transported through high-gradient stream reaches, and is deposited on bars and channel margins in low-gradient streams. Natural rates of sediment yield vary with rock and soil resistance to weathering, landslope and shape, ameliorating effects of vegetation, soil surface organic matter, and roughness. Seasonal climatology, particularly large storms, may trigger landsliding—the largest portion of the annual sediment budget.

Natural rates of sediment yields within the planning area vary greatly depending on physiographic area, topography, vegetation, and climate. The high annual variability of sediment yields extends to watersheds. For example, Flynn Creek Experimental Watershed, which served as a control in the Alsea study in the Coast Range, reported annual sediment yields of 59 to 1,237 tons per square mile per year (Brown and Krygier 1971).

Various studies show that average annual sediment yield from natural and anthropogenic sources in the Coast Range province vary from 200 to 800 tons per square mile per year compared to the Western Cascades province, which vary from 100 to 500 tons per square mile per year (Swanson et al. 1982; Stallman et al. 2005). In one study, sediment input from roads accounted for 67% of the total annual sediment budget (Swanson et al. 1982).

Forest management activities, including road building and timber harvesting, can lead to accelerated rates of erosion and sediment yield (FEMAT 1993, V-16). Fine sediment (particle sizes less than 2 mm) is of most interest, because it is more easily mobilized and capable of traveling the distances necessary to reach a water body.

As follows, road networks physically alter hill slopes as well as change the surface and subsurface flow of water:

- Flood flows and debris can plug culverts causing fill failures.
- Road construction on steep and unstable ground can also lead to accelerated rates of erosion in a watershed (Swanston and Swanson 1976; Reid and Dunne 1984), and are the most important source of management-accelerated delivery of sediment to anadromous fish habitats within the planning area (Ice 1985; Swanson et al. 1985).
- Road segments that have stream connection pathways, such as roadside ditches, have potential to deliver surface eroded sediment to streams (Wemple 1998; Jones et al. 2000).
- Road segments that are not connected to streams by ditch lines or gullies, or have more than 25 to 100 feet of filtering forest floor duff and vegetation (depending on the slope, soil properties, and surface roughness) between them and a stream, are usually not at risk of delivering sediment to streams. Rashin et al. (2006) found that when erosion features are further than 33 feet from streams, sediment delivery is unlikely unless sediment is routed by concentrated drainage water.

Road runoff and landsliding are the primary routes of sediment delivery to stream channels. Road parent material, location, design, use, and density can be important in affecting the extent and magnitude of road-related sediment impacts (Reiter et al. 1995).

Roads differ in their inherent erodibility, or erosion potential, due to the geology of a parent material on which they are constructed. See *Figure 103 (Geology within the planning area)* (Walker and King 1969) and *Table 114 (Basic erosion rates for roads based on the underlying geology)*. Sediment yields by erosion from older roads with undisturbed ditches are much smaller than sediment yields from newer roads or roads with disturbed ditches. Frequent road maintenance of ditchlines can increase sediment yields.

Figure 103. Geology within the planning area

Table 114. Basic erosion rates for roads based on the underlying geology

Erosion Category	Geologic Parent Material	Erosion Rates (tons/acre/year)	
		New Roads (0 to 2 years)	Old Roads (> 2 years)
High	• Mica schist • Volcanic ash • Highly weathered sedimentary rock	110	60
High/Moderate	• Quartzite • Course-grained granite	110	30
Moderate	• Fine-grained granite • Moderately weathered rock • Sedimentary rocks	60	30
Low	• Competent granite • Basalt • Metamorphic rocks • Relatively unweathered rocks	20	10

Note: Basic erosion rates (tons per acre per year) are an estimate of erodibility, which is based on the geologic parent material. This rate is for bare ground and is further reduced depending on road surface type, vegetation of cut and fillslopes, and traffic level.

Sources: Kochendorfer and Helvey 1984; Hayden et al. 1991; Megahan and Kidd 1972; Reid and Dunne 1984; Sullivan and Duncan

Primary road sediment sources include:

- Exposed surfaces, including the road tread (particularly native road surfaces), along with cuts and fills. Erosion may result by overland flow from rainwater or snowmelt, or concentrated flow in ditches. The BLM controls approximately 14,000 miles of road within the planning area. Less than 7% of these road miles are native surface roads. Much of the road network is on ridgetops or traversed areas well away from stream channels. See *Figure 104 (Road distribution in a representative watershed)*.
- Inadequate ditch relief culverts, resulting in elevated ditch flow that can mobilize sediment.
- Stream crossings that have undersized pipes or that traverse debris-flow streams.
- Roads in upland areas cross small seasonal streams more frequently, and so incur the greatest risk for failure.
- Road fill failures; particularly if they are within the slide out range of a stream channel.
- Midslope roads, with steep and unstable road cuts and deep fills, pose the highest risk for landslides.
- Older roads that were sidecast constructed, built on fills with organic material, or crossed slide prone ground that have not yet failed are also at higher risk. In the Western Cascades province, road fill failures were found to represent the most frequent cause of debris flow initiation (Swanson et al. 1982).

Figure 104. Road distribution in a representative watershed

Modeling was used to determine the effects of the alternatives on fine sediment delivery within the stream influence zone. The model was based on the concept of using reference roads. (Refer to *Appendix B – Surface Erosion* of the 1997 4.0 version of the *Washington Department of Natural Resources Forest Practices Watershed Analysis Manual*.)

Although there are 260 fifth-field watersheds within the planning area, only the 185 watersheds with BLM-administered lands were included in the analysis. A 200 foot sediment delivery buffer was created around all stream channels in all ownerships. The BLM roads data layer, which includes roads on all lands, was clipped with the sediment delivery buffer data layer. Road segments that crossed streams were selected since they are most likely to deliver fine sediment to streams. The amount of potential fine sediment delivery was calculated for thousands of these road segments. Factors used to estimate the amount of fine sediment included road erodibility, road surfacing, and vegetation on road cut and fill slopes. Traffic level was assumed to be moderate. The effect of road maintenance was not evaluated.

See *Table 115 (Potential fine sediment delivery from existing roads)* for the potential fine sediment delivery for the existing condition. Approximately 36% of all roads on BLM-administered lands are within the likely sediment delivery distance (5,096 miles out of 14,273 total BLM miles). When considering all roads, the highest yield is from natural surface roads, which average 9.61 tons per square mile per year. The lowest yield is from paved roads, which average 1.58 tons per square mile per year.

Table 115. Potential fine sediment delivery from existing roads

Existing Roads ^a	Roads Within Fine Sediment Delivery Distance (miles) ^b		Potential Fine Sediment Delivery (tons/year) ^c		Watershed Potential Fine Sediment Delivery (tons/mile ² /year) ^c	
	BLM	Other	BLM	Other	BLM	Other
Natural	1,738	15,874	23,050	233,054	0.86	8.75
Aggregate	2,590	22,938	28,938	30,765	1.09	1.15
Paved	767	2,436	8,277	33,807	0.31	1.27
Totals	5,096	21,249	60,265	297,626	2.26	11.17

^aIncludes BLM-controlled roads and private roads within the planning area from BLM GIS GTRN (roads) coverage.

^bIncludes road segments within 200 feet of a stream channel where ditch flow carrying fine sediment could enter streams.

^cPlanning criteria estimate in which calculations are calculated by surface type for each fifth-field watershed and summed for the planning area.

See *Figure 105 (Watersheds with the highest fine sediment delivery from roads)* for the highest (25%) fine sediment delivery watersheds that contain BLM-administered lands. Sediment delivery to stream channels within these watersheds range from 34 to 77 tons per mile per year and averages 43 tons per mile per year. Elsewhere, sediment delivery to stream channels range from 0 to 43 tons per mile per year and averages 17 tons per mile per year. The Klamath and Coast Range provinces contain the highest number of these sensitive watersheds. This is likely due to underlying geology and landforms.

Figure 105. Watersheds with the highest fine sediment delivery from roads

Timber harvesting activities can result in shallow colluvial landsliding, mass failures, and debris torrents depending on harvest location, type of harvest, design, and operation.

Miller (2003) and Miller and Benda (2005) have developed a GIS-based mass wasting hazard model for western Oregon to estimate the susceptibility to shallow colluvial landsliding. The model was calibrated using landslide inventories from the Coast Range, Western Cascades, and Klamath provinces. Landslide density was determined for topographic attributes from the 1996 storms. Of particular importance is the steepness of slope, watershed convergence, and source area. The density of landsliding for a set of stochastic events (1996 storms) was determined by calibration and set onto the landscape by topographic indicators. See *Figure 106 (Relative landslide susceptibility in a representative watershed)* for the relative landslide susceptibility mapping for a representative watershed.

Figure 106. Relative landslide susceptibility in a representative watershed

The BLM uses the timber productivity capability classification (TPCC) to screen for low forest productivity timberlands and landslide prone areas, and withdraws them from general forest management. This classification is done by silviculture and soil specialists from the interpretation of aerial photography and ground review. Over 89,937 acres of BLM-administered lands (3.5% of BLM administered lands) is withdrawn due to forest capability or land stability concerns. See *Figure 107 (Timber productivity capability classification withdrawn areas in a watershed)* for an example of a representative watershed with these withdrawals.

Figure 107. Timber productivity capability classification withdrawn areas in a watershed

Most landsliding occurs during severe storms when soils are fully saturated. Landsliding factors include:

- steepness of slope
- soil depth and texture
- underlying rock bedding planes
- forest cover
- water runoff pathways

In western Oregon, the highest hazard for landslides occurs on steep slopes over 70 to 80% (ODF 1999). Basal area retention of forest trees can be important in preventing landslides on unstable terrain. Retention trees transpire water and live roots increase soil strength, both of which increase stability. Weaver and Hagans (1996) found that 71% of observed landslides in western Oregon from the February 1996 storms were initiated from recent regeneration harvests, while no slides were reported from partial cuts. For the same storm, landslide densities and size in the Coast Range were the highest for regeneration harvests that were 0 to 9 years old, lower for mature forests, and lowest for forested areas between 10 to 100 years (ODF 1999).

Streamside forested areas protect the integrity of streambanks, provide excellent filtration, and capture of disturbed sediments. Riparian areas normally include higher vegetative cover, root masses that bind soils, and decomposing organic material that protects the soil surface. As follows, filter strip widths that prevent chronic sediment delivery within the planning area vary by physiographic province and geologic parent material:

- Swift (1986) measured travel distances through forest litter on 47% slopes. The maximum travel distance was 314 feet and the average distance was 65 feet. On a burned forest floor at a 42% slope, the maximum travel distance was 198 feet and the average was 96 feet.
- On basalt derived soils, Packer (1967) reported protective strip widths needed to contain 83.5% of the number of flows ranged from 35 to 127 feet depending on herbaceous vegetation and spacing between obstructions.
- On soils derived from gneiss and schist, Burroughs and King (1989) found that sediment flows below road fill slopes traveled less than 88 feet.
- In a recent study in the Pacific Northwest, filter strips have been found to be 95% effective at 33 feet in width (does not include burned areas) without the application of any other best management practice (Rashin et al. 2006).

Postfire sediment yields vary, depending on fire severity, frequency, climate, vegetation, and geomorphic factors such as topography, geology, and soils (Swanson 1981). Soil erosion after fires can vary from 0.4 to 2.6 tons per acre per year in prescribed burns, while more intense wildfires can create soil erosion that is an order of magnitude higher (Megahan and Molitor 1975). Recovery rate is rapid as grass, forbs, and shrubs occupy the site.

Many older roads on poor locations (i.e., with inadequate design and maintenance) pose high risks of erosion and sedimentation to stream channels and habitats from mass failure (FEMAT 1993, V-16).

The three largest floods in the last 50 years are the 1953 flood, the 1964 flood (both long-duration, high-intensity rain-on-snow events), and the February and November 1996 floods (separate long- and short-duration, high-intensity rain events). See *Figure 108 (November 1996 precipitation return period for western Oregon)* for the return period for daily precipitation for western Oregon for the November 1996 storm.

Figure 108. November 1996 precipitation return period for western Oregon

Observed landslides from an aerial reconnaissance survey of 83 watersheds in the Coast Range and Western Cascades provinces from the February 1996 storm revealed that 36% of the observed landslides were associated with roads, and 65% of all landslides resulted in stream torrents (Weaver and Hagans 1996). Based on samples in wildland Forest Service watersheds, failed stream crossings from the 1996 floods depended on the size of the storm events with more debris torrents occurring during the larger February 1996 event (Furniss et al. 1997). In the Furniss study, the most common failure mechanism in the Western Cascades was debris torrents, while sediment slugs were the most common failure mechanism in the Coast Range. Woody debris obstructions and culvert capacity exceedance were also important failure mechanisms.

Currently roads damaged from flooding, where rebuilt, are designed to higher standards than in the past. For example, the BLM abandoned sidecasting of waste material in the 1980's and planned lower fill heights over culverts at stream crossings. A road inventory in Washington found that roads constructed in the last 15 years had minimal damage rates from large storms compared to roads constructed earlier (Toth 1991). The Oregon Department of Forestry observed for the 1996 storms that road-related landslides were fewer and smaller than in previous studies and concluded that current improved road management practices were responsible (ODF 1996).

With the development of road networks in the early twentieth century, valley bottom roads along streams were constructed to salvage riparian timber and

access upper watershed areas. There was often little regard for riparian areas. Streams were sometimes straightened and protected with boulders so that roads could use floodplain terraces. Many of these arterial roads still remain and most are surfaced with few stream crossings. Road systems associated with forest management have been constructed on ridges and across middle slopes (between valley bottoms and ridge tops). There are many more road crossings in these upper watershed areas. There are minimal miles of roads within riparian areas along streams in these upper watershed areas.

Approximately 3,800 miles (25%) of the BLM road system are maintained in a given year. See *Figure 139 (Miles of road maintenance)* in the *Lands, Realty, Access, and Transportation* section of *Chapter 3*. Maintenance reduces sediment delivery by road surface grading and replacement, pavement maintenance and replacement, slough and slide removal, and culvert clearing and replacement.

Road closure and decommissioning has led to a net decrease of 700 miles (5%) of roads on BLM lands within the planning area since 1994. These road closure segments were scattered with most being outside of the riparian reserves.

The Northwest Forest Plan 10-year monitoring effort regarding watershed condition found that the condition scores of watersheds as influenced by roads generally did not change significantly since the Northwest Forest Plan was implemented (Gallo et al. 2005). The amounts of roads removed from any given watershed may have been relatively small and insufficient to change the watershed condition. There were 3,324 miles of roads decommissioned from 1995 to 2002 on U.S. Forest Service and BLM lands while there were an estimated 354 miles of new roads constructed during the same period (Baker et al., in press).

Using a random survey design across the region, ODEQ assessed four western Oregon physiographic provinces for fine sediment (Willamette Valley, Coast Range, Western Cascades, and Klamath). See *Table 116 (Fine sediment and ODEQ probabilistic stream surveys for third-order or less streams from 1994 to 2001)* for the assessment results. Because of the mix of land uses (forestry and agricultural) and different land management practices under different regulatory authorities within the watersheds, it is unclear how these survey results apply to BLM lands.

Table 116. Fine sediment and ODEQ probabilistic stream surveys for third-order or less streams from 1994 to 2001

Physiographic Province	Good Condition (%)	Fair Condition (%)	Poor Condition (%)	Confidence
Coast Range	42	17	41	± 7
Willamette Valley	7	3	90	± 22
Cascades	71	18	11	± 11
Klamath	65	14	22	± 19

Source: ODEQ 2004b

Heavy Metals

Heavy metals in streams and rivers in forested and rangeland areas are normally associated with natural sources, agricultural runoff and mine drainage. Natural sources may be increased by land erosion rates. Urban and industrial point sources, such as manufacturing, storm water runoff and landfills, provide additional inputs. Heavy metals may assimilate near the point source or in large rivers outside the majority of BLM ownership. Mercury is the most common heavy metal of concern.

Water Quantity

Aquatic organisms require adequate flows during migration, spawning, and rearing to satisfy the requirements of various life stages (FEMAT 1993, V-19). The timing, magnitude, duration, and spatial distribution of peak flows must be sufficient to create and sustain riparian and aquatic system habitat, and to retain the patterns of sediment, nutrient, and wood routing (FEMAT 1993, V-19).

Timber harvesting and associated activities in maritime mountainous watersheds alter the amount and timing of peak flows by changing site-level hydrologic processes (Keppeler and Ziemer 1990; LaMarche and Lettemmaier 1998; Wemple and Jones 2003; Wright et al. 1990). These hydrologic processes include changes in the amount of snow and snowmelt rates, roads intercepting surface and subsurface flow, and changes in soils infiltration rates and soil structure.

Changes in hydrologic processes affecting peak flows can be grouped by the following primary forest management actions:

- Reduction in forest vegetation through harvesting.
- Construction of forest access roads.

Reduction of forest vegetation through harvesting can affect processes that control snow accumulation in tree canopies and on the ground. Snowmelt can be accelerated where wind with warm air temperatures cross forest openings.

Low intensity winter precipitation of various durations is common within the planning area. Some of this precipitation falls as rain or snow, depending on the prevailing storm air temperature and watershed elevation. Snow acts as stored water within the mountainous watersheds. Lower valleys are below the snow line, except for extreme cold fronts. Snow comes and goes within the intermediate elevations, while higher elevations have a winter permanent snowpack. These precipitation zones are displayed as hydroregions. See *Figure 109 (Precipitation hydroregions within the planning area)*. The use of hydroregions helps to distinguish how peak flows would be affected by different-sized openings in areas that mimic regeneration harvested and stand establishment conditions.

Hydroregions

Hydroregions are a means for classifying the dominant precipitation type of a region as either rain or snow. With regards to snow, hydroregions also distinguish the depth of winter snow and the longevity of accumulated snow.

Figure 109. Precipitation hydroregions within the planning area

A spatial analysis to determine susceptibility to peak flow increase from vegetative management was developed for the planning area for both rain-dominated and rain-on-snow-dominated areas. The analysis uses sixth-field subwatersheds (a USGS hydrologic unit), because they are small enough areas to capture the patterns of BLM forest lands and because tributary streams are more sensitive to vegetation and runoff-related changes. Subwatersheds are generally 10,000 to 40,000 acres in size and have a single outlet. There are 1,192 subwatersheds within the planning area. When separated by hydroregion, 635 subwatersheds are rain-dominated, 471 subwatersheds are rain-on-snow-dominated, and 86 watersheds are snow-dominated. Snow-dominated watersheds involve higher elevation, which is important for sustaining spring flows, but have minor contributions to the elevation of winter peak flows.

Within the rain-dominated hydroregion, the effect of increased peak flow is proportional to the area cut with the detection of effects set at 40% for small catchments and considerably higher for watersheds (Grant et al. 2007, in review). Patch size or arrangement is not a factor in explaining greater flow volume or timing. Ziemer (1981, 1995) found a nonstatistical (4%) increase in peak flow for 80 year old conifer stands that were harvested where 50% of the basal area was retained.

The analysis of the affect of the alternatives on peak flows used the vegetation projections derived from the OPTIONS modeling for the existing condition on the BLM-administered lands. The stand establishment structural stage (without legacy) was used as a surrogate for the removal of basal area. On other lands, vegetative crown closure was

classified using satellite imagery from the 1996 Interagency Vegetation Mapping Project. Areas of less than 10% crown closure were used as a surrogate for the removal of basal area. A basal area of 40% removed was set as a sixth-field watershed response level.

There is currently one sixth-field subwatershed (out of 635) that is susceptible to peak flow increase. See *Figure 110 (Subwatersheds that are currently susceptible to peak flows in the rain-dominated hydroregion)*. Two additional sixth-field subwatersheds would be susceptible when considering the management activity on all lands.

Figure 110. Subwatersheds that are currently susceptible to peak flows in the rain-dominated hydroregion

A rain-on-snow storm involves prolonged rainfall under warm and windy conditions. Rain-on-snow events are of particular interest because the melt of shallow snow packs can enhance storm runoff, and has been associated with landsliding and downstream flooding.

Large openings in a forest canopy (commonly in regeneration harvests or forest stand conversions) affect precipitation and snow interception and melt. The ablation of snow in large openings may occur before rain-on-snow storms in contrast to increased snow accumulation and melt during winter storms; when the freezing levels are initially low but subsequently rise.

Snowmelt can provide extra water for runoff. Regeneration harvests or forest conversions with large open areas will provide additional melt contributions under rain-on-snow

conditions (Harr 1981; Storck 1997). This is primarily due to more snow accumulation in the openings and increased wind speeds. In contrast, research suggests that forest thinning treatments maintain patterns of snow accumulation that are similar to mature forests and reduce turbulent air near the ground. Furthermore, it is concluded that thinning treatments have little effect on snowmelt rates during rain-on-snow events (Poggi et al. 2004).

A rain-on-snow empirical analytical technique was used to identify susceptible subwatersheds to peak flow increase within the rain-on-snow hydroregion. The procedure was patterned after the Washington State Department of Natural Resources' hydrologic change watershed analysis methodology (1997). This screening technique (with modifications) was converted to GIS spatial analysis. See *Appendix I. Water*.

An appropriate method of describing the peak flows of various exceedance probabilities for unregulated streams in ungauged watersheds is to use the basin characteristics regression analysis with gauged watersheds that have long-term records. The Harris and Hubbard (1979) flood frequency equations were chosen as reference points—because they cover the various hydrologic regions within the planning area and have long-term records (10 to 70 years). The base period of streamflow data for use in the analysis was collected prior to the maximum forest conversion in many watersheds (with much of the streamflow data being gathered before 1960). The base period data set may include some chance rain-on-snow events, but with considerably fewer forest openings. Rain-on-snow occurrences of interest correspond to a streamflow return period of 2 to 8 years where research has shown prelogging and postlogging regressions were significantly different (Harr 1992). The 2-year, 24-hour and the 5-year, 24-hour streamflows were calculated for each sixth-field subwatershed with these equations and serve as reference points for a rain-on-snow watershed response level.

Rain-on-snow areas, where shallow snow accumulations can come and go, have been reported by Harr (1981, 1992) to be in the elevation range of 1,200 to 3,600 feet in western Oregon and from 2,500 to 5,000 feet in the southern Cascades (Lindell, pers. comm.). Forest openings commonly receive greater snow accumulation (two to three times more snow water equivalent) than adjacent forests (Harr 1992). These openings also receive greater wind speeds and twice the amount of heat during rain-on-snow events, which provides greater melt compared to a mature forest (Harr 1981, 1992; Storck 1997). For BLM-administered lands, acres of stand establishment were taken from the OPTIONS model vegetation modeling for each alternative. Satellite imagery from the 1996 Interagency Vegetation Mapping Project was used to determine the forest cover on other lands.

Published regression equations were used to generate a winter snowpack (Greenburg and Welch 1998) that relate to snow accumulation by elevation using the snow telemetry (SNOWTEL) data from the National Resources Conservation Service for January 1 snow accumulation. Large forest openings within the rain-on-snow hydroregion receive greater snow accumulation (two to three times more snow water equivalent) than adjacent forests (Harr 1992). Further adjustments for regeneration harvest areas (Brunengo, unpublished data) were used to estimate snow cover in openings.

Snowmelt equations from the U.S. Army Corps of Engineers (USACE 1956, 1998) were used to melt snow in the rain-on-snow elevation to approximate a 2-year, 24-

hour storm using average environmental conditions. The water from snowmelt for all vegetation cover types for each sixth-field subwatershed was averaged for the watershed and added to the precipitation for the 2-year, 24-hour storm. The water available for runoff (precipitation plus snowmelt) was rerun in the 2-year, 24-hour peak flow basin characteristics runoff equations. Water available for runoff was substituted as precipitation. The 2-year, 24-hour peak streamflow was then compared with a 5-year, 24-hour peak streamflow. Where it exceeded the 5-year, 24-hour peak streamflow, the watershed was considered susceptible to peak flow increase.

There are currently three sixth-field subwatersheds (out of 471) that are susceptible to peak flow increase in the rain-on-snow hydroregion on BLM-administered lands. See *Figure 111 (Subwatersheds currently susceptible to peak flows in the rain-on-snow-dominated hydroregion)*. No additional sixth-field subwatersheds would be susceptible when considering management activity on all lands.

Figure 111. Subwatersheds currently susceptible to peak flows in the rain-on-snow-dominated hydroregion

Shown is the peak flow susceptibility for sixth-field watersheds where the 2-year, 24-hour bankfull channel forming peak flow is greater than the 5-year, 24-hour peak flow. Includes the current rate of harvest on private land from 1996 IVMP imagery.

The largest floods in the world are caused by sustained rates of rainfall or dam-break floods (Naiman and Bilby 1998). Within the planning area, warm subtropical air from winter storms with sustained rates of rainfall combine with snow on the ground to produce the largest floods. For example, the largest floods on record (1861, 1890, and 1964) were rain-on-snow events. Harr (1981) concluded that 23 of 25 of the largest annual peak flows of the Willamette River at Salem, Oregon between 1814 and 1977 were caused by rapid snowmelt during rainfall. Harr also concluded that the effect of these wet mantle floods overwhelmed the peak flow response to forest management.

Forest roads and landings change the infiltration of soil and the flow of surface and subsurface water in watersheds. These compacted areas are relatively impermeable and are a source of overland flow. The road and its cutslope can advance the timing of surface runoff, compared to slower, subsurface flow routes (Harr et al. 1975, 1979; Megahan et al. 1981, 1992; Wemple et al. 1996). During large storm events, roads intercept larger contributions of subsurface flow and route it to drainage ditches. This additional runoff contributes to rising flows where drainage ditches connect to streams. (Megahan 1972; LaMarche and Lettenmaier 2001; Luce 2002; Wemple and Jones 2003).

There are approximately 14,000 miles of BLM roads within the planning area. Many of these roads are crowned or insloped with a drainage ditch between the road shoulder and the backslope. This drainage ditch and stream connectivity effectively extends the stream channel network at stream crossings. However, where road drainage intersects ditch relief culverts, stream extension is appreciably reduced. Any remaining extension is short and is often terminated at the point of the first ditch relief culvert. Some surface runoff and interception of subsurface flow could enter stream channels below this juncture.

There has long been debate regarding the magnitude of floods caused by timber harvesting and road building.

Research from primary hydrologic study sites in the Cascades, Coast Range, and in northern California since the late 1950s show that a peak flow change from clear-cut harvesting is detectable at the catchment scale (less than 1,000 acres).

The greatest response is from the first stream flow peaks in the fall that can be increased up to 100%, or more, after logging (Harr 1976; Ziemer 1981). These early fall storms produce small peaks, which had little, if any, consequence on channel form because stream flow is very low at this time (Grant et al. 2007). This effect of logging at peak flow through the winter storm season is thought to diminish with each subsequent storm by a variable representing the percentage of the area logged divided by the sequential storm number (Ziemer 1981).

For peak flows from clear-cutting with no roads, where the return interval was less than 1 year, there was a significant increase in peak flows, but this diminished within 5 years (Jones and Grant 1996).

Large peak flows (those with return intervals of greater than 5 years) were not significantly affected by clear-cut logging in either the H. J. Andrews (Rothacher 1973)

or Alsea (Harr 1976) studies. These are the flows that can scour stream channels, modify floodplains, and carry tremendous quantities of sediment.

Ziemer (1981, 1995) found a nonstatistically significant increase (4%) in peak flow for 80 year old conifer stands that were harvested where 50% of the basal area was retained.

For roads, Jones and Grant (1996) found no statistical increase in peak flow for catchments that contained roads but no clear-cuts. They found peak flows increased 50% for all event sizes with 25% of the area in clear-cuts and roads. Increases in peak flow were found when roads and other impermeable areas occupied more than 12% of the catchment scale watershed (Harr et al. 1975; Harr 1976).

A recent literature review in which all northwest studies were arranged by hydroregion has concluded for watersheds with roads and large openings that within the rain dominated hydroregion there is no data supporting any increase in peak flow below 40% of a harvested watershed area. For basins within the rain-on-snow hydroregion, the detection threshold is 20% of a harvested watershed area (Grant et al. 2007).

Jones and Grant (1996) reported that peak discharges with a return interval of less than one year or greater have increased by as much as 100% in fifth- and sixth-field watersheds in the last 50 years. However, the data set was skewed toward smaller peak flows. Greater than 75% of the data set had a return period of less than one year and gauged areas were small catchments, which were not representative of the watershed-size basins. Further analysis of the same data set by others (Beschta 1997; Thomas and Megahan 1988) either could not detect any changes for the fifth- or sixth-field watersheds or were inconclusive.

Source Water Protection

The 1996 Safe Water Drinking Act amendments require the identification and management of source water protection areas for public water systems. States are required to develop source water assessments for public drinking water supply systems that include surface water and groundwater sources. The assessments include mapping of the surface or groundwater area, an inventory of the potential sources of contamination, and an evaluation of watershed sensitivity. See *Table 117 (Potential contaminant sources affecting waterbodies within source water watersheds)* for the activities on BLM lands that could affect drinking water supplies.

Table 117. Potential contaminant sources affecting waterbodies within source water watersheds

Contaminant	Activity	Causal Mechanism
Temperature	Harvesting within riparian zones on perennial streams	Decrease in stream shade affected by canopy removal
Sediment	- Existing road network - New road construction	Sediment delivery near stream crossings of roads
	- Harvest areas - Recent burns - Cattle grazing	- Landslides and debris torrents - Erosion and dry ravel - Concentrated animal grazing in riparian areas leading to erosion or streambank collapse
Bacteria	- Recreation at campgrounds - Dispersed sites	- Failing sewage systems - Improper waste disposal
	Cattle grazing	- Cattle holding areas within riparian areas - On-stream watering
Nutrients	Forest fertilization	Fertilizer entering watercourses
	Recent burns	Mobilization from adjacent areas to streams
Pesticides	Forest pesticide application	Application to nontargeted areas by drift or runoff
Petroleum products	- Refueling of equipment - Transportation and fuel storage	Spills

See Figure 112 (*Source water watersheds percentage on BLM lands within the planning area*). These watersheds are primarily in rural settings and do not involve industrialized contaminant sources. See *Appendix I. Water* for descriptions of specific community public water systems using surface water, population served, and land area affected for each district.

Figure 112. Source water watersheds percentage on BLM lands within the planning area

With the settlement of the Pacific Northwest in the late eighteenth and early nineteenth centuries, along with increasing populations, concerns arose about the quality of drinking water. Early focus centered on the characterization of disease-causing microbes in public water supplies and methods to immobilize or remove them.

As a matter of necessity, small cities in rural areas set up points of diversion from surface waters from federal lands. They generally enjoyed excellent water quality during most of the year with minimal treatment. During the 1950s and 1960s, timber harvesting and range activities increased. A water system survey conducted by the Public Health Service in 1969 showed that only 60% of the public water systems surveyed delivered water that met Public Health Service standards (EPA 2000). Small systems, such as those found in rural communities, were the most at risk. Deficiencies related more to water system equipment, including filtration, disinfection, and a safe distribution system, rather than surface water quality.

The height of road construction, harvesting, and rangeland use on BLM lands occurred in the 1950s through the 1980s. Watersheds have been generally on an improving trend during the last 15 years.

Fire and Fuels

Key Points

- The natural disturbance agent of fire differs in severity and frequency between the northern and southern BLM districts.
- Fire exclusion has increased the risk of high-severity fires in the Medford District and Klamath Falls Resource Area of the Lakeview District.
- Fire exclusion and vegetative ingrowth is a threat to fire resiliency in the Medford District and Klamath Falls Resource Area of the Lakeview District.

Fire Regimes

Fire is a natural disturbance agent that has played a major role in shaping the forests within the planning area. A natural fire regime is a general classification of how fire would behave in the absence of human intervention. See *Table 118 (Frequencies and severities of the natural fire regimes)* for the frequencies and severities of natural fire behavior.

Table 118. Frequencies and severities of the natural fire regimes

Natural Fire Regime	Frequency (years)	Severity
Fire Regime I	0 to 35	low to mixed (surface fires are the most common)
Fire Regime II	0 to 35	high (stand replacement fires)
Fire Regime III	35 to 100+	mixed
Fire Regime IV	35 to 100+	high (stand replacement fires)
Fire Regime V	200+	high (stand replacement fires)

Generally, the BLM districts within the planning area fall into the following fire regimes:

- Eugene and Salem fall mostly into Fire Regime IV and Fire Regime V.
- Roseburg is a transition zone of weather and the natural fire regimes.
- Coos Bay has a variety of fire regimes.
- Medford falls into Fire Regime I.
- Klamath Falls (a resource area in the Lakeview District) is a complex mix of fire regimes; however, all are dry site (i.e., xeric).

See *Map 31 (Fire regimes)*.

Map 31. Fire regimes

The northern districts historically have had less frequent high-severity fire regimes. The southern districts, particularly the Medford District and the Klamath Falls Resource Area, have had less severe but more frequent fire regimes. These frequent low-severity fire events contribute to the fire resiliency of the forests of southern Oregon by removing understory vegetation, reducing ground and surface fuels, and reducing tree density.

There appears to be an emerging trend toward higher severity fires in the southern portion of the planning area (USDA, USDI 2004d). In the dry Douglas fir forests of southern Oregon, forests that currently would burn at a high severity level compose 50% of the landscape compared to 20% historically. This is a result of fire exclusion and harvesting practices that have fundamentally changed the historic fuel conditions (Peterson et al. 2005). These changes to the historic fuel conditions include:

Fire resilient forest

A forest that has characteristics that limit fire severity and increase the resistance of the forest to mortality (Brown et al. 2004).

- An increase in shade tolerant species, which are less fire resistant. Frequent, low-intensity fires control the establishment of fire intolerant species, which are more susceptible to mortality from bowl scorch and have increased the risk of crown fires due to lower canopy base heights.
- The lower height to live crown ratio of shade tolerant species increases ladder fuels.

- Increased tree stocking levels. Frequent, low-intensity fires maintained a higher proportion of low-density stands. Surface fuels accumulate over time as smaller trees crowd out and die.
- A decrease in canopy base height. Frequent, low-intensity fires pruned the lower limbs of the trees that survived and reduced the threat of crown fires.
- Ground fuels build up as duff and large woody material accumulate and decompose. This is a long-term process that occurs over decades. These fuels will not contribute to spread rates but will contribute heavily to fire severity.

The following management practices have increased the potential for uncharacteristic wildfires:

- Fire exclusion has created thickets of ladder fuels and increased fuel loadings.
- A lack of thinning and slash treatments has created higher density stands, understory vegetation, and fuels that favor large, high-severity fires.
- Harvesting practices have removed the more fire-resilient larger trees.
- Excluding areas (such as reserved areas) from the practices of thinning, prescribed burns, or fuel reduction activities makes them susceptible to wildfires of uncharacteristically high intensity and severity. This exclusion also makes them less fire resilient.

Fire exclusion is not a significant factor in fire severity in the northern portion of the planning area, which has a low return, high fire severity. The existing fuel loadings are likely consistent with the fire regime. In general, fires in the northern portion of the planning area are scattered and tend to be small. In the southern portion of the planning area, however, fire exclusion and harvesting practices have reduced fire resiliency.

Research suggests that fire-resilient stands have the following characteristics:

- Reduced surface fuel loading (Cram et al. 2006; Brown et al. 2004; Peterson et al. 2005)
- Lower density and basal area (Cram et al. 2006; Brown et al. 2004)
- Maintain large trees of fire-resistant species (Brown et al. 2004; Cram et al. 2006; Noss et al. 2006)
- Increased diameter increases the probability of the survival of green trees (Brown et al. 2004)
- Increased height to live crown creates multistoried canopies with gaps (Brown et al. 2004; Peterson et al. 2005)

Legacy trees increase fire resiliency within a forest. Currently, 27% of the stand establishment and young stands in the Medford District contain legacy trees and 19% of the stand establishment and young stands in the Klamath Falls Resource Area contain legacy trees.

The Klamath province and the southern portion of the Western Cascades province have a greater abundance of fires. There are more large fires in those province areas. See *Figure 113 (Incidence of forest fires within the planning area between 1994 and 2004)*.

Figure 113. Incidence of forest fires within the planning area between 1994 and 2004

Fire Hazards

Weather plays a major role in assessing fire hazard. Weather can increase the number of days per season that fuels are capable of producing a significant wildfire.

Thunder storms are common in July and August, and more than half cause fires (Agee 1996). The area in western Oregon south of the Rogue-Umpqua divide generally has more severe and frequent thunderstorms with little precipitation. Storms tend to track up the crest and east side of the Cascade Range (Agee 1996).

The primary cause of large wildfire ignitions within the planning area is lightning. The secondary cause is humans. Lightning often produces multiple fire starts that overwhelm available suppression forces.

What is called the wildland urban interface encompasses a large portion of BLM-administered lands within the planning area. A wildland urban interface is an area where structures and other human development meet or intermingle with undeveloped wildland. As wildland urban interface areas continue to develop infrastructure, the sources of wildfire ignition increases also. In southwest Oregon, the primary ignition source of fires is now humans.

The complexity and difficulty of fire management is increased by the checkerboard land ownership pattern of the BLM lands within the planning area. These BLM lands are interspersed with a variety of other lands (including intensively managed private, industrial forests and residential areas where residents may not want active forest management). While the goal of rapid fire suppression may be common to all landowners, it is often difficult to proactively treat fuel loadings in mixed ownership situations. Rural residents are concerned about smoke and the potential for fire to escape from the prescribed burns that are designed to treat fuel loadings. Industrial landowners are more tolerant of smoke, but, they are also concerned about fire that may escape from prescribed burns. Therefore, the ability to do, and thus the effectiveness of, fuels treatments is often reduced by mixed land ownership.

Ground fuels that consume large amounts of woody fuels and organic soil horizons would produce disproportionately large amounts of smoke compared to fires that are generated from other types of fuels. Ground fires reduce the accumulation of organic material and carbon storage, and contribute to smoke production long after the flaming front of a fire has passed (Graham et al. 2004). Under drought conditions, these fires also damage and kill large trees by killing or damaging their roots and lower stem cambium (Graham et al. 2004). Because of the long duration of ground fires, they may result in greater heating than surface and crown fires with the potential for reducing organic material, volatilizing nutrients, and creating a hydrophobic layer that contributes to soil erosion (Graham et al. 2004). Crown fires have the largest immediate and long-term ecological effects and the greatest potential to threaten wildland urban interfaces (Graham et al. 2004).

Fire hazard ratings consider slope, aspect, climate, elevation, fuel type, and crown fire characteristics. A fire hazard and risk assessment was completed in 2006 by the Oregon Department of Forestry. See *Figure 114 (Ratings of fire hazards within the planning*

area) for the district-specific breakdown for the ratings of the fire hazards within the planning area.

Figure 114. Ratings of fire hazards within the planning area

As follows, the general trend for the fire hazard ratings is for them to be lower in the northern portion of the planning area and higher in the southern portion of the planning area:

- About 92% of the lands in the northern districts (Salem through Coos Bay) have a moderate fire hazard rating. The exception is Roseburg where the percentage of lands in the moderate category drops to about 55%.
- About 48% of the lands in the southern portion of the planning area (the Medford District) have a high fire hazard rating along with very high ratings (17% and 33%) that are much higher than in the northern districts (0.1 to 9%).
- The exception to the general north to south trend is the Klamath Falls Resource Area in which the bulk of the lands have a moderate rating. The issue in this area is fire frequency with dry pine sites that are highly susceptible to fire exclusion.

See Table 119 (Current fire hazard ratings by percent of land within the districts of the planning area) and Figure 115 (Current fire hazard ratings by percent of land within the Salem District) through Figure 121 (Current fire hazard ratings by percent of land within the Klamath Falls Resource Area of the Lakeview District) for an illustration of these trends across the districts within the planning area.

Table 119. Current fire hazard ratings by percent of land within the districts of the planning area

BLM Districts	Fire Hazard Ratings (by % of land)			
	Very Low/ Low	Moderate	High	Very High
Salem	2.4	92.9	4.6	0.1
Eugene	0.9	91.5	7.4	0.1
Roseburg	0.1	55.6	35.4	8.8
Coos Bay	5.8	91.0	3.1	0.1
Medford (northern portion)	0.2	35.9	47.1	16.9
Medford (southern portion)	0.2	18.6	48.6	32.6
Klamath Falls Resource Area (Lakeview District)	2.0	73.0	13.0	12.0

Figure 115. Current fire hazard ratings by percent of land within the Salem District

Figure 116. Current fire hazard ratings by percent of land within the Eugene District

Figure 117. Current fire hazard ratings by percent of land within the Roseburg District

Figure 118. Current fire hazard ratings by percent of land within the Coos Bay District

Figure 119. Current fire hazard ratings by percent of land within the northern portion of the Medford District

Figure 120. Current fire hazard ratings by percent of land within the southern portion of the Medford District

Figure 121. Current fire hazard ratings by percent of land within the Klamath Falls Resource Area of the Lakeview District

Air

Key Points

- Wildfires contribute large amounts of air pollutants in episodic events that often exceed air quality standards over vast areas.
- Prescribed burns contribute negligible amounts of air pollutants in smaller, controlled events that exceed air quality standards over smaller, controlled areas.

The standards for air quality are set by the Environmental Protection Agency under the authority of the Clean Air Act. There are two primary concerns regarding air quality—health standards and visibility.

Western Oregon has a history of air quality issues due to weather patterns and topography. Weather patterns are dominated in western Oregon by the Pacific high pressure system. This weather pattern creates inversions during the summer and late-winter months that causes air stagnation by trapping pollutants at the lower elevations for extended periods of time. Topography compounds this issue by forming topographic bowls with the valleys in western Oregon and Klamath County that create the need for moderately intense storms to move the inversions and to mix the air layers. Most prescribed burning is conducted in the spring and fall when the atmosphere is generally unstable, which allows the mixing of air and the transport of pollutants off-site. All prescribed burning in western Oregon is conducted under the Oregon Smoke Management Plan, which requires dispersion, dilution, and avoidance techniques to minimize smoke impacts on local communities and to direct smoke away from designated areas.

Inversion

A layer of warm air that prevents the rise of cool air and traps pollutants beneath it.

There are four types of classifications used in Oregon for the designation of air quality areas.

- **Attainment.** Areas that meet air quality standards.
- **Class I visibility areas.** Areas that have very clean air and are subject to the tightest restrictions on how much additional pollution can be added to their airshed.
- **Nonattainment areas.** Areas that have consistently not met the national ambient air quality standards.
- **Maintenance areas.** Areas that have had a history of nonattainment but are now consistently meeting the national ambient air quality standards.

See Figure 122 (*Air quality management areas within the planning area*).

Figure 122. Air quality management areas within the planning area

In Class I visibility areas, the primary concern is the protection of visibility. These areas are protected under the Oregon State Implementation Plan, which governs regional haze. The following sites in western Oregon and Klamath County are designated as Class I visibility areas:

- Mount Hood Wilderness
- Mt. Jefferson Wilderness
- Mt. Washington Wilderness
- Three Sisters Wilderness
- Diamond Peak Wilderness
- Crater Lake National Park
- Kalmiopsis Wilderness
- Mountain Lakes Wilderness
- Gearhart Mountain Wilderness

Particulate matter is measured by two diameter classes—10 micron (PM₁₀) and 2.5 microns (PM_{2.5}). Both classes contribute to regional haze and reduced visibility. Data from air monitoring stations has shown that wildfire has not been a predominant long-term source of visibility impairment in any Class I area, although emissions from fire are an important episodic contributor to visibility aerosols (Sandberg 2002).

There are currently six nonattainment areas in Oregon. Five are within the planning area.

- Eugene/Springfield Urban Growth Boundary (PM₁₀ nonattainment)
- Lakeview (PM₁₀ nonattainment; redesignation to attainment is pending EPA approval)
- Medford/Ashland (PM₁₀ nonattainment; redesignation to attainment is pending EPA approval)
- Oakridge Urban Growth Boundary (PM₁₀ nonattainment)
- Salem Keizer (carbon monoxide and ozone nonattainment)

There are currently six maintenance areas within the planning area that have been redesignated from nonattainment areas.

- Portland Air Quality Maintenance Area (ozone and carbon monoxide)
- Eugene/Springfield (carbon monoxide)
- Grants Pass Business District (carbon monoxide)
- Grants Pass Urban Growth Boundary (PM₁₀)
- Klamath Falls Urban Growth Boundary (carbon monoxide and PM₁₀)
- Medford Urban Growth Boundary (carbon monoxide)

Smoke from wildfires and smoke from hazardous fuels treatments are similar in composition; however, the amount of emissions from wildfire is roughly double that from fuels treatments (Huff et al. 1995).

In general, particulate matter from the smoke of wildfires and hazardous fuels treatments is the major pollutant of concern to health. Particulate is a general term for a mixture of solid particles and liquid droplets found in the air. Particulate from smoke tends to be very small (less than 1 micron in diameter) and, as a result, is more of a health concern than the coarser particles that typically make up road dust. Particulate matter from wood smoke has a size range near the wavelength of visible light (0.4-0.7 micron). This makes the particles excellent at scattering light and, therefore, excellent at reducing visibility.

Carbon monoxide (CO) is a colorless, odorless gas that is produced from incomplete combustion. It is produced in the largest amounts during the smoldering stages of a fire. Carbon monoxide is potentially one of the most dangerous components of smoke. Concentrations drop rapidly as the proximity to a fire decreases and are usually of concern only to firefighters.

Hazardous air pollutants, such as acrolein, benzene, and formaldehyde, are present in smoke, but in far less concentrations than particulates and carbon monoxide. Nitrogen oxides and volatile organic gasses combine to form ozone. Although not confirmed, there appears to be an indirect link between the large smoke plumes from wildfires and increased ozone levels. The data used to compile the totals of emissions in this document show that approximately 62% of total emissions are 2.5 microns or smaller in diameter.

Recreation

Key Points

- BLM management actions can affect the recreational setting of an area, which, in turn, influence the level and distribution of visitor use.
- The growing popularity of off-highway vehicle use has resulted in a trend towards increased demand for this type of activity on BLM lands in western Oregon.

Recreation activities that take place in different settings produce different experiences for visitors. Certain settings are more conducive to certain types of activities and preferred by visitors who engage in them. This relationship between recreation activities and setting preferences can, in turn, influence visitor use patterns and levels across the landscape. If a management action changes the recreational setting of an area, it can cause corresponding changes in the public use of that area.

The recreational setting classification system is based on a combination of physical, administrative, and social setting characteristics. The combination of these characteristics determines the overall recreational setting for a particular area. These settings include:

- primitive
- backcountry
- middle country
- front country
- rural

Physical Setting Characteristics

Physical setting characteristics are directly affected by timber management activities. These features include:

- remoteness (i.e., proximity to roads and road types)
- naturalness (i.e., landscape quality, level of disturbance, forest structural complexity, and age)
- recreational developments (e.g., campgrounds, day-use areas, trails, and other facilities)

The remoteness and naturalness are best suited for measuring the affects of timber management on the recreational setting. Management actions that require road building or decommissioning directly affect the level of remoteness of an area. Those actions that affect forest stand structure and age directly influence an area's level of naturalness.

Recreational developments are also considered characteristics of the physical setting. Timber management actions generally do not directly affect these areas. However, recreational developments directly influence the level and distribution of visitor use.

The BLM's functional road classification system is used to assign road types within middle country, front country, and rural settings in order to determine levels of remoteness. The system is based on traffic volume, vehicle speed, trip distance, travel mobility, and property access. Road types consist of arterial, collector, local, and resource roads (USDI, BLM 1996b, updated 2002). Primitive and backcountry settings are assigned to areas based on their proximity away from all of these road types. See *Table 120 (Classification of recreational settings by remoteness)* for the classification of recreational settings from primitive to rural by levels of remoteness.

Table 120. Classification of recreational settings by remoteness

Recreational Setting Classifications	Level of Remoteness
Primitive	Greater than 1 mile from any class of road, excluding those that are permanently closed or decommissioned
Backcountry	0.25 to 1 mile from any class of road, excluding those that are permanently closed or decommissioned
Middle country	Within 0.25 mile of local* or resource* roads
Front country	Within 0.25 mile of collector* roads
Rural	Within 0.25 mile of arterial roads or highways

Note: Collector, local, and resource are functional classifications of roads in the BLM road system. For details, see *Transportation* in *Chapter 3* under *Lands, Realty, Access, and Transportation*.

See *Figure 123 (Remoteness levels for a portion of the Klamath Falls Resource Area of the Lakeview District)* for the remoteness levels that exist across a portion of the BLM's land base in the Klamath Falls Resource Area of the Lakeview District.

Figure 123. Remoteness levels for a portion of the Klamath Falls Resource Area of the Lakeview District

Forest structural stage classifications describe the development of forest stands over time. These structural stage classes are used to classify naturalness levels for each recreational setting. See *Table 121 (Classification of recreational settings by naturalness)* for the classification of recreational settings from primitive to rural by levels of naturalness.

Table 121. Classification of recreational settings by naturalness

Recreational Setting Classifications	Level of Naturalness
Primitive	• Undisturbed natural landscape • Structurally complex forest with existing old or very old forest
Backcountry	• Natural appearing landscape having modifications not readily noticeable • Mature forest with a single or multiple canopies
Middle country	• Natural appearing landscape having modifications that do not overpower natural features • Young, high-density forest with structural legacies; or, young, low-density forest with or without structural legacies
Front country	• Partially modified landscape with more noticeable modifications • Young, high-density forest without structural legacies
Rural	• Substantially modified natural landscape • Stand establishment forest with or without structural legacies

See *Figure 124 (Stand visualizations for each classification of naturalness)* for the naturalness levels for each recreational setting using a series of forest stand visualizations.

Figure 124. Stand visualizations for each classification of naturalness

Primitive

Backcountry

Middle Country

Front Country

Rural

Administrative Setting Characteristics

The BLM provides a wide range of recreational opportunities for the public across western Oregon. These opportunities are supported by a network of recreational developments that include:

- campgrounds
- day-use areas
- trail systems
- backcountry byways
- environmental education areas
- recreation and public purpose leases to local governments

Included within these areas are numerous wildlife viewing areas, visitor centers, picnic areas, boat ramps, waysides, and other amenities.

See the tables at the end of *Chapter 2* for listings of all recreational developments by district.

Administrative setting characteristics include:

- management controls and constraints (e.g., legal access, regulatory signing, and law enforcement presence)
- motorized use restrictions (e.g. off-highway vehicle area designations)
- visitor services (e.g., interpretive exhibits, environmental education programs, and on-site personnel)

Timber management actions typically do not directly affect these administrative setting characteristics. However, certain aspects of these administrative setting characteristics are important to understanding the recreation program:

- Legal public access is necessary for visitors seeking to recreate on public lands.
- Recreation management areas set the stage for most aspects of the administrative setting.
- Off-highway vehicle area designations directly influence the distribution of visitor use.

Since a majority of BLM lands in western Oregon are intermingled with private lands, public access can vary greatly. Reciprocal right-of-way agreements, easements, and unsecured access rights across adjacent private lands all have a determining affect on public access, which, in turn, influence visitor use.

The BLM has assigned either a secured or an unsecured legal public access status to every distinct management unit of BLM land throughout western Oregon.

Secured legal public access includes public access rights that have been secured by the United States. Public access rights are generally included in the acquisition of exclusive

or access road easements where the United States has acquired control of the right-of-way. Physical access must be present and available via roads or trails.

Unsecured legal public access includes public access rights that have not been secured by the United States. Administrative access may be legally and physically available to the BLM, although the right-of-way agreements or easements do not include legal access rights for the public.

There are 1.9 million acres (77%) of BLM lands that are legally accessible to the public and 600,000 acres (23%) that are legally inaccessible to the public. See *Table 122 (Legal public accessibility of BLM lands by district)* and *Figure 125 (Proportion of BLM lands by district with secured or unsecured legal public access)* for these results by district.

Table 122. Legal public accessibility of BLM lands by district

District	Secured Legal Public Access		Unsecured Legal Public Access	
	Acres	Percentage	Acres	Percentage
Salem	293,337	73%	109,887	27%
Eugene	196,740	62%	118,475	38%
Roseburg	284,484	67%	141,832	33%
Coos Bay	259,578	81%	62,647	29%
Medford	736,424	85%	131,804	15%
Klamath Falls Resource Area (Lakeview District)	192,190	85%	32,711	15%
Totals	1,962,754	77%	597,356	23%

Figure 125. Proportion of BLM lands by district with secured or unsecured legal public access

See *Figure 126 (Secured and unsecured legal public access to a portion of the BLM's land base in the Coos Bay District)* for an example of secured and unsecured legal public access to a portion of BLM lands in the Coos Bay District. A complete set of legal public accessibility maps are available to the public for review at the district offices.

Figure 126. Secured and unsecured legal public access to a portion of the BLM's land base in the Coos Bay District

All BLM lands are classified as either special or extensive recreation management areas:

- A special recreation management area is a unit of public land identified to provide specific recreational opportunities (i.e., activities, experiences, and benefits). The BLM manages 27 special recreation management areas in western Oregon that total 151,150 acres. See the tables at the end of *Chapter 2*.
- Extensive recreation management areas include all other BLM lands that are not classified as special recreation management areas. Recreation management is generally custodial in nature and used to address dispersed recreational demand. Management is designed to ensure visitor safety, limit resource impacts, and limit visitor conflicts. Extensive recreation management areas total 2.2 million acres across the planning area. See the tables at the end of *Chapter 2*.

All BLM lands are required to be designated as open, limited, or closed to motorized vehicles. Designations are based on the protection of natural and cultural resources, public safety, and limiting visitor conflicts.

- **Open areas.** Areas where off-highway vehicle use is unlimited since there are no issues regarding resources, visitor conflicts, or public safety to warrant limiting cross-country travel.
- **Limited areas.** Areas where off-highway vehicle use is restricted in order to meet recreational and resource management objectives. Restrictions may include:

the number or types of vehicles; the time or season of use; permitted or licensed use only; and limiting use to existing or designated roads and trails.

- **Closed areas.** Areas that are closed to all motorized vehicle use to protect resources, ensure visitor safety, or reduce visitor conflicts.

The BLM also establishes subarea designations for making distinctions within larger off-highway vehicle areas. An off-highway vehicle emphasis area is an example of a subarea designation where off-highway vehicle use is more concentrated and intensively managed. These areas do not allow or prevent off-highway vehicle use. That is only determined through the broader designations of open, limited, and closed. The BLM currently manages six off-highway vehicles emphasis areas within the planning area (totaling 58,000 acres).

The combination of these area and sub-area designations affects the administrative setting, which can in turn influence the level and distribution of recreational demand across the landscape. See the tables at the end of *Chapter 2* for the current off-highway vehicle area and emphasis area designations by district.

Social Setting Characteristics

Social setting characteristics include: visitor contacts (number of encounters with other visitors), the distribution of visitors (number of visitors per area), and evidence of visitors (signs of past visitor use). Evaluating the level and distribution of visitors across the range of physical settings aids in understanding how timber management affects recreation use.

Recreation on BLM lands occurs within the larger context of overall recreational demand in western Oregon. When comparing the BLM's most recent visitor use data (USDI, BLM 2006b) with the Oregon Parks and Recreation Department's most recent outdoor recreation survey data (OPRD 2003), an estimated 17% of the total recreational demand throughout the planning area occurs on BLM lands.

Recreational demand is measured in two ways: (1) the total number of visitors per year, and (2) the total number of participants by 13 primary recreation activity categories. Since one visitor can participate in more than one activity, the number of participants is typically higher than the number of actual visitors.

Overall recreational demand is increasing at a rate of 1.9% each year in western Oregon (OPRD 2003). If this rate remains constant over the next 10 years, total visitation on BLM lands within the planning area is expected to increase from 5.1 to 6.2 million visitors by the year 2016.

This rate of increase is not the same for all recreation activities, nor does the rate of change for individual activities proportionally affect overall changes in recreational demand. For example, nonmotorized boating is expected to increase 7% annually; however, this activity accounts for less than 1% of the total public use on western Oregon

BLM lands. On the other hand, camping and picnicking is projected to increase at a rate of 1% each year, but it accounts for 9% of total visitation.

See *Table 123 (Current and projected levels of participation by recreation activity within the planning area from 2006 to 2016)* for the current level of participation for 13 primary recreation activities on western Oregon BLM lands, the annual rate of change for each activity (based on statewide trends), and their projected levels by the year 2016. See *Figure 127 (Current and projected levels of participation by recreation activity within the planning area from 2006 to 2016)* for an illustration of these trends by activity.

Table 123. Current and projected levels of participation by recreation activity within the planning area from 2006 to 2016

Recreation Activity	Current Level (2006)	Annual Rate of Change	Projected Level (2016)
Nonmotorized winter activities	112,153	1.6%	136,827
Snowmobile and other motorized winter activities	151,061	5.0%	255,897
Motorized boating	161,763	1.0%	183,439
Nonmotorized boating	181,822	7.0%	360,917
Swimming and other water-based activities	277,203	-0.8%	246,156
Motorized off-highway vehicle travel	634,823	2.3%	835,427
Fishing	514,091	5.8%	930,505
Hunting (big game, upland game, and migratory game birds)	1,014,102	1.1%	1,163,175
Nonmotorized travel (hiking, biking, and horseback riding)	1,057,134	2.2%	1,380,617
Camping and picnicking	1,181,868	1.2%	1,373,331
Specialized nonmotorized activities and events	1,297,771	3.1%	1,861,004
Driving for pleasure (along designated BLM roadways)	1,530,294	1.1%	1,764,429
Wildlife viewing, interpretation, and nature study	2,748,317	5.2%	4,738,099

Figure 127. Current and projected levels of participation by recreation activity within the planning area from 2006 to 2016

See Figure 128 (*Proportion of projected recreational demand by activity in the year 2016*). The proportions are based on the current levels and annual rates of change for each activity.

Figure 128. Proportion of projected recreational demand by activity in the year 2016

The setting preferences of visitors are used to determine the distribution of recreational demand, which has been adapted from statewide survey data collected for Oregon's Statewide Comprehensive Outdoor Recreation Plan (OPRD 2003)¹⁴. It is assumed that the distribution of recreational demand on BLM lands within the planning area would mimic these statewide results. See *Table 124 (Distribution of recreational demand by setting for each recreation activity)* and *Figure 129 (Distribution of recreational demand by setting for each recreation activity)* for the distribution of recreational demand by setting for each recreation activity.

Table 124. Distribution of recreational demand by setting for each recreation activity

Recreational Demand	Distribution of Recreational Demand by Setting (% of visitor use)					
	Primitive	Back-country	Middle Country	Front Country	Rural	Totals by Demand
Wildlife viewing, interpretation, and nature study	9	19	42	11	19	100
Driving for pleasure	0	0	67	15	18	100
Specialized activities and events	4	9	22	17	48	100
Camping and picnicking	6	13	49	20	12	100
Nonmotorized travel	15	23	36	9	17	100
Hunting	22	26	27	19	6	100
Motorized off-highway vehicle travel	0	27	42	10	21	100
Fishing	21	15	38	13	13	100
Swimming and other water-based activities	6	17	47	9	21	100
Nonmotorized boating	17	17	27	11	28	100
Motorized boating	0	0	41	17	42	100
Snowmobile and other motorized winter activities	0	0	11	28	61	100
Nonmotorized winter activities	9	9	9	23	50	100

¹⁴ In some cases, visitor preferences may be constrained by the administrative setting. For example, off-highway vehicle riders may prefer the primitive setting. These areas, however, are restricted to nonmotorized activities (e.g., wilderness areas). These management constraints were taken into account when developing *Table 124* to avoid such conflicts with BLM policy.

Figure 129. Distribution of recreational demand by setting for each recreation activity

Wilderness Characteristics

Key Points

There are 26,123 acres of BLM-administered lands in western Oregon that have been found to contain wilderness characteristics.

The BLM's authority to conduct wilderness reviews, including the establishment of new wilderness study areas, expired on October 21, 1993 pursuant to Section 603 of the Federal Land Policy and Management Act. However, the BLM has retained the authority under Section 201 of the Federal Land Policy and Management Act to inventory wilderness characteristics and to consider such information during land use planning.

Managing for wilderness characteristics may include protecting certain lands of sufficient size in their natural condition and providing opportunities for solitude or recreation that is primitive and unconfined.

To be of sufficient size, an area must be without roads and at least 5,000 acres. An exception may be made to this acreage requirement when a smaller area is considered large enough to provide for the preservation and use in an unimpaired condition because of its topography, vegetative screening, or other similar features. Another exception is when a BLM area with less than 5,000 acres adjoins an administrative boundary of the United States Forest Service and the combined acreage of the two roadless areas is a minimum 5,000 acres.

During the scoping for the western Oregon resource management plan revisions, 146 public wilderness proposals were received. Thirteen of these areas are located off BLM lands or outside of the western Oregon planning area. Those 13 proposals were not included in the evaluation process. The remaining 133 public wilderness proposals were evaluated to determine if they contain wilderness characteristics. Of these, nine areas were found to contain wilderness characteristics. The remaining 124 areas do not contain wilderness characteristics and, therefore, were not analyzed further.

Six of the nine areas with wilderness characteristics are smaller than 5,000 acres but meet the sufficient size criteria because they are contiguous with United States Forest Service roadless areas. Only the portions of these proposed areas that occur on BLM lands were evaluated and considered during this land use planning process.

None of the proposed areas that are located on BLM lands are currently designated as wilderness areas or wilderness study areas. See *Table 125 (Lands with wilderness characteristics)* for the proposed areas that were found to contain wilderness characteristics. Refer to *Table 22 (Lands with wilderness characteristics maintained under special management)* in Chapter 2 for those areas that would receive special management. See *Appendix K. Wilderness Characteristics* for the evaluation process used to identify lands with wilderness characteristics.

Table 125. Lands with wilderness characteristics

BLM Lands	Total (acres)	Identified Wilderness Characteristics		
		Naturalness	Outstanding Opportunities for Solitude	Outstanding Opportunities for Primitive, Unconfined Recreation
Salem District				
Bull of the Woods/Opal Creek Additions	3,203	X	X	X
South Fork Clackamas River	919	X	X	
Salmon Huckleberry Additions	637	X	X	X
Mount Hebo	81	X	X	X
Eugene District				
No lands were identified with wilderness characteristics				
Roseburg District				
Williams Creek	116	X	X	
Coos Bay District				
Wasson Creek	3,408	X	X	X
Medford District				
Berry Creek	6,433	X	X	X
Wellington Mountain	5,659	X		X
Whiskey Creek	5,667	X	X	X
Klamath Falls Resource Area				
No lands were identified with wilderness characteristics				
Total	26,123			

Figure 130 (Mt. Hebo wilderness characteristics) shows an example of a small unit of BLM land with wilderness characteristics abutting a USFS roadless area.

Figure 130. Mt. Hebo wilderness characteristics

Visual Resources

Key Points

Visual resource inventory classes provide a mechanism to assess the visual impacts of management actions.

Visual resource management is a system for minimizing the visual impacts of surface-disturbing activities and for maintaining scenic values. The BLM's visual resource management system consists of two distinct components:

- visual resource inventory classes (one set of classes—Class I through Class IV)
- visual resource management classes (another set of classes—Class I through Class IV)

Visual resource inventory classes portray the relative quality of visual resources. Inventory classes do not establish management direction and are not used as a basis for constraining or limiting surface-disturbing activities, except for the Class I visual resource inventory class. There are four inventory classes that are assigned to BLM lands through the inventory process:

- **Visual resource inventory Class I.** This class is assigned to areas where a management decision has been made to preserve a natural landscape. This includes areas such as wilderness areas, wilderness study areas, wild and scenic rivers classified as wild, and other congressionally and administratively designated areas.
- **Visual resource inventory Class II, Class III, and Class IV.** These classes are assigned to areas based on a combination of scenic qualities, sensitivity levels, and distance zones.

Class II visual resource inventory areas have a higher visual resource quality than do Class IV visual resource inventory areas.

Visual resource management classes are designated through a resource management plan. These class designations can vary from the inventory class designations, except for the Class I visual resource management class. Refer to *Chapter 2* for a description of the management objectives and the allocation of visual resource management classes.

See *Table 126 (Acres of each visual resource inventory class by district)* and *Figure 131 (Acres by visual resource inventory class within the planning area)*.

Table 126. Acres of each visual resource inventory class by district

BLM District	Visual Resource Inventory Classes (acres)			
	Class I	Class II	Class III	Class IV
Salem	19,593	56,996	56,612	253,869
Eugene	1,187	4,739	34,606	272,836
Roseburg	0	92,354	23,582	307,895
Coos Bay	592	13,455	61,974	245,108
Medford	57,093	266,248	317,049	223,447
Klamath Falls Resource Area (Lakeview District)	340	42,824	79,578	100,876
Totals	78,805	476,616	573,401	1,404,031

Figure 131. Acres by visual resource inventory class within the planning area

National Landscape Conservation System

Key Points

The BLM manages a variety of National Landscape Conservation System designations within the planning area.

The National Landscape Conservation System, established in June 2000, is designed to conserve, protect, and restore nationally significant landscapes that have outstanding cultural, ecological, and scientific values. The establishment of the system does not create new legal protections. It does, however, provide the administrative structure, staff, and budget that allows the BLM to better manage these areas.

All National Landscape Conservation System designated lands are withdrawn from timber harvesting with the exception of designated, suitable, and eligible wild and scenic rivers that are classified as scenic or recreational. These two classifications allow for limited timber harvesting in a manner that does not impair their free-flowing character, classification, or identified outstandingly remarkable values. Because of this variation in management, only wild and scenic rivers are described in detail below. All National Landscape Conservation System designated lands are summarized in *Table 127 (National Landscape Conservation System designated lands by district)*.

Table 127. National Landscape Conservation System designated lands by district

Designation Type	Name	BLM District	Acres
National monument	Cascade-Siskiyou	Medford	53,000
Wilderness areas	Table Rock	Salem	5,700
	Wild Rogue	Medford	8,700
National scenic trail	Pacific Crest	Medford	488
		Klamath Falls	12
Wilderness study areas	Soda Mountain	Medford	6,107
	Brewer Spruce	Medford	1,705
	Little Sink	Salem	80
	Cherry Creek	Coos Bay	570
	Mountain Lakes	Klamath Falls	340
Outstanding natural area	Yaquina Head	Salem	100
Other congressional designations	Mount Hood Corridor	Salem	4,700
	Bull Run Watershed Management Unit	Salem	660
Wild and scenic rivers	See <i>Table 128</i> below	All districts	109,533
Total			191,695

Notes:

- Acreages for the Pacific Crest National Scenic Trail are based on a 100-foot wide corridor with one linear trail mile being equal to 12 acres.
- Acreage for the wild and scenic rivers is based on a half-mile wide corridor with one linear river mile being equal to 320 acres.

Most rivers are added to the National Wild and Scenic Rivers System through federal legislation after a study of the river's eligibility and suitability for designation. The result of the study process is a decision on whether to recommend the designation of a river to Congress (USDA, USDI 1999). There are a number of river segments that are at various stages of this process because of the high concentration of free-flowing rivers within the planning area and the in-depth nature of the study process.

Of the 122 designated, suitable, and eligible wild and scenic river segments:

- 12 are designated;
- 9 are suitable for recommendation to congress; and
- 101 are eligible but have not yet been studied for suitability.

The BLM must provide permanent protection of designated wild and scenic rivers. Interim protection is required for eligible and suitable river segments, until either:

1. An eligible river segment has been determined to be unsuitable for inclusion as a wild and scenic river after completing a suitability study.
2. A determination is made by Congress to include or remove a suitable river segment from the National Wild and Scenic River System.

All designated, suitable, and eligible wild and scenic river segments must be classified as wild, scenic, or recreational. These classifications are defined as follows.

- **Wild river segments.** River segments that are free of impoundments and generally inaccessible, except by trail. Their watersheds or shorelines are essentially primitive and their waters unpolluted. These represent vestiges of primitive America. No timber harvesting is allowed.
- **Scenic river segments.** River segments that are free of impoundments, their shorelines or watersheds are largely primitive and undeveloped, but their shorelines are accessible in places by roads. Limited timber harvesting is allowed.
- **Recreational river segments.** River segments that are readily accessible by road or railroad, they may have some development along their shorelines, and they may have undergone some impoundment or diversion in the past. Limited timber harvesting is allowed.

In addition to meeting one of the above criteria, all designated, suitable, and eligible rivers must possess one or more outstandingly remarkable value. These include: scenic, recreational, geological, fish, wildlife, historic, prehistoric, or other similar values.

See *Table 128 (Wild and scenic rivers by district)* for a summary of the wild and scenic river segments that occur on BLM lands within the planning area. See *Figure 132 (Wild and scenic rivers by classification)* for a summary of these river segments by classification. Individual wild and scenic river segments are listed by district in the tables at the end of *Chapter 2*.

Table 128. Wild and scenic rivers by district

Wild and Scenic River Classification	Status	District	Number of River Segments	Acres	Limited Timber Harvesting Allowed
Wild	Designated	Salem	1	142	No
		Medford	1	6,602	
	Suitable	Medford	4	5,083	
	Eligible	Medford	30	24,368	
Scenic	Designated	Salem	3	1,398	
		Klamath Falls	1	2,780	
	Eligible	Salem	3	1,401	
		Medford	2	3,864	
Recreational	Designated	Medford	1	4,911	Yes
		Roseburg	1	2,142	
		Salem	4	2,505	
	Suitable	Salem	2	6,004	
		Eugene	3	6,691	
	Eligible	Salem	25	8,560	
		Coos Bay	4	1,958	
		Eugene	6	2,512	
		Roseburg	3	4,338	
		Medford	28	24,274	
		Total	122	109,533	

Figure 132. Wild and scenic rivers by classification

Soils

Key Points

Soils perform many functions in the environment that are important for plant growth, water quality, and human benefit. Natural events and management actions can change the capacity of a soil to perform these functions.

Physical, chemical, and biological properties determine soil compactibility, erosiveness, and productivity. For example, shallow soils tend to hold less moisture and nutrients and are more susceptible to loss of soil productivity than deeper soils. Some soils are more or less susceptible to landslides and debris flows depending on geology and slope.

Precipitation falls on the soil surface and is either:

- taken up by plants after being infiltrated and stored in the soil, or
- moves across or through the soil into streams and lakes.

The condition of the soil surface determines how this occurs. The potential for plant growth depends on the ability of the soil to accept, hold, and release nutrients and moisture. Soil provides the environment for root growth and development. Soil serves as the habitat for microorganisms that control processes related to plant nutrition, nutrient cycling, and the biological control of pests. The condition of the subsoil (soil below the surface) determines the effectiveness of these functions (Larson et al. 1996).

Natural events or management actions can change soil properties. Wildfire can reduce the organic matter found in soil and landslides can cause erosion. Timber harvesting, site preparation, road construction, prescribed burns and fuels reduction, off-highway vehicle use, mining, and livestock grazing cause soil compaction or displacement, surface erosion, and mass wasting processes. They also alter nutrient status, soil biology, and long-term soil productivity.

Compaction

Soil compaction is the packing together of soil particles by physical pressure or vibration at the soil surface that results in an increase in soil density and a decrease in pore space. When pore space is decreased to a point where water, air, and plant roots have restricted movement, it increases surface runoff and reduces plant growth. All soils are susceptible to compaction and displacement “regardless of soil type, machine type [ground skidding machinery will cause soil compaction], soil moisture, or other soil characteristics” (Skaugset 1997). In addition, “research and monitoring confirmed that despite their unique design and use, highly mechanized systems (e.g., harvesters and forwarders) for logging younger and smaller timber have the potential to produce significant soil compaction” (Adams 2005).

Soil displacement is a process where the soil surface is moved some distance by mechanical means or the hoof action of livestock. If nutrients, water, and soil organisms are removed from the site, rooting depth is reduced to the point plant growth is decreased. This process usually occurs concurrently with soil compaction.

Compaction and displacement from past timber harvesting activities remain. The extent of these conditions across the planning area is not known.

Soil compaction is also caused by road construction. The road surface must be compacted to hold the weight of rolling vehicular traffic. This results in soil that is unavailable for tree growth. Some literature suggests, however, that the growth of roadside trees may benefit from the increased light, moisture, and reduced competition (Miller et al. 1989). It is not known if increased growth makes up for the loss of trees on the running surface of a road. There are approximately 78,300 acres of roads that are administered by the BLM within the planning area, which represents about 3% of BLM land.

Erosion

Erosion is the detachment and movement of soil particles by water, wind, ice, or gravity. All soils are susceptible to erosion. The soils within the planning area are subject to two types of erosion:

- surface erosion
- mass soil movement from debris flows or avalanches, slumps, and earth flows

Surface erosion is rare on BLM lands within the planning area since undisturbed forest soils have a cover of vegetation, duff, and litter, which limits the overland flow of water and the subsequent erosion. Surface erosion can occur on compacted sites (e.g., roads).

Mass soil movement is common on BLM lands in western Oregon. Slope failures are consistent with the soils, geologic material, and topography in western Oregon (Burroughs et al. 1976). Fast moving debris flows develop in shallow, coarse textured soils on steep slopes (greater than 65 %) in V-shaped drainages (usually in bedded sedimentary rock). Slumps and earth flows occur in deep, saturated soils that are high in silt or clay on gentle to moderate slopes. Soils derived from volcanic and deeply weathered sedimentary materials are subject to this mass movement process.

Both wildfires and prescribed burns cause soil heating. Wildfire is a natural process that occurs with varying frequency, intensity, and severity. Prescribed burns are used as a tool for preparing sites for planting after timber harvests, for changing vegetative species, and for fuels reduction. When soil heating occurs to the point where there is a breakdown in soil structure, soil functions are impaired. Such impairments can include a reduction or loss of organic matter and microbial species, water repellency, and surface runoff.

Productivity

Soil productivity is the ability of a soil to produce vegetation. Vegetative growth requires adequate air, water, and nutrients. The physical (texture and structure), chemical (organic matter decomposition and nutrient release), and biological (nutrient cycling and nitrogen fixation) properties of soil supply air, water, and nutrients for plant growth. When any of these properties are altered such that vegetative growth is reduced, soil function is impaired. These soil properties are influenced by soil compaction and displacement, erosion, and fire.

Soil productivity can be altered through such management actions as the harvesting of timber or the addition of fertilizer. Nitrogen is the main growth-limiting nutrient within the planning area and all districts have applied nitrogen fertilizer in the past, except for some Coast Range areas with soils that are not nitrogen limited.

Organic matter decomposition and the subsequent nutrient release is a major factor of long-term soil productivity. The small components of trees (needles, leaves, and twigs) contain the highest concentrations of nitrogen and yet are the easiest material to remove from a site through displacement, erosion, or fire.

Grazing

Key Points

- The availability of forage and water is generally adequate for livestock.
- The number of vacant allotments and leases within the planning area has increased since 1996 by over 300%.
- The condition within individual allotments is variable based on historic grazing levels, past management actions, and current grazing management.

The Medford and Coos Bay districts and the Klamath Falls Field Office administer livestock grazing on 560,000 acres, which represents 22% of the planning area. See *Map 7 (Lands available for livestock grazing)* in *Chapter 2*. This level of grazing represents 14% of the total federal grazing acres that occur on lands that are covered by the Northwest Forest Plan. See *Figure 133 (Percentage of grazing on BLM and Forest Service lands within the planning area)*.

Figure 133. Percentage of grazing on BLM and Forest Service lands within the planning area

The existing grazing leases and permits authorize a total of 26,840 active animal unit months during the grazing season. See *Table 129 (Livestock grazing authorizations by district)*.

Table 129. Livestock grazing authorizations by district

Authorization Type	Coos Bay District	Medford District	Klamath Falls Resource Area (Lakeview District)	Total
Allotments	0	95	96	191
Leases	4	0	0	4
Public land acres	16	352,312	207,682	560,010
Active animal unit months	23	13,416	13,401	26,840
Permittees or lessees	3	59	92	154

The level of livestock grazing on Forest Service and BLM lands that are covered by the Northwest Forest Plan has decreased between the early 1990s and the early 2000s (Charnley 2006). The reasons for the decline include:

- Requirements of the Northwest Forest Plan
- Periods of drought
- Requirements of the Endangered Species Act
- Socioeconomic factors causing the viability of grazing operations to decline
- Difficulty of managing livestock across the checkerboard pattern of intermingled private and federal lands

The level, duration, and timing of livestock grazing use within the planning area has been leased or permitted at or below the levels of the current resource management plans. The number of vacant allotments and leases within the planning area has increased from 17 in 1996 (all in the Medford District) to 53 in 2004 (43 in the Medford District, 2 in the Coos Bay District, and 8 in the Klamath Falls Resource Area of the Lakeview District). See *Figure 134 (Change in the number of active allotments between 1996 and 2004)*. Some allotments have been vacant since the 1970s. The reasons for the increase of vacant allotments include:

Vacant allotment

A vacant allotment is an allotment that does not currently have an active permit or lease.

- relinquishment by operators
- cancellation due to nonuse or noncompliance
- lack of interest
- intermingled private land making it difficult to graze within an allotment
- lack of fencing to control livestock on public land

Figure 134. Change in the number of active allotments between 1996 and 2004

The overall number of active animal unit months decreased within the planning area. See *Figure 135 (Change in active animal unit months between 1996 and 2004)*. The increase in the total active animal unit months for the Klamath Falls Field Office between 1996 and 2004 is a result of a combination of factors, including:

- Land sales, acquisitions, and exchanges
- Changes based on rangeland health assessments and rangeland survey results
- Adjustments to correct past allocation errors
- New information

Figure 135. Change in active animal unit months (AUMs) between 1996 and 2004

The condition within individual allotments is variable based on historic grazing levels, past management actions, and current grazing management.

- In the Coos Bay District, the vegetation on BLM land within the four grazing leases is characterized by a mix of native grass species, noxious weeds, and nonnative pasture vegetation with the nonnative pasture species being the dominant vegetation.
- In the Medford District, the vegetation within grazing allotments is characterized by a mix of grassland, chaparral, and mixed conifers and hardwoods.
- In the Klamath Falls Resource Area of the Lakeview District, the eastern portion of the resource area is characterized by nonforested uplands, which are comprised of sagebrush and juniper communities. The western portion of the resource area is characterized by mixed conifers and hardwoods.

Current grazing regulations direct the BLM to manage livestock grazing in accordance with the *Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the States of Oregon and Washington*. The standards are the basis for assessing and monitoring rangeland conditions and trends. If livestock is a significant causal factor in the failure to meet a standard, management will be implemented to ensure that progress is being made toward the attainment of the standard. A total of 101 allotments, which is 52% of the number of allotments and leases and 53% of the total number of public land acres within the planning area, have been assessed. Livestock was identified as a significant causal factor in the failure to meet one or more of the standards on all or portions of seven allotments. See *Table 130 (Rangeland health standards assessment results)*.

Table 130. Rangeland health standards assessment results

Rangeland Standards Category	Coos Bay District		Medford District		Klamath Falls Resource Area (Lakeview District)		Totals	
	Allotments	Acres	Allotments	Acres	Allotments	Acres	Allotments	Acres
Meeting or Making Significant Progress Toward Meeting All Standards	4	16	23	20,280	44	105,548	71	125,844
Not Meeting or Making Significant Progress but Appropriate Action Has Been Taken to Ensure Significant Progress (Livestock is a factor)	0	0	0	0	7	36,369	7	36,369
Not Meeting or Making Significant Progress Toward Meeting Standards Due to Causes Other Than Livestock Grazing	0	0	17	99,667	6	34,697	23	134,364
Total Assessed	4	16	40	119,947	57	176,614	101	296,577
Total Not Assessed	0	0	55	232,365	39	31,068	94	263,433
Totals per District	4	16	95	352,312	96	207,682	195	560,010

Note: The category of Rangelands Not Meeting All Standards or Making Significant Progress Toward Meeting the Standard-No Appropriate Action has been Taken to ensure Significant Progress Toward Meeting the Standard (Livestock is a Significant Factor) is not included in the above table as the numbers would all be zero.

Range improvements have been developed when needed to achieve the standards for rangeland health for Oregon and Washington, resource management plan objectives, or other allotment specific objectives. See *Table 131 (Range Improvements constructed or maintained from 1996 through 2006)*. Range improvements have been constructed to:

- improve the distribution of livestock;
- provide livestock with forage;
- provide for restoration;
- protect sensitive areas;
- improve wildlife habitat; and
- facilitate intensive management of livestock through the implementation of grazing systems.

Table 131. Range Improvements constructed or maintained from 1996 through 2006

Type of Project	Coos Bay District		Medford District		Klamath Falls Resource Area (Lakeview District)		Totals	
	Units	Miles	Units	Miles	Units	Miles	Units	Miles
Livestock Fences Constructed	0	0	18	5	11	19	29	24
Livestock Fences Maintained	0	0	123	64	21	38	144	102
Reservoirs Constructed or Springs Developed	0	---	6	---	3	---	9	---

As overstory canopy cover decreases, understory forage production increases (USDA, Soils Conservation Service 1971; Young et al. 1967). Production of forage within regeneration harvest units is greater than within thinned stands because the understory vegetation does not have to compete with the overstory for limited resources. Over time, forage production would decline as juvenile trees continue to grow and begin to outcompete forage for the limited resources. The understory production is also influenced by successional stage and forest type (Walburger et al. 2005). The amount of forage production would be higher within a stand establishment forest than within a young, mature and structurally complex forest. See *Figure 136 (Forage production within a stand establishment forest versus a young forest)*.

Figure 136. Forage production within a stand establishment forest versus a young forest

Off-highway vehicle use affects livestock grazing through the disturbance or harassment of livestock by the type of vehicles and access that permittees and lessees use to manage livestock or to conduct range improvement maintenance.

- Areas designated as open to off-highway vehicle use provide more opportunities for the disturbance or harassment of livestock than areas designated as limited.
- Areas designated as open to off-highway vehicle use do not limit the type of vehicle and availability of access that operators can use to move livestock or conduct range improvement maintenance.

Fuels treatments affect livestock grazing by temporarily changing the use of foraging areas and changing forage production. Adjustments to foraging areas would be needed if soil and vegetation are no longer capable of supporting livestock following fuels treatments. Forage production would decline following fuels treatments but would increase over time as vegetation recovered.

Wild Horses

Key Points

The wild horses within the Pokegama Herd Management Area have an appropriate management level of 30 to 50 head.

The Pokegama Herd Management Area is the only herd management area within the planning area. It encompasses a total of 80,885 acres in Oregon and California and includes private, state, and federal lands. The planning area contains 84% of the herd management area, which is 67,869 acres. See *Map 12 (Location of Pokegama Herd Management Area)* in *Chapter 2* and *Figure 137 (Wild horses in the Pokegama Herd Management Area)*.

Figure 137. Wild horses in the Pokegama Herd Management Area

Approximately 23% of the herd management area that lies within the planning area is located on BLM land while the remainder is located on private land. The wild horse herd is estimated to spend approximately 80 to 90% of its time on private land. The herd management area that is on BLM land is administered by the Klamath Falls Field Office. The private landowners have generally allowed the presence of wild horses on their lands—providing that the horses are within the established appropriate management level and do not range outside of the herd management area.

The appropriate management level for the Pokegama Herd Management Area is 30 to 50 head. The appropriate management level has been maintained through two captures that were completed in 1996 and 2000. Since the designation of the herd management area in 1971, the wild horse population has ranged from 25 in 1972 to 55 in 2000. The current estimate of the herd size is 30 to 35 animals; however, actual horse numbers are difficult to determine in a forested landscape.

The average growth rate for the Pokegama herd is 4 to 5%, which is below the average rate of 20% for other wild horse herds. The lower growth rate for the Pokegama herd may be related to a higher ratio of male to female horses (Gottlieb 1993). The lower growth rate may also be related to young horses being killed by mountain lions during the winter or being illegally removed (USDI, BLM 2002). The overall condition of the herd is excellent (USDI, BLM 1996c, 2002).

Due to the high percentage of private lands (77%) within the herd management area and the use the herd makes of those lands, 150 animal unit months of forage are allocated to the herd on BLM lands. That figure is based on the proportion of BLM-administered lands in the herd management area.

The Oregon portion of the herd management area lies within the boundaries of two grazing allotments. There is abundant forage and available water within the two allotments that comprise the herd management area, even though the distribution of the wild horses is not uniform. The Pokegama herd prefers (94%) meadows, open areas, and the tree cover on the edge of meadows (Gottlieb 1993). During the spring and summer the horses are seen in the northern and central portions of the herd management area. Due to the typically high winter snow accumulations present on the northern and central portions of the herd management area, the horses concentrate in the southern portion of the area from December through March.

The majority (95%) of the Californian portion of the herd management area (13,016 acres) is located on private and state land, while only 5% is located on BLM land. The Pokegama herd can usually be found on the Californian portion of the herd management area during the winter and early spring, although they can be found there at any time of the year.

The diet of the Pokegama herd is predominantly grasses and grass-like species. The primary water sources for the Pokegama herd include creeks, springs, and reservoirs. The BLM and private land owners have constructed several exclosures to protect riparian areas from wild horse use. The majority (70 to 80%) of developed water sources (springs and reservoirs) for the Pokegama herd are located on private land (Lindsey 2006).

Off-highway vehicle use affects wild horses through disturbance or harassment. Areas designated as open to off-highway vehicle use would provide more opportunities for the disturbance or harassment of the wild horse herd than areas designated as limited.

Fuels treatments affect wild horses by temporarily changing the use of traditional watering or foraging areas and changing forage production. Adjustments to traditional watering or foraging areas would be needed if soil and vegetation are no longer capable of supporting wild horses following fuels treatments. Forage production would decline following fuels treatments but would increase over time as vegetation recovered.

As overstory canopy cover decreases understory forage production increases (USDA, Soils Conservation Service 1971; Young et al. 1967). The production of forage within regeneration harvest units is greater than within thinned stands because the understory vegetation does not have to compete with the overstory for limited resources. Over time, forage production would decline as juvenile trees continue to grow and would begin to outcompete forage for the limited resources. The understory production is also influenced by successional stage and forest type (Walburger et al. 2005). The amount of forage production would be higher within a stand establishment forest than within a young, mature, or structurally complex forest. See *Figure 136 (Forage production within a stand establishment forest versus a young forest)* in the *Grazing* section of this chapter.

Areas of Critical Environmental Concern and Research Natural Areas

Key Points

- Relevant and important resource values are being protected and maintained on BLM-administered lands through the special management attention that is prescribed within 132 designated and potential areas of critical environmental concern on 85,548 acres.
- There is a high level of diversity in both the values protected within the areas of critical environmental concern across the planning area and the number and types of values contained within any one area of critical environmental concern.

Areas of critical environmental concern were defined in the Federal Land Policy and Management Act as areas within the public lands where special management attention is required to protect or to prevent irreparable damage to:

- important historic, cultural, or scenic values;
- fish and wildlife resources;
- other natural processes or systems; or
- life and safety from natural hazards.

Special management attention is developed to expressly protect relevant and important values. The management measures used for special management attention would not be necessary if the relevant and important features were not present, and would not be prescribed in the absence of the designation.

Some special management attention is designed to change the relevant and important value on a trend towards the desired condition. Other special management attention is designed to protect the relevant and important values from management actions or other human activities, such as timber harvesting or recreation activities, by prohibiting those activities or by modifying the methods that would be used.

In order to be considered for designation as an area of critical environmental concern, an area must meet relevance and importance criteria and require special management attention. An area meets the relevance criterion if it contains one or more of the following:

- an important historic, cultural, or scenic value;
- a fish and wildlife resource;
- a natural process or system; or
- a natural hazard.

The value, resource, process or system, or hazard described above must have substantial significance in order to satisfy the importance criteria. This generally means that the value, resource, process or system, or hazard is characterized by one or more of the following:

- it has more than locally significant qualities that give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource;

- it has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change;
- it has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of the Federal Land Management and Practices Act;
- it has qualities that warrant highlighting in order to satisfy public or management concerns about safety or public welfare; or
- it poses a significant threat to human life or safety, or to property.

Research natural areas are designated as a type of area of critical environmental concern. These areas are established and maintained for the primary purpose of research and education because the land has one or more of the following characteristics:

- a typical representation of a common plant or animal association;
- an unusual plant or animal association;
- a threatened or endangered plant or animal species;
- a typical representation of common geologic, soil, or water feature; or
- an outstanding or unusual geologic, soil, or water feature.

The research natural area network is designed to play a role as a control group or reference site to allow the BLM to determine if changes that are due to climate change, invasive organisms, or disturbance processes are occurring in the forests that are being managed for sustained yield to the same degree as in the research natural areas.

Outstanding natural areas are dually designated as an area of critical environmental concern. These areas are designated to protect the unique scenic, scientific, educational, and recreational values of certain areas within the public lands.

Within the planning area, there are:

- 94 designated areas of critical environmental concern;
- 5 potential areas of critical environmental concern that have been under interim management;
- 34 designated areas of critical environmental concern that are also research natural areas; and
- 7 designated areas of critical environmental concern that are also outstanding natural areas.

There are 85,548 acres within the designated and potential areas of critical environmental concern. The potential areas of critical environmental concern are under interim management. (The potential areas of critical environmental concern were nominated during the previous resource management plan process and are referred to in this analysis as “old” potential areas of critical environmental concern.) See *Table 132 (Designated and old potential areas of critical environmental concern by district)*.

Table 132. Designated and old potential areas of critical environmental concern by district

Areas of Critical Environmental Concern (ACECs)	Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath Falls	Totals
Designated ACECs	26	14	10	11	28	5	94
Potential ACECs (under interim mgmt)	0	3	0	0	0	2	5
Research natural areas	8	5	7	1	12	1	34
Outstanding natural areas	5	1	0	0	1	0	7
Total ACEC acres per district	20,029	12,915	12,165	10,211	17,692	12,536	85,548
Total BLM acres per district	403,000	315,100	426,300	322,700	865,800	224,900	2,557,800
% ACEC acres of BLM acres	5.0%	4.1%	2.9%	3.2%	2.0%	5.6%	3.3%

Note: The research natural areas and outstanding natural areas are dually designated as areas of critical environmental concern, and their numbers are already counted within the designated and potential numbers.

Each district received new nominations for areas of critical environmental concern for the revisions of the western Oregon resource management plans. Thirty-three areas were found to meet the relevance and importance criteria and were recommended for further analysis in the plan revisions as new potential areas of critical environmental concern. While these areas are not currently designated as areas of critical environmental concern, their relevant and important values receive interim management upon nomination and are discussed here. None of these areas were nominated as research natural areas or outstanding natural areas. There are 20,608 acres within these 33 new potential areas of critical environmental concern. See *Table 133 (New potential areas of critical environmental concern by district)*.

Table 133. New potential areas of critical environmental concern by district

Areas of Critical Environmental Concern (ACECs)	Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath Falls	Totals
New potential ACECs	10	5	3	6	7	2	33
Total ACEC acres per district	5,508	2,040	202	4,053	8,620	185	20,608
Total BLM acres per district	403,000	315,100	426,300	322,700	865,800	224,900	2,557,800
% ACEC acres of BLM acres	1.4%	0.6%	0.05%	1.3%	1.0%	0.08%	0.8%

Relevant and important values are usually described in four categories. See *Table 134 (Value categories for designated and old potential areas of critical environment concern by district)* and *Table 135 (Value categories for new potential areas of critical environmental concern by district)*.

- Historic, cultural, or scenic values include, but are not limited to, rare or sensitive archeological resources and religious or cultural resources that are important to Native Americans.
- Fish and wildlife resources include, but are not limited to, habitat that is needed for endangered, sensitive, or threatened species, or habitat that is essential for maintaining species diversity.

- Natural processes or systems include, but are not limited to, endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities that are terrestrial, aquatic, or riparian; or rare geological features.
- Natural hazards include, but are not limited to, areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may be considered a natural hazard if it is determined through the resource management planning process that it has become part of a natural process.

Table 134. Value categories for designated and old potential areas of critical environment concern by district

Value Category	Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath Falls	Totals
Historic, cultural, and scenic	8	4	2	5	8	5	32
Fish and wildlife	17	12	3	5	8	5	50
Natural process or system	26	15	9	11	27	7	95
Natural hazard	2	0	0	0	0	0	2

Table 135. Value categories for new potential areas of critical environmental concern by district

Value Category	Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath Falls	Totals
Historic, cultural, and scenic	0	0	0	1	1	1	3
Fish and wildlife	1	3	0	2	3	1	10
Natural process or system	9	4	3	5	7	2	30
Natural hazard	1	0	0	0	0	0	1

While it is only necessary for an area to meet the relevance and importance criteria for one value to qualify as an area of critical environmental concern, many areas within the planning area meet these criteria for several values. However, the number of values that meet the relevance and importance criteria can vary widely across the planning area, as can the combination of values that meet these criteria within an area of critical environmental concern. For example, area of critical environmental concern values range from a single special status plant species (Kincaid's lupine) in the Stouts Creek Potential Area of Critical Environmental Concern in Roseburg, to a combination of unique geologic features, vernal pools, special status plants (natural processes and systems), listed fairy shrimp (fish and wildlife), developed interpretive educational area, scenic and cultural values at the Table Rocks Area of Critical Environmental Concern/Outstanding Natural Area in Medford.

Cultural Resources

Key Points

Cultural and paleontological sites are not evenly distributed across the districts but the location of sites is predictable.

Cultural and paleontological resources are nonrenewable and typically consist of physical remains. Some traditional use sites and some historic sites may only be identified through written historic records or oral traditional sources and may not have physical remains. Collectively, these resources can be called heritage resources. See *Table 136 (Heritage resources by district)*.

Table 136. Heritage resources by district

Heritage Resources	BLM Districts					
	Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath Falls
Archaeological sites ^a	58	89	223	47	357	924
Historic sites ^b	142	7	23	45	711	217
National Register of Historic Places (eligible)	7	2	45	5	130	0 ^c
National Register of Historic Places (listed)	4	0	2	1	26	0 ^c
% of district inventoried	25	4	15	10	7	50
Paleontological sites	6	0	18	19	2	Isolated

Notes:

^aSites that contain either or both prehistoric and historic surface and subsurface deposits.

^bSites with historic structural remains.

^cNo formal determinations have been conducted.

Cultural resource locations are identified as:

- sites (the locations of a significant event, a prehistoric or historic occupation or activity, or a building or structure); or
- isolated finds (the locations with fewer than 10 artifacts).

Cultural sites may be prehistoric, historic, or both. Sites may be entirely buried, may consist of above-ground or built features only (particularly historic sites), may include archeological remains, or may consist of features that are not native or natural to the specific environment. Nonnative features may be evidenced by domestic fruit trees and a clearing, which may be the only remaining evidence of a homestead site.

Types of Cultural Resource Sites

The types of cultural resource sites include lithic scatters and other prehistoric sites, historic sites, paleontological sites, and traditional use sites.

- Lithic scatters account for at least 80% of the prehistoric sites within the planning area. Lithic scatters are sites that consist primarily of flakes and chipped stone tools.
- Other categories of prehistoric sites recorded within the planning area include rock shelters, middens, middens with structural features, rock art, rock features, lithic quarries, house pits, and peeled trees. Human burial sites may occur in districts either as individual sites or as features within larger sites (e.g., middens and housepit villages). Stacked rock hunting blinds and rock ring villages are contained in the Klamath Falls Resource Area of the Lakeview District. Stacked rock cairns in the Klamath Falls Resource Area are often associated with Native American vision quests.
- Historic sites within the planning area are predominantly associated with the following activities:
  - homesteading, ranching, and settlement
  - logging
  - fire suppression
  - mining
  - subsistence living
  - government management of the land
- Paleontological sites consist of the physical remains of past animal or plant life in the form of fossils. Paleontological sites are uncommon within the planning area. The known sites have fossil remains of invertebrate marine and plant species. No known sites have vertebrate fossil remains.
- Traditional use sites play a current role in a living community's historically rooted beliefs, customs, and practices. Traditional use sites within the planning area may include areas where traditional resources (food resources, basket making resources, and other traditional material sites) are collected and spiritual or sacred sites are located. Two of the federally recognized Indian tribes within the planning area (the Confederated Tribes of Warm Springs and the Klamath Indian Tribe) have off-reservation treaty rights. The Klamath Indian Tribe's rights, however, apply to their former reservation boundaries, which are not within the planning area. Members of the Confederated Tribes of Warm Springs do exercise their off-reservation rights within the planning area (west of the Cascade crest into the Portland basin and extending south into the northeast reaches of the Eugene District). Trust responsibility directly applies to proposed agency actions that could pose an effect on tribal lands and resources (e.g., water quality, air quality, or fire control).

Prehistoric Sites

Overall site density is difficult to ascertain on BLM-administered lands in western Oregon due to the checkerboard pattern of land ownership, which has prevented extensive cultural resource surveys from being conducted over large contiguous areas within any single terrain type. Ascertainment of site density is further handicapped by heavy groundcover in the forested environment. However, it is possible to make some broad generalizations regarding prehistoric site density based on BLM inventory acreages and site documentation from the past 30 years.

Northern and Coastal Areas (Salem, Eugene, and Coos Bay Districts)

The majority of prehistoric archaeological sites on the west slopes of the Cascade Range are situated in predictable locations. Sites are typically situated:

- along the crests of major ridge systems (often within saddles);
- on river and stream terraces and on upland slump benches and meadows;
- on the lower reaches of east, south, and west aspect slopes within the 400 to 500 foot upslopes of larger secondary streams; and
- where quarry sites occur on slopes.

Ridgeline sites are the most scattered as their locations are strongly associated with saddles, which are limited in number and distribution. Not all ridgeline saddles contain archaeological sites. Sites within this location category have a site density of 1 or 2 sites per linear mile of ridgeline.

Valley margin sites have much higher densities with as many as 14 sites recorded within a single 500 acre tract for an average density of approximately 1 site per 37 acres. However, site distribution in this setting is often much more concentrated with as many as six distinct artifact clusters being located within a 40 acre tract.

The BLM lands in the Salem and Eugene districts, with some notable exceptions, are absent from the valley floors of all, but the most minor, streams.

There are only 12 recorded prehistoric archaeological sites located on BLM land in the Coast Range. The lack of prehistoric archaeological sites is verified by the results of numerous preproject cultural resource surveys. The few known sites do not provide enough information to identify topographic settings that have a high probability for site occurrence.

The scarcity of known prehistoric sites on BLM land in the Coast Range is in part due to the history of BLM land tenure in the Coast Range. Most of the land administered by the BLM is revested O&C parcels and in the Coast Range those parcels have steep midslopes that largely preclude habitation.

Southern Area (Roseburg and Medford Districts)

In the Siskiyou Mountains, known prehistoric sites are located in the vicinity of permanent springs and along river and stream terraces. The underlying serpentine bedrock includes pockets of high-quality rock that were used prehistorically for tool production. As least one excavated site on BLM land is located on a small midslope terrace with access to raw tool-making materials. Other prehistoric sites on BLM land are found along ridgetops. The availability of water was a greater factor in choosing site locations for prehistoric habitation in the southern areas of Oregon than in either the Coast Range or the Western Cascades, particularly during the fall acorn harvest.

Known prehistoric site density appears higher in this region than in the Coast Range, although the scattered nature of BLM parcels and of the surveyed areas limits meaningful quantitative measurement.

Slope is a prominent factor in the location of prehistoric sites in the Medford District. Slopes that are greater than 35% are associated with a lower incidence of prehistoric site occurrence. Other factors include the proximity to water and the presence of culturally important geologic resources (e.g., tool stone).

The Roseburg District manages a larger number of acres that are located on river and stream terraces than either of the Salem or Eugene districts.

The BLM manages scattered parcels within the Oregon coastal shelf, which is the area between the Pacific Ocean and the foothills of the Coast Range and the Siskiyou Mountains. This north/south corridor has seen the development of substantial historic settlement and infrastructure and this development has adversely affected the preservation of prehistoric cultural resources (mostly shell middens).

Klamath Falls Area (Klamath Falls Resource Area of the Lakeview District)

Prehistoric cultural resource occurrence reflects a mix of two physiographic provinces—the Basin and Range and the High Cascades. Sites tend to be near water sources that are within areas affording unobstructed views of prominent landscape features (e.g., Mt. Shasta, Mt. McLoughlin, Yainax Butte, and Bryant Mountain), along ridgelines, and adjacent to rock outcrops.

The Klamath River Canyon contains some of the oldest and most significant prehistoric sites known in this area. Many of these sites are located on private property (PacifiCorp), although nearly 30 sites are known to exist on BLM land.

The Gerber Block (located in the eastern portion of the Klamath Falls Resource Area of the Lakeview District) contains the vast majority of known archaeological sites in the resource area. Both the Klamath Indians and Modoc Indians were known to use this area for hunting and gathering. Numerous village sites, lithic and ground stone artifact scatters, hunting blinds, and vision quest sites have been documented in this area.

Historic Sites

The location and density of cultural sites varies greatly within the planning area. Historic site distribution differs from that of prehistoric sites. The majority of historic sites consist of the remains of features that were constructed as temporary or permanent residences or as transportation facilities for the purposes of:

- homesteading;
- obtaining timber, minerals, and other commodity resources;
- protecting against fires; or
- managing government resources.

Sites related to homesteading, settlement, logging, and transportation are found generally in the Cascade Range, Coast Range, and Siskiyou Mountains.

Historic sites occur in a variety of locations, such as:

- alongside drainages,
- along ridgelines and on peaks,
- in and around meadows and wetlands, and
- along stream terraces.

Slope is not a reliable predictor for historic site occurrence, particularly those associated with logging or mining. The presence of geologic resources (e.g., a precious metal), however, is a reliable predictor for mining sites.

Few historic structures from the time of the first settlement activities (the mid nineteenth through the early twentieth centuries) can still be found standing.

Historic sites representing early settlement activities appear to be more frequent in the Cascade Range and the Siskiyou Mountains than in the Coast Range for several reasons.

- The Willamette Valley was the destination of Oregon's earliest settlers and was always the most densely populated area in the state relative to other regions.
- The early settlement of agriculturally productive land in the Willamette Valley resulted in later-arriving settlers seeking homesteads.
- The economic boom and bust cycles in the Willamette Valley led to short-term homesteading or subsistence living attempts in the Willamette uplands, which have left some cultural remains visible today.
- Farming and ranching activities in the Siskiyou Mountains were more easily undertaken in that area's open environment.
- Dryer weather in the southern portions of the state preserved structures better.
- Remaining sites are more visible in the Cascade Range and in the Siskiyou Mountains than in the Coast Range due to the open vegetation in those areas.

Paleontological Sites

While rare within the planning area, paleontological resources have been found in the sedimentary rock that exists on all of the districts, except the Eugene District.

Traditional Use Sites

The identification of traditional use sites cannot be effectively accomplished without the help of recognized tribal governments and other traditional groups who currently use the sites for traditional practices. Once identified, cultural sites are evaluated and managed according to two different sets of criteria:

- **Eligibility criteria of the National Register of Historic Places.** Eligibility for listing on the National Register of Historic Places is assessed using criteria that addresses site integrity and considers factors that include uniqueness, research potential in the study of history or prehistory, and association with important events or persons that have made contributions to the broad patterns of history. The first element addressed in the National Register of Historic Places significance criteria is site integrity.
- **Criteria of the management use categories of the BLM** (BLM Manual Section 8110.42). Six BLM management use categories (scientific use, conservation for future use, traditional use, public use, experimental use, and discharged from management) are employed to provide for site protection and use standards. Although some scientific and experimental uses result in the physical alteration of resources, in general, use does not imply consumptive use. Managed use of cultural resources can be fully compatible with long-term preservation, and also provide the means by which preservation is achieved.

The Confederated Tribes of Warm Springs have reserved treaty rights within the planning area. Other recognized tribes also have traditional areas and resources of concern within the planning area. A list of tribes with interests within the planning area is included in *Appendix N. Cultural Resources*. The importance of identified traditional use sites and resources are determined in consultation with federally recognized tribal governments.

Adverse impacts to heritage values occur when sites are disturbed and site material contexts become mixed or churned, materials are damaged, and site integrity is disrupted or destroyed. Change to site setting can also be an adverse impact.

Threats to site integrity can be natural- or human-caused, inadvertent or intentional, or direct or indirect. Natural causes include erosion, weathering, gradual deterioration and decay, flooding, and wildfire. Human activities that result in ground or vegetation disturbance, and that can directly or indirectly affect heritage resource values, include timber harvest, reforestation, road building and decommissioning, burning and fire line construction, recreation development and use, livestock grazing, special forest product collection, and mineral extraction. Heritage resource values are also adversely impacted by such intentional disturbances as theft and vandalism.

Traditional use sites can be impacted by visual and audible intrusions, loss of access, alteration of setting, and loss of or reduction in the quantity or quality of the material (resource) needed for traditional practices.

Lands, Realty, Access, and Transportation

Lands and Realty

Land use plans use land tenure zones to identify lands that are available for retention, proposed disposal, or acquisition. The factors considered in evaluating opportunities for the disposal or acquisition of lands can be found in *Appendix O. Lands, Realty, Access, and Transportation*.

The three land tenure zones identify lands as follows.

- Zone 1 is the retention and acquisition zone.
- Zone 2 is the exchange and consolidation zone.
- Zone 3 is the disposal zone.

For the acreage of the zones for the six districts within the planning area, see *Table 137 (Acres of land tenure zones by district)*.

Table 137. Acres of land tenure zones by district

BLM District	Zone 1	Zone 2	Zone 3	Total BLM Acres per District
Salem	160,200	233,300	9,500	403,000
Eugene	80,900	234,200	100	315,200
Roseburg	35,900	377,000	13,400	426,300
Coos Bay	4,600	317,000	1,000	322,600
Medford	292,100	566,500	7,200	865,800
Klamath Falls Resource Area (Lakeview District)	212,100	8,200	3,800	224,100
Total acres per zone	785,800	1,736,200	3,500	2,557,000

There has been limited activity in the acquisition of lands by purchase under Zone 1. One active acquisition project is ongoing—the Sandy River/Oregon National Historical Trail project that is located in the Salem District.

The majority of the BLM's land within the planning area is identified as Zone 2 (suitable for exchange). Land changes, as a method of adjusting land tenure, have had limited use in the support of resource management programs. Land exchanges have become extremely controversial and difficult to complete. Most land exchanges and transfer activities within the planning area were directed by federal legislation rather than by a discretionary agency action.

There are 35,000 acres of BLM land within the planning area that are designated as Zone 3 (suitable for sale). There have been 2,186 acres sold to date—sold primarily to resolve unintentional occupancy trespass cases. Lands identified for sale are not sold if project-level reviews show conflicts with the land tenure adjustment criteria. Specific parcels of Zone 3 lands are shown in *Appendix O. Lands*.

Section 3 of the Oregon Public Lands Transfer and Protection Act (Public Law 105-321), which is dated October 23, 1998, established a “no net loss” requirement for lands that are administered by the BLM in western Oregon. The act requires that, when selling, purchasing, or exchanging land, the BLM may not:

- Reduce the total acres of the Oregon and California Railroad Grant (O&C) lands or the Coos Bay Wagon Road (CBWR) lands.
- Reduce the number of acres of O&C, CBWR, and public domain lands that are available for timber harvesting below what existed on the date of enactment.

The act requires the BLM to ensure a no net loss of acres on a 10-year basis. To date, the BLM in western Oregon shows a surplus of 50 acres of O&C land and a deficit of 63 acres of harvestable timberland. There has been a general decline in the use of land sales or land exchanges in western Oregon as methods of adjusting land tenure since the enactment of this law.

Withdrawals generally segregate land from operations under the nondiscretionary general land laws, mining laws, and sometimes the mineral leasing laws, but do not always affect BLM surface management. Classifications generally segregate the lands from all forms of appropriation under the public land laws, including the mining laws, but not the mineral leasing laws. The existing withdrawals and classifications within the planning area are shown in *Appendix O. Lands*.

There are 86 communication sites located on BLM land within the planning area. Several sites have multiple authorized users or uses, including two-way, microwave, and low power relay. These uses are generally compatible on the same site. Mass media users with associated high power transmissions are generally not compatible with existing low power uses on these developed sites. Existing communication site information is shown in *Appendix O. Lands*.

Access

BLM land is generally available for needed right-of-ways where consistent with local comprehensive plans, Oregon statewide planning goals and rules, and the exclusion and avoidance of areas identified in resource management plans. Numerous types of right-of-ways have been authorized by the BLM, including:

- state highways
- county roads
- private access roads

- trails
- power transmission lines
- electric distribution and service lines
- telephone and cable television lines
- railroads
- water pipelines and reservoirs
- canals
- federal highway material sites
- communication sites
- oil and gas pipelines
- bicycle paths

The checkerboard land ownership pattern of the O&C lands generates most of the need to cross public lands in order to provide access and utilities to intermingled private lands. New right-of-way proposals across public lands are likely to continue in the future. The location and nature of such proposals is generally not known until an application is received by the BLM.

Major existing right-of-way corridors within the planning area are shown in *Map 9 (Utility corridors)* in *Chapter 2*. Existing facilities located within right-of-way corridors include Bonneville Power Administration and private electric transmission lines, pipelines, fiber-optic lines, and transportation infrastructure.

A programmatic environmental impact statement to designate corridors for oil, gas, and hydrogen pipelines, and electricity transmission and distribution facilities on federal lands in 11 western states is currently underway by the Department of Energy. After the environmental impact statement is completed (December 2007), the BLM will amend relevant land use plans, as necessary, to implement any new corridor designations. The project currently includes the Salem, Eugene, Roseburg, Medford, and Lakeview districts.

The proposed Jordan Cove Energy Liquid Natural Gas Terminal and Pacific Connector Gas Pipeline project would include an approximately 223-mile-long, 36-inch-diameter natural gas pipeline extending from a new terminal in Coos Bay southeastward across Coos, Douglas, Jackson, and Klamath counties in Oregon to an interconnection with an existing pipeline near Malin, Oregon. The proposed route extends across 40 miles of BLM land in the Roseburg, Coos Bay, Medford, and Lakeview districts. The Federal Energy Regulatory Commission will prepare an environmental impact statement to address the environmental consequences of the project. The final environmental impact statement is scheduled to be finished by December 2007.

The majority of right-of-ways granted over BLM land in western Oregon are for logging roads. In most cases, other right-of-ways (for such uses as domestic or irrigation water lines, or utility lines for servicing residences) are authorized within or adjacent to existing road clearing limits. In addition, there are numerous temporary use permits in effect that authorize other activities on public lands, including:

- apiary (beehive) sites;
- agricultural cultivation of small areas;
- residential encroachments or other structures pending their removal or long-term authorization;
- national guard or military reserve training; and
- other miscellaneous short-term activities.

Leases are issued for land uses involving substantial construction, development, or land improvement. No new permits or leases (under any authority) are allowed for landfills and other waste disposal facilities.

The BLM land within the planning area is predominantly intermingled in a checkerboard pattern with private land. Intermingled nonfederal lands are owned primarily by private timber companies and are managed for commercial timber production. Most of the legal access to the federal and nonfederal timberlands is provided through long-term or perpetual reciprocal right-of-way agreements between the United States and the private timberland owners. It is estimated that 80% of the public lands within the planning area are available for road construction and use under reciprocal right-of-way agreements. Reciprocal right-of-way agreements provide the United States and the private landowner with the right to use and construct logging roads on each other's property for forest management and timber removal.

Transportation

The BLM controls approximately 14,000 miles of road within the planning area. Approximately 13,000 miles (about 93%) of BLM roads have some form of surfacing (bituminous, aggregate, or pit run). The primary purpose for development and use of the BLM road system is the transportation of timber. The majority of the BLM road system is authorized for use by intermingled private timberland owners through reciprocal right-of-way agreements and used for transportation of timber harvested from their lands.

Although most BLM roads are not public roads, the BLM road system serves as a means for the public to access public lands for recreational activities where public access rights have been obtained or to provide ingress and egress to residences. The roads of the BLM road system are described by the following functional classifications. For a quantitative comparison of the road types, see *Figure 138 (Distribution of functional classifications for BLM roads)*.

- **Collector roads.** Those roads that normally provide access to large blocks of public land and connect to state and county road systems.
- **Local roads.** Those roads that primarily provide access to lands that are adjacent to the collector network and serve travel over relatively short distances.
- **Resource roads.** Those roads that are primarily spur roads and provide access for only one or two types of resource management and carry very low traffic volumes.

Road construction standards and maintenance intensity are generally highest on collector roads and lowest on resource roads.

Figure 138. Distribution of functional classifications for BLM roads

Transportation management includes the development of a transportation management plan, road density reduction, and maintenance of the road system to meet the needs of resource programs. A transportation management plan for western Oregon was developed in 1996 (with a subsequent revision in 2002). The BLM has decommissioned approximately 590 miles of road. An additional 1,360 miles of BLM roads are identified for potential road closure. The BLM's contractual obligations in reciprocal right-of-way agreements preclude a substantial reduction in road mileage within fifth-field watersheds.

Maintenance of the BLM road system within the planning area follows the guidance in the western Oregon transportation management plan of 2002. Each district develops an annual maintenance operating plan that contains a list of roads scheduled to be maintained in the current year. Approximately 25% of the BLM road system (3,800 miles) is scheduled to be maintained in any given year. See *Figure 139 (Miles of road maintenance)*. Road maintenance activities include:

- roadside brush removal
- road surface grading and replacement
- pavement maintenance and replacement
- ditch cleaning
- culvert cleaning and replacement
- slough and slide removal

Drainage facilities currently under assessment include:

- 350 bridges
- 500 major culverts (greater than 80 inches in diameter)
- 40,000 minor culverts

Maintenance levels (for the intensity of maintenance) are assigned to BLM roads using a progressive five-level system (levels 1 through 5). Higher maintenance intensity (level 4 or 5) is typically assigned to bituminous surface collector roads. Native surface local

roads receive at least level 1 or 2 maintenance to ensure resource protection. Roads at levels 3 to 5 are maintained on a scheduled basis and may receive more extensive maintenance during periods of short-term increased use for timber hauling.

Figure 139. Miles of road maintenance

The following tables display the current inventory of transportation development on and to BLM land within the planning area.

Table 138. Road functional classifications by BLM district within the planning area

Land Control Category	Functional Classifications of Roads (miles)					
	Arterial	Collector	Local	Resource	Unknown	Road Totals
Salem District						
BLM Controlled	0	219	847	1,434	27	2,527
BLM Land, No Control	15	17	75	67	199	373
Salem Totals	15	236	922	1,501	226	2,900
Eugene District						
BLM Controlled	0	138	1,553	350	4	2,045
BLM Land, No Control	34	20	145	45	41	285
Eugene Totals	34	158	1,698	395	45	2,330
Roseburg District						
BLM Controlled	0	372	775	1,637	47	2,831
BLM Land, No Control	15	12	109	191	45	372
Roseburg Totals	15	384	884	1,828	92	3,203
Coos Bay District						
BLM Controlled	0	227	408	1,257	3	1,895
BLM Land, No Control	17	27	59	109	162	374
Coos Bay Totals	17	254	467	1,366	165	2,269
Medford District						
BLM Controlled	0	390	1,091	3,128	102	4,711
BLM Land, No Control	32	36	72	106	443	689
Medford Totals	32	426	1,163	3,234	545	5,400
Klamath Falls Resource Area (Lakeview District)						
BLM Controlled	2	87	133	143	0	365
BLM Land, No Control	3	8	150	1	188	350
KFalls RA Totals	5	95	283	144	188	715
Totals (All)	118	1,553	5,417	8,468	1,261	16,817

Table 139. Road standards by BLM district within the planning area

Land Control Category	Width of Roads (miles)				
	Double-Lane	Multiple-Lane	Single-Lane	Unknown	Road Totals
Salem District					
BLM Controlled	23	0	2,407	97	2,527
BLM Land, No Control	16	0	136	221	373
Salem Totals	39	0	2,543	318	2,900
Eugene District					
BLM Controlled	18	0	1,945	82	2,045
BLM Land, No Control	21	0	214	50	285
Eugene Totals	39	0	2,159	132	2,330
Roseburg District					
BLM Controlled	31	0	2,746	54	2,831
BLM Land, No Control	20	1	300	51	372
Roseburg Totals	51	1	3,046	105	3,203
Coos Bay District					
BLM Controlled	60	0	1,792	43	1,895
BLM Land, No Control	5	17	182	170	374
Coos Bay Totals	65	17	1,974	213	2,269
Medford District					
BLM Controlled	25	0	4,557	129	4,711
BLM Land, No Control	47	2	192	448	689
Medford Totals	72	2	4,749	577	5,400
Klamath Falls Resource Area (Lakeview District)					
BLM Controlled	8	0	312	45	365
BLM Land, No Control	2	0	26	322	350
KFalls RA Totals	10	0	338	367	715
Total (All)	276	20	14,809	1,712	16,817

Table 140. Road surface type by BLM district

Land Control Category	Surface Type of Roads (miles)			
	Aggregate	Bituminous	Natural or Unknown	Road Totals
Salem District				
BLM Controlled	2,145	139	243	2,527
BLM Land, No Control	134	25	214	373
Salem Totals	2,279	164	457	2,900
Eugene District				
BLM Controlled	1,494	224	327	2,045
BLM Land, No Control	174	25	86	285
Eugene Totals	1,668	249	413	2,330
Roseburg District				
BLM Controlled	2,057	176	598	2,831
BLM Land, No Control	183	8	181	372
Roseburg Totals	2,240	184	779	3,203
Coos Bay District				
BLM Controlled	1,139	414	342	1,895
BLM Land, No Control	111	10	253	374
Coos Bay Totals	1,250	424	595	2,269
Medford District				
BLM Controlled	3,005	300	1,406	4,711
BLM Land, No Control	97	39	553	689
Medford Totals	3,102	339	1,959	5,400
Klamath Falls Resource Area (Lakeview District)				
BLM Controlled	150	34	181	365
BLM Land, No Control	13	3	334	350
KFalls RA Totals	163	37	515	715
Totals (All)	10,702	1,397	4,718	16,817

Energy and Minerals

Key Points

- Most of the lands within the planning area are open to the exploration and development energy and mineral.
- The coal-bearing sandstones and siltstones of the Coos Bay Basin contain methane gas at a rate that compares very favorably to existing natural gas from coal operations elsewhere in the United States and Canada.
- Coastal and ridge line areas within the planning unit are rated as having outstanding potential for wind-driven power generation.
- Approximately 3 to 5% of all mineral materials that are produced in Oregon come from public lands. Within the planning area, there are about 250 sites that each produce between 1,000 and 25,000 tons per year.

Physiographic and Geologic Terrains

The planning area is divided into several physiographic provinces (the Coast Range, the Willamette Valley, the Western Cascades, the Eastern Cascades, and Klamath). The unique geologic origin and morphology of each province controls their potential for mineral occurrence.

The heavily vegetated, elongated Coast Range province consists of a long, narrow belt of moderately high mountains and coastal headlands that extend southward from the Columbia River to the Middle Fork of the Coquille River and westward from the continental shelf inland to the western edge of the Willamette Valley. The area of the Coast Range province is approximately 200 miles long by 30 to 60 miles wide. The shoreline depositional basins of this province (including the southwest coastal coal beds) hold the potential for the accumulation of natural gas.

The Willamette Valley province extends southward for 130 miles from the Columbia River to Cottage Grove and comprises a 30 to 40 mile wide low land catch basin between the Coast Range and the Western Cascade. The valley dips gently from about 400 feet in elevation at its southern end to near sea level at Portland. The material deposited by floods consists mainly of gravels to fine sediments and is separated at intervals by low hills.

The planning area contains lands that have a moderate to high potential for both hydrothermal metallic deposits and geothermal energy.

The Coast Mountains and the Willamette Valley terminate to the south against the 12,000 square miles of the Klamath. It is a province of deep, narrow valleys and peaks, bounded to the west by a narrow coastal plain with steep headlands and the Cascades Mountains to the east. Intrusions within the Klamath Mountains have created a high potential for the accumulation of hydrothermal metallic deposits and secondary enrichment zones.

The Basin and Range is a province of narrow, north and south trending fault-block mountains and alternating broad basins bordering the Cascade Mountains to the west and the High Lava Plains of central Oregon to the north. The Basin and Range may have some potential for natural gas while its volcanic past has created a high potential for geothermal resources.

Regulation and Availability of Mineral and Energy Resources

In Oregon, the BLM administers the mineral estate on nearly 40 million acres of BLM, U.S. Forest Service, and other federal and Indian lands. Approximately 2,557,700 acres are within the planning unit. An additional 68,600 acres of federal subsurface mineral estate exists beneath private surface. Known and inferred information indicates that about half of this area has a low potential for mineralization of interest with 40% at a moderate potential and 5% with a higher likelihood. Aside from the restrictions that are imposed by law, regulation, or executive/secretarial order, over 90% of the BLM-administered public lands, including O&C lands, are currently available for mineral and energy exploration and development (subject to the tenets of the individual resource management plans of the districts).

Mineral and energy resources on federal lands are managed under the authorities enacted by Congress in the following laws:

- Mining Law of 1872 (e.g., metallic and gem stones)
- Mineral Leasing Act of 1920 (e.g., energy and industrial chemicals)
- Mineral Materials Sales Act of 1947 (e.g., common variety construction materials)
- Mining and Materials policy Act of 1970
- Federal land Policy and Management Act of 1976
- National Materials and Minerals Policy, Research and Development Act of 1980

The cornerstone of BLM minerals management policy is the understanding that public lands will remain open for exploration and development, unless it is clearly in the national interest to withdraw them in whole or in part from mineral entry. Furthermore, the BLM encourages environmentally sound practices for mineral exploration and development on the open public lands by individuals and industry in a manner that satisfies both National and local needs.

Known and Inferred Mineral Occurrence Potential

Summarized below is the approximate aerial extent of the BLM-administered mineral estate, current acreage open or closed to mineral entry, and the likely potential for the occurrence of economic mineralization (consistent with the existing resource management plans) for each district within the planning area.

Salem District

Table 141. Known and inferred mineral occurrence potential for the Salem District

Category	Acres	Remarks
Federal Surface and Mineral Estate	398,100	
Federal Minerals and Private Surface	27,800	
Locatable		(e.g., metallics and gemstones)
Closed	5,900	Nondiscretionary
Closed	16,200	Discretionary
Open	49,200	Standard restrictions/stipulations
Open	326,800	Additional restrictions
Unknown or Low	321,900	Mineral occurrence potential
Moderate	18,000	Mineral occurrence potential
High	58,200	Mineral occurrence potential
Salable		(e.g., sand, gravel, stone, clays, pumice)
Closed	5,900	Nondiscretionary
Closed	220,400	Discretionary
Open	49,200	Standard restrictions/stipulations
Open	122,600	Additional restrictions
Unknown or Low	387,600	Mineral occurrence potential
Moderate	5,000	Mineral occurrence potential
High	1,000	Mineral occurrence potential
Leasable		(e.g., oil, gas, geothermal, coal, chemical minerals)
Closed	5,900	Nondiscretionary
Open	49,200	Standard restrictions/stipulations
Open	122,000	Additional restrictions
Open	221,000	No surface occupancy
Unknown or Low	389,100	Mineral occurrence potential
Moderate	219,500	Mineral occurrence potential
High	25,400	Mineral occurrence potential

Provinces and mineral potentials within the Salem District:

- Geologic terrains (west to east):
  - Coast Range
  - Willamette Valley
  - Cascade Mountains
- Minerals:
  - ferruginous bauxite throughout Willamette Valley
  - porphyritic copper and gold in headwater area of Santiam River
  - good potential for lode metallics near St. Helens
  - scattered low to moderate potential for beach placers
- Mineral materials:
  - Aggregate and basalt rock abundant throughout district
- Energy:
  - high potential for gas near Mist with moderate potential throughout Coast Range and Willamette Valley
  - scattered low grade coal deposits east of Salem and Newport
- Known production:
  - natural gas (Mist field)
  - coal (Columbia Co.)
  - clays (Portland area)

Eugene District

Table 142. Known and inferred mineral occurrence potential for the Eugene District

Category	Acres	Remarks
Federal Surface and Mineral Estate	318,000	
Federal Minerals and Private Surface	1,300	
Locatable		(e.g., metallics and gemstones)
Closed	400	Nondiscretionary
Closed	15,300	Discretionary
Open	290,600	Standard restrictions/stipulations
Open	10,000	Additional restrictions
Unknown or Low	299,900	Mineral occurrence potential
Moderate	13,500	Mineral occurrence potential
High	2,900	Mineral occurrence potential
Salable		(e.g., sand, gravel, stone, clays, pumice)
Closed	100	Nondiscretionary
Closed	9,100	Discretionary
Open	200	Standard restrictions/stipulations

Category	Acres	Remarks
Open	307,000	Additional restrictions
Unknown or Low	300,100	Mineral occurrence potential
Moderate	12,500	Mineral occurrence potential
High	3,800	Mineral occurrence potential
Leasable		(e.g., oil, gas, geothermal, coal, chemical minerals)
Closed	100,000	Nondiscretionary
Open	--	Standard restrictions/stipulations
Open	138,000	Additional restrictions
Open	177,000	No surface occupancy
Unknown or Low	99,000	Mineral occurrence potential
Moderate	316,000	Mineral occurrence potential
High	--	Mineral occurrence potential

Provinces and mineral potentials within the Salem District:

- Geologic terrains (west to east):
  - Coast Range
  - Willamette Valley
  - Cascade Mountains
- Minerals:
  - gold placers in the headwaters of the McKenzie and Middle Fork of the Willamette Rivers, and the Dorena Lake area
  - metallic placer potential around Eugene
- Mineral materials:
  - aggregate and basalt rock abundant throughout district
  - clays at Hobart Butte
- Energy:
  - speculative to moderate potential for gas in the Willamette Valley and coastal areas

Roseburg District

Table 143. Known and inferred mineral occurrence potential for the Roseburg District

Category	Acres	Remarks
Federal Surface and Mineral Estate	425,600	
Federal Minerals and Private Surface	1,700	
Locatable		(e.g., metallics and gemstones)
Closed	300	Nondiscretionary
Closed	4,800	Discretionary
Open	366,200	Standard restrictions/stipulations
Open	20,800	Additional restrictions
Unknown or Low	307,600	Mineral occurrence potential
Moderate	88,000	Mineral occurrence potential
High	24,400	Mineral occurrence potential
Salable		(e.g., sand, gravel, stone, clays, pumice)
Closed	30	Nondiscretionary
Closed	8,400	Discretionary
Open	381,700	Standard restrictions/stipulations
Open	29,200	Additional restrictions
Unknown or Low	--	Mineral occurrence potential
Moderate	418,700	Mineral occurrence potential
High	1,900	Mineral occurrence potential
Leasable		(e.g., oil, gas, geothermal, coal, chemical minerals)
Closed	30	Nondiscretionary
Open	356,300	Standard restrictions/stipulations
Open	53,300	Additional restrictions
Open	9,700	No surface occupancy
Unknown or Low	420,600	Mineral occurrence potential
Moderate	78,100	Mineral occurrence potential
High	155,800	Mineral occurrence potential

Provinces and mineral potentials within the Roseburg District:

- Geologic terrains:
  - Coast Range
  - Klamath
- Minerals:
  - nickel laterites east of Riddle; mercury in the headwaters of the Calapeoya and North Umpqua
  - disseminated copper and gold throughout the pre-late Jurassic rocks along the Umpqua River and its tributaries
  - placer metallics east of Drain and Sutherline

- Mineral materials:
aggregate and basalt rock abundant throughout district
- Energy:
scatter low grade coal deposits near Glide, Melrose, and Carson Valley
- Known production:
nickel (Riddle)

Coos Bay District

Table 144. Known and inferred mineral occurrence potential for the Coos Bay District

Category	Acres	Remarks
Federal Surface and Mineral Estate	329,600	
Federal Minerals and Private Surface	12,200	
Locatable		(e.g., metallics and gemstones)
Closed	1,000	Nondiscretionary
Closed	11,500	Discretionary
Open	99,500	Standard restrictions/stipulations
Open	217,600	Additional restrictions
Unknown or Low	--	Mineral occurrence potential
Moderate	--	Mineral occurrence potential
High	--	Mineral occurrence potential
Salable		(e.g., sand, gravel, stone, clays, pumice)
Closed	600	Nondiscretionary
Closed	14,700	Discretionary
Open	84,600	Standard restrictions/stipulations
Open	229,700	Additional restrictions
Unknown or Low	303,900	Mineral occurrence potential
Moderate	4,600	Mineral occurrence potential
High	900	Mineral occurrence potential
Leasable		(e.g., oil, gas, geothermal, coal, chemical minerals)
Closed	1,600	Nondiscretionary
Open	101,400	Standard restrictions/stipulations
Open	56,300	Additional restrictions
Open	170,300	No surface occupancy
Unknown or Low		Mineral occurrence potential
Moderate		Mineral occurrence potential
High		Mineral occurrence potential

Provinces and mineral potentials within the Coos Bay District:

- Geologic terrains:
  - Coast Range
  - Klamath
- Minerals:
  - gold, platinum, and chromite in coastal black beach sands
  - disseminated lode and placer copper, chromite, and gold with scattered nickel laterite deposits throughout prelate Jurassic rocks along the Rogue River, its tributaries, and in the Kalmiopsis Wilderness
  - silica beach sands at the mouth of the Umpqua River
- Mineral materials:
  - aggregate and basalt rock abundant throughout district
- Energy:
  - moderate to high potential for coal in early Tertiary basins surrounding Coos Bay with associated coal bed methane
- Known production:
  - subbituminous coal (Coos Co.)
  - silica sands

Medford District

Table 145. Known and inferred mineral occurrence potential for the Medford District

Category	Acres	Remarks
Federal Surface and Mineral Estate	866,300	
Federal Minerals and Private Surface	4,700	
Locatable		(e.g., metallics and gemstones)
Closed	16,800	Nondiscretionary
Closed	20,800	Discretionary
Open	536,500	Standard restrictions/stipulations
Open	293,400	Additional restrictions
Unknown or Low	473,100	Mineral occurrence potential
Moderate	388,700	Mineral occurrence potential
High	10,100	Mineral occurrence potential
Salable		(e.g., sand, gravel, stone, clays, pumice)
Closed	--	Nondiscretionary
Closed	--	Discretionary
Open	864,800	Standard restrictions/stipulations
Open	--	Additional restrictions
Unknown or Low	--	Mineral occurrence potential

Category	Acres	Remarks
Moderate	864,800	Mineral occurrence potential
High	--	Mineral occurrence potential
Leasable		(e.g., oil, gas, geothermal, coal, chemical minerals)
Closed	22,000	Nondiscretionary
Open	232,500	Standard restrictions/stipulations
Open	539,700	Additional restrictions
Open	73,300	No surface occupancy
Unknown or Low	789,500	Mineral occurrence potential
Moderate	202,700	Mineral occurrence potential
High	52,600	Mineral occurrence potential

Provinces and mineral potentials within the Medford District:

- Geologic terrains:
  - Klamath
  - Cascade Mountains
- Minerals:

disseminated lode and placer copper, chromite, and gold with scattered nickel laterite deposits throughout prelate Jurassic rocks throughout the area of the middle Rogue River and tributaries with major mining regions and pocket deposits along contacts of fine grained slate, argillite and carbonaceous rock
- Mineral materials:

aggregate and basalt rock abundant throughout district
- Energy:

scattered low grade coal deposits near Medford and Ashland
- Known production:
  - gold and precious metals (along Galice, Josephine, Sucker, Althouse Creeks and the Illinois River)
  - talc
  - subbituminous coal (Jackson Co.)

Klamath Falls Resource Area (Lakeview District)

Table 146. Known and inferred mineral occurrence potential for the Klamath Falls Resource Area of the Lakeview District

Category	Acres	Remarks
Federal Surface and Mineral Estate	212,000	
Federal Minerals and Private Surface	21,000	
Locatable		(e.g., metallics and gemstones)
Closed	4,700	Nondiscretionary
Closed	700	Discretionary
Open	191,600	Standard restrictions/stipulations
Open	37,900	Additional restrictions
Unknown or Low	99,000	Mineral occurrence potential
Moderate	128,000	Mineral occurrence potential
High	900	Mineral occurrence potential
Salable		(e.g., sand, gravel, stone, clays, pumice)
Closed	300	Nondiscretionary
Closed	14,500	Discretionary
Open	--	Standard restrictions/stipulations
Open	222,500	Additional restrictions
Unknown or Low	--	Mineral occurrence potential
Moderate	200,000	Mineral occurrence potential
High	1,300	Mineral occurrence potential
Leasable		(e.g., oil, gas, geothermal, coal, chemical minerals)
Closed	300	Nondiscretionary
Open	--	Standard restrictions/stipulations
Open	197,600	Additional restrictions
Open	40,800	No surface occupancy
Unknown or Low	--	Mineral occurrence potential
Moderate	200,000	Mineral occurrence potential
High	1,500	Mineral occurrence potential

Provinces and mineral potentials within the Klamath Falls Resource Area of the Lakeview District:

- Geologic terrains:
  - Cascade Mountains
  - western Basin and Range
- Minerals:
  - diatomite along Sprague River

- Mineral materials:
aggregate, basalt rock, and pumice are abundant throughout district
- Energy:
  - moderately favorable potential for geothermal from Klamath Falls and southward
  - speculative gas
- Known production:
diatomite

Energy Resources

Currently, exploration or development of inground energy resources within the planning area are focused on the hydrocarbon potential (i.e., coal and natural gas) that are generally associated with Cenozoic marine sediments. Small quantities of low-grade coal have been mined in both the Salem and Coos Bay districts. There is a potential for occurrence elsewhere in the Coast Range and Willamette Valley provinces. The potential for renewable wind energy has yet to be tapped but is generally rated at good to better over most of the planning area.

Natural Gas

Conventional natural gas has been produced since the 1970s near the community of Mist in west-central Columbia County. The Mist Gas Field produced over 65 billion cubic feet of gas since its discovery in 1979 with a value of about \$125 million. Modern seismic technology is being used to guide the discovery of new pools at the field. The Mist Gas Field now includes two commercial underground natural gas storage projects. The potential existence of gas deposits in many coastal and Coast Range areas of western Oregon resulted in the leasing of nearly 6 million acres from federal, state, and local agencies and the permitting of over 500 wells in the 1980s.

In western Oregon, there are up to 100,000 prospective onshore acres for natural gas production. These are enhanced by excellent year-round access via logging and fire control roads and the availability of already constructed timber recovery staging areas for drilling sites. Currently, there are no conventional that are producing gas wells on federal leases.

To date, the state of Oregon's Department of Geology and Mineral Industries has created only one gas field designation for the area encompassing the Mist Gas Field. Another gas field designation, however, is expected soon for the Coos Basin. The designation is required to accomplish state requirements for well spacing designations, mineral rights, and the control of drainage. It also increases interest and competition among development companies.

In the state of Oregon, nonfederal leasing and applications for permits to drill for production are currently focused in the Mist Gas Field, which has 16 current production wells and eight applications recently submitted for production permits (Houston, 2007), and focused in the Coos Basin (115,000 acres leased for three single-pad multiwell production systems).

Coal Bed Methane

Coal bed methane was recently proved up along the southwest coast with the strong likelihood of commercial development in the Coos Bay District. Foreseeable development of coal bed methane plays could potentially result in an additional 25,000 acres of BLM-managed lease offerings. To develop this resource, the industry estimates a near-term build-out of between 300 and 719 wells (Halferty 2007) with approximately 37 wells and 77 wells on BLM lands.

The coal-bearing sandstones and siltstones of the Coos Bay Basin are estimated to form a section approximately 6,600 feet thick with multiple seams containing approximately 780 billion cubic feet of methane gas (approximately 10 billion cubic feet per section) with a producible rate that compares favorably to existing natural gas from coal operations elsewhere in the United States and Canada. A commercial drilling program is underway near the Coos County natural gas line and within a few miles of unleased federal coal. The Coos Bay District is beginning an environmental assessment process to develop special lease stipulations for about 10,000 acres that appear to be of interest to industry for coal bed natural gas. The environmental assessment should be completed in time to allow leasing to begin in September 2007.

Geothermal

Oregon has the distinction of being a state where geothermal resources are available in many areas. These resources are suitable for many different types of uses including the current dominant production for direct heat applications.

Although Oregon does not generate commercial electricity from geothermal energy, the potential is there. A U.S. Interior Department report identifies seven sites as among the 35 highest potential geothermal regions in the country. These sites include the Newberry Crater (near Bend), a location of past geothermal exploration, and the Klamath Falls, Lakeview, Crump Lake, Summer Lake, Malheur River, and Vale areas of southern and eastern Oregon.

Wind

Nationally, about 20% of installed wind energy capacity is on federal lands. Coastal areas and ridge lines within the planning unit are rated as having a good to excellent potential for wind-driven power generation—the better portion of the 7,991 megawatts for all of Oregon. Oregon currently has some 435 megawatts

of installed wind power generating capacity with another 140 megawatts proposed (American Wind Energy Association 2007). Notable areas with a good to excellent potential include the Columbia River corridor and the Oregon coast. The Columbia River corridor is generally an area of high wind resource; however, the complex terrain causes considerable local variability. The annual average wind resource at exposed areas ranges from Class 3 to Class 6. Spring and summer are the seasons of maximum wind power, except for the extreme west where the maximum resource is in winter. The power potential of western Oregon is classified at 4. Winter is the season of maximum power potential at sites well exposed to the prevailing south and southeasterly winds. During the summer, wind power is high along the central and southern Oregon coast at sites well-exposed to northerly winds and is associated with the strong surface pressure gradients created by the cold water and relatively warm interior (Wind Energy Resource Atlas of the United States 2007).

Energy Transmission

The proposed 1 billion cubic feet per day 223-mile Pacific Connector Gas Pipeline (Pacific Connector) is being jointly developed by Williams' Northwest Pipeline (Williams' Northwest), Pacific Gas and Electric Company (PG&E), and Fort Chicago Energy Partners L.P. (Fort Chicago). It will join the proposed Jordan Cove liquefied natural gas terminal being developed by Fort Chicago near Coos Bay, Oregon, to the Williams' Northwest pipeline system near Myrtle Creek, Oregon, and then to Pacific Gas and Electric Company's backbone gas transmission system near Malin, Oregon. About 56 miles of the proposed route cross federal land that is managed by the BLM and the Forest Service, and will require a federal right-of-way. Environmental reviews and public participation are underway as part of the Federal Energy Regulatory Commission prefilings process.

National Energy Policy

Within the planning area, implementation of the National Energy Policy is a priority for modernizing the energy infrastructure, increasing supplies of renewable and nonrenewable energy, and accelerating conservation, protection, and improvement of the environment.

Oregon's contribution to this effort is focused on:

- Acting in a timely manner to requests for right-of-ways and easements for energy exploration and development (e.g., geophysical surveys and infrastructure to develop and transport renewable and nonrenewable energy, and emphasizing parallel use of existing right-of-ways wherever possible).
- Being receptive to alternative energy proposals and the completion of an environmental impact statement relating to the authorization of wind energy projects (Nevada, Idaho, Oregon, Arizona, and Utah are principal areas identified for development).

- Being prepared for increased interest in oil and gas drilling in the southwest Oregon coastal area based on promising exploration taking place on private lands.
- Emphasizing adjudication of lands nominated for oil, gas, and geothermal leasing; timely processing of drilling permits; development of wind and geothermal resources; hydropower relicensing; monitoring to ensure environmentally sound practices; and integrating study findings of the Energy Policy Act into BLM land use plans.
- Facilitating National Energy Policy goals for modernizing energy infrastructure, increasing energy supplies, and accelerating the protection and improvement of the environment.
- Providing opportunities for environmentally sound commercial development.
- Supporting land use plan decisions for renewable and nonrenewable energy exploration, development, and transportation of energy sources.
- Reducing impediments that are limiting access across public lands.
- Issuing right-of-way authorizations for necessary infrastructure to develop and transport renewable and nonrenewable energy (e.g., oil or gas from producing areas or electricity generated from a variety of sources, such as hydropower, coal or gas-fired generators, and geothermal).

Summary of Mineral Occurrence Potential

Salable Mineral Materials

Within the planning area, the functions of the BLM's principle mineral material program (common sand, gravel, rock, volcanic cinders, and clay) are related to designation of sites (community pits and common use areas), disposals (issuing sale contract and free use permits), and compliance inspections. Mineral materials are the most commonly mined commodities in Oregon. See *Figure 140 (Active mineral materials cases on BLM-administered lands by township)*.

Figure 140. Active mineral materials cases on BLM-administered lands by township

Although production from BLM pits has declined since the 1980s due to the decrease in logging road construction, approximately 3 to 5% of all mineral materials produced in Oregon come from public lands, including from some 250 sites within the planning area that can yield between 1,000 and 25,000 tons per year. This trend is expected to continue with an average annual growth rate of approximately 1% requiring significant quantities of crushed stone, sand, and gravel to come from resources yet to be delineated. Despite its low unit value, the aggregate and crushed stone industry is a major contributor to the regional economics (U.S. Geological Survey 2007).

Currently, activity is limited primarily to small sales and the use of larger volumes by other federal, state, and local agencies. In many portions of the planning area, rock sources are becoming scarce or are encumbered by restrictions, which limit the availability of rip-rap, large bounders and surfacing material required for restoration projects or timber harvesting activities. In the rapidly developing urban areas, expensive materials are being purchased from private sources and transported to BLM projects, at times passing potential BLM-administered sources.

Locatable Minerals

Locatable minerals include metallic minerals (i.e., gold, silver, lead, and zinc) and some nonmetallic minerals (e.g., fluorspar, asbestos, mica, gemstones, and uncommon varieties of sand, gravel, and stone). Large areas of southwestern Oregon are within mining districts. Most claim sites within the planning area are situated in the Klamath Mountains and the Western Cascades.

Mining district

A mining district is a section of country that is usually designated by name and described or understood as being confined within certain natural boundaries in which gold, silver, or other minerals may be found in paying quantities.

All BLM districts within the planning area carry out actions that are related to the administration of some 2,500 claims of active record. See *Figure 141 (Active mining claim cases on BLM-administered lands by township)* for the spatial distribution of claim sites to the nearest township. Related actions include:

- the processing of mining notices and plans of operations,
- the inspection of mining claims and mill sites for surface management compliance,
- the determination of mining claim validity,
- the processing of patents that are not otherwise precluded by moratorium, and
- the mitigation of trespass and unauthorized occupancy cases.

Figure 141. Active mining claim cases on BLM-administered lands by township

Sporadic small-scale placer gold mining is the main type of locatable production occurring on BLM lands within the planning area, particularly in the southern districts. The number of active mining claims in western Oregon has generally declined due to changes in federal regulations that have resulted in increased fees for recording claims and maintenance.

Summary of Potential

Currently, none of the types of mineral entry (i.e., locatable, salable, or leasable) contribute significantly to the economic base of the communities within the planning area.

For western Oregon, the mineral occurrence potential can generally be described as follows:

- **Natural gas.** Submarginal to moderately favorable for natural gas from Coos County northward to the Columbia River with areas of high potential surrounding Coos Bay and in the vicinity of Mist in Columbia County. Conventional oil and gas potential exist as identified speculative petroleum systems (Ryu et al. 1990). Part of a structural sedimentary basin system that extends on and offshore from the Klamath Terrains boundary (Middle Fork of the Coquille River) north to the Columbia River (extending into Washington) and from the continental shelf east to the Willamette Valley.
- **Coal bed natural gas (methane).** Focused mainly on the Coaledo Formations of the onshore portion of the Coos Basin (an area of approximately 250 square mile located on the western edge of the Coos Bay District). Federally managed mineral rights are approximately 12.3% of the basin while the BLM-administered mineral right is approximately 7.6%.
- **Coal.** Highly favorable in the Coos Bay Field and Eden Ridge Field in southern Coos County, although of generally poor quality with interstratified carbonaceous shale.
- **Locatable metallic deposits.** Moderate to highly favorable throughout southwestern Oregon and in the vicinity of St. Helens in Columbia County. Reported production of gold and nickel in Douglas and Josephine counties.
- **Saleable.** Moderate to high potential across the planning area.

See Table 147 (*Summary of the mineral occurrence potential within the planning area by resource type*).

Table 147. Summary of the mineral occurrence potential within the planning area by resource type

Resource Type	Unknown or Low Potential ^a	Moderate Potential ^b	High Potential ^c
Locatable (acres)	1,180,000	636,000	97,000
Salable (acres)	1,534,000	1,000,000	9,000
Leasable (acres)	2,016,000	1,265,000	235,000
Wind ^d (% of planning area)	20% is Class 1 and 2	75% is Class 4	5% is Class 5 and 6

Note: All values rounded to the nearest 1,000.

^a**Unknown or low potential:** References and district documents indicate geologic formations and processes are not favorable for the accumulation of mineral resources or there is insufficient information to make a determination of the mineral potential.

^b**Medium potential:** References and district documents indicate geological formation and processes are favorable for the accumulation of mineral resources. For example, there may be additional mineral resources in old mines, or prospects or new resources in areas with a high level of mining notice filing.

^c**High potential:** References and district documents indicate geological formation and processes are favorable for the accumulation of mineral resources. These are areas of known active mines or active exploration and development activities, which indicate a high potential for the accumulation of mineral resources.

^d**Wind class:** According to the Wind Energy Resource Atlas of the United States, wind classes are as follows: Class 1 (< 200 W/m²), Class 2 (200 to 300 W/m²), Class 3 (300 to 400 W/m²), Class 4 (400 to 500 W/m²), Class 5 (500 to 600 W/m²), and Class 6 (600 to 800 W/m²).

Restrictions that could affect the exploration and development of energy and mineral resources can be divided into five categories:

- nondiscretionary closures
- discretionary closures
- no surface occupancy stipulations
- standard stipulations
- additional restrictions

See Table 148 (*Acres of the restrictions that could affect the exploration and development of energy and mineral resources*) for the acres of the existing restrictions.

Table 148. Acres of the restrictions that could affect the exploration and development of energy and mineral resources

Restrictions	Unknown or Low Potential	Moderate Potential	High Potential
Nondiscretionary closures	389,000	128,000	59,000
Discretionary closures	25,000	8,000	1,000
No surface occupancy stipulations	56,000	121,000	0
Standard stipulations	2,618,000	2,251,000	275,000
Additional restrictions	354,000	286,000	5,000

Note: The sum of acres for each resource type (locatable, saleable, and leasable), which include overlap, are rounded to nearest 1,000.

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