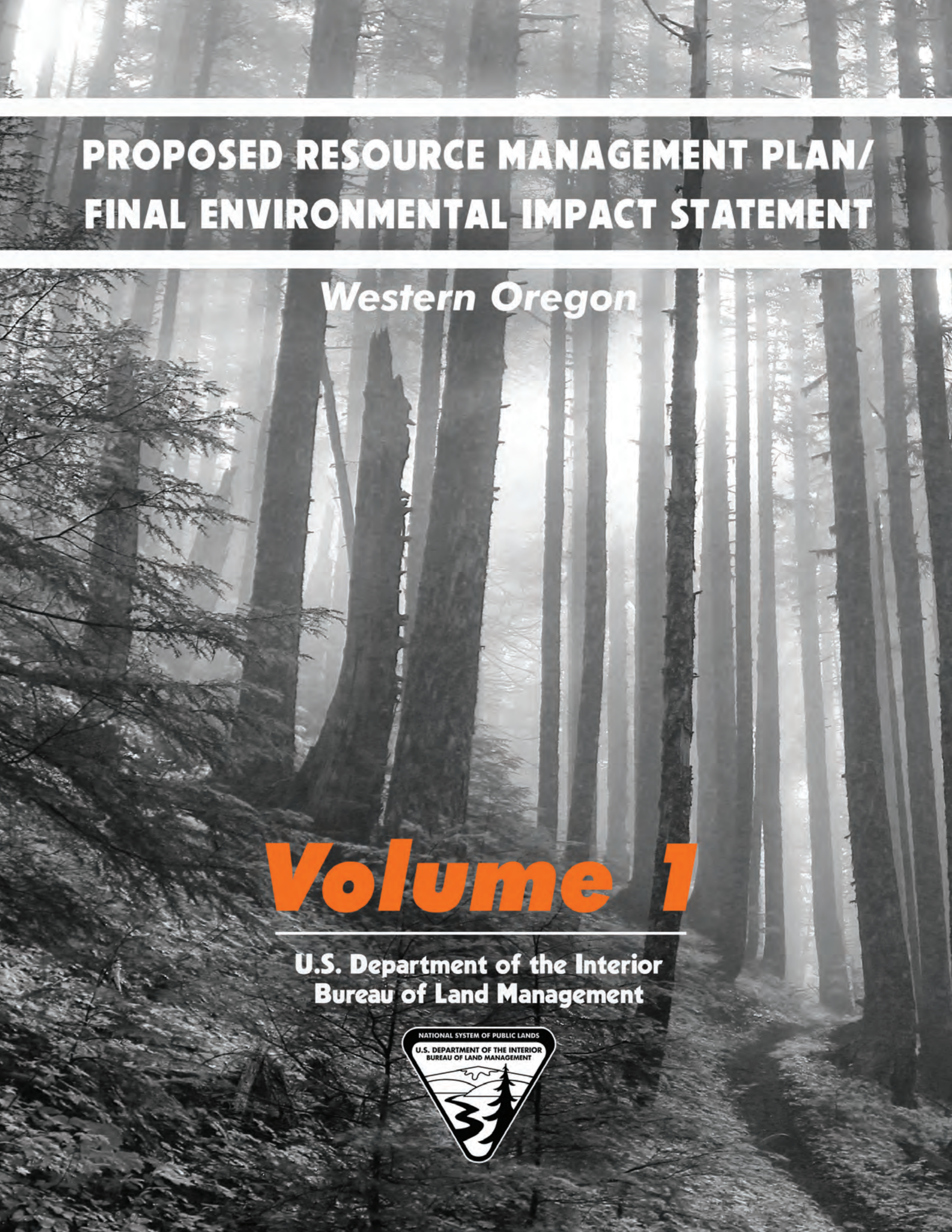

PROPOSED RESOURCE MANAGEMENT PLAN/ FINAL ENVIRONMENTAL IMPACT STATEMENT

Western Oregon

Volume 1

U.S. Department of the Interior
Bureau of Land Management

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

The BLM manages more than 245 million acres of public land, the most of any Federal agency. This land, known as the National System of Public Lands, is primarily located in 12 western states, including Alaska. The BLM also administers 700 million acres of sub-surface mineral estate throughout the nation.

The BLM's mission is to manage and conserve the public lands for the use and enjoyment of present and future generations under our mandate of multiple-use and sustained yield. In fiscal year 2013, the BLM generated $4.7 billion in receipts from public lands.

blm.gov/or

NATIONAL SYSTEM OF PUBLIC LANDS

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Oregon State Office
P.O. Box 2965, Portland, Oregon 97208
http://www.blm.gov/or

Dear Reader,

The 2.5 million acres of Bureau of Land Management (BLM)-administered lands in western Oregon play an important role in the region's social, ecological, and economic well-being. As stewards of these lands, the BLM has a responsibility to ensure that our management is meeting our legal mandates and the needs of the local communities.

On April 24, 2015, we released a Draft Resource Management Plan/Environmental Impact Statement (Draft RMP/EIS) for the revision of the 1995 RMPs for the six BLM districts in western Oregon. During the four-month comment period that followed, we received approximately 4,500 comments from government agencies, organizations, Tribes, and members of the public. Thank you for your input; your participation has helped shaped our analysis and decision-making at every step of the planning process. If you would like to read all of the comments we received during the comment period, you can do so on our website at http://www.blm.gov/or/plans/rmpswesternoregon/comments.php.

Enclosed you will find the Proposed RMP/Final EIS. We have developed the Proposed RMP in consultation with cooperating agencies and Tribes and with consideration of the comments that we received on the Draft RMP/EIS. This document explains why we are proposing a plan revision, presents our Proposed RMP and a full spectrum of different management alternatives, and analyzes their environmental effects.

Below you will find information on the Protest Period and issuance of the Records of Decision (RODs). As always, we welcome your participation and involvement. Oregonians are in need of a lasting solution that will provide predictable outcomes and sustainable management of the BLM-administered lands in western Oregon. With your help, we are building an RMP that will provide sustainable solutions for the public lands that we are privileged to manage.

Protest Period

Pursuant to the BLM's planning regulations at 43 CFR 1610.5–2, any person who participated in the planning process for this Proposed RMP, and has an interest which is or may be adversely affected by the planning decisions, may protest approval of the planning decisions within 30 days from the date the Environmental Protection Agency publishes the Notice of Availability in the Federal Register. Protests must comply with the requirements described in the BLM's planning regulations at 43 CFR 1610.5–2. Interested parties should take care to document all relevant facts. As much as possible, specific planning documents or available planning records (e.g., meeting minutes, summaries, and correspondence) should be referenced or cited.

Emailed protests will not be accepted as valid protests unless the protesting party also provides the original letter by either regular or overnight mail postmarked by the close of the protest period. Under these conditions, the BLM will consider the emailed protest as an advance copy and will afford it full consideration. If you wish to provide the BLM with such advance notification, please direct emailed protests to the attention of the BLM protest coordinator at protest@blm.gov.

All protests, including the follow-up letter (if emailing), must be in writing and mailed to one of the following addresses:

Regular Mail:	**Overnight Delivery:**
Director (210)	Director (210)
Attn: Protest Coordinator	Attn: Protest Coordinator
P.O. Box 71383	20 M Street SE, Room 2134LM
Washington, D.C. 20024-1383	Washington, D.C. 20003

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

The BLM Director will make every attempt to render a decision on each protest promptly. The protest decision will be in writing and will be sent to the protesting party by certified mail, return receipt requested. The decision of the BLM Director shall be the final decision of the Department of the Interior for the protest.

Records of Decision

Following resolution of any protests and the completion of the consistency review by the Governor of Oregon, the BLM anticipates issuing two Records of Decision/Resource Management Plans (RODs/RMPs): one ROD/RMP that would apply to the Coos Bay District, Eugene District, Salem District, and the Swiftwater Field Office of the Roseburg District; and another ROD/RMP that would apply to the Klamath Falls Field Office of the Lakeview District, the Medford District, and the South River Field Office of the Roseburg District.

The RODs/RMPs will identify the decision by the State Director on the RMP revision and the rationale for the decision. The RODs/RMPs will constitute the decision documents for the enclosed Proposed RMP/Final EIS. The RODs/RMPs will also contain the approved RMPs themselves, including the land use allocations, management objectives, and management direction. The RODs/RMPs will describe the compliance with applicable laws, the alternatives evaluated and the environmentally preferable alternative, necessary mitigations, the process for plan monitoring and evaluation, and the guidance for transition from the 1995 RMPs to the approved RMPs.

The approval of the RODs/RMPs will represent the completion of this RMP revision process. Following approval of the RODs/RMPs, the BLM will take only those management actions that are specifically provided for in the approved RMPs, or, if not specifically mentioned, actions that are clearly consistent with the goals, objectives, or management direction of the approved RMPs.

The BLM will email parties when the RODs/RMPs are available online or will mail the RODs/RMPs to parties who have requested hard copies.

For more information on the Protest Period, planning process, or public participation, you can visit our website at http://www.blm.gov/or/plans/rmpswesternoregon/index.php. Thank you for your continued interest and participation in this planning process. We look forward to continuing to work with you.

Jamie Connell
Acting State Director
Bureau of Land Management
Oregon/Washington

United States Department of the Interior
Bureau of Land Management

Proposed Resource Management Plan/Final Environmental Impact Statement for the Resource Management Plans for Western Oregon

Coos Bay, Eugene, Medford, Roseburg, and Salem Districts,
and the Klamath Falls Field Office of the Lakeview District

Cooperating agencies:

Benton County	State of Oregon
Clackamas County	Environmental Protection Agency
Columbia County	National Marine Fisheries Service
Coos County	U.S. Fish and Wildlife Service
Curry County	U.S. Forest Service
Douglas County	Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians
Klamath County	Confederated Tribes of Grand Ronde
Lane County	Confederated Tribes of Siletz Indians
Lincoln County	Coquille Indian Tribe
Linn County	Cow Creek Band of Umpqua Tribe of Indians
Marion County	Klamath Tribes
Multnomah County	
Polk County	
Tillamook County	
Washington County	
Yamhill County	

Abstract: This Proposed Resource Management Plan/Final Environmental Impact Statement addresses revision of the 1995 Resource Management Plans for the Coos Bay, Eugene, Medford, Roseburg, and Salem Districts, and the Klamath Falls Field Office of the Lakeview District. The purpose of this Resource Management Plan revision is to provide a sustained yield of timber, contribute to the conservation and recovery of threatened and endangered species, provide clean water in watersheds, restore fire-adapted ecosystems, provide recreation opportunities, and coordinate management of lands surrounding the Coquille Forest with the Coquille Tribe. The BLM analyzed the Proposed RMP, the No Action alternative of continued implementation of the 1995 Resource Management Plans, four action alternatives, and two sub-alternatives.

This Proposed RMP/Final EIS is open for a 30-day protest period beginning with the date the Environmental Protection Agency publishes the Notice of Availability of the Proposed RMP/Final EIS in the Federal Register. Protests must be filed with the Director of the BLM as described in the Dear Reader Letter.

For further information contact:

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RMPs for Western Oregon
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Summary

This summary presents a brief description of the major elements of this document. This summary is necessarily neither comprehensive nor complete. Furthermore, this summary omits the citations, definitions, and explanations provided in the document. Therefore, the details in the four chapters of this document are essential to understanding fully the planning process, the alternatives and the Proposed RMP, and their effects.

Introduction

The Bureau of Land Management (BLM) is revising the resource management plans (RMPs) for its Coos Bay, Eugene, Medford, Roseburg, and Salem Districts, and the Klamath Falls Field Office of the Lakeview District. This Proposed RMP/Final Environmental Impact Statement (Proposed RMP/Final EIS) provides a description of the various alternative management approaches the BLM is considering for the management of these lands along with an analysis of the potential effects of the alternatives and the Proposed RMP.

The 1995 RMPs are consistent with the 1994 Northwest Forest Plan, which the Department of the Interior and the Department of Agriculture adopted for Federal forests within the range of the northern spotted owl. This RMP revision would replace the 1995 RMPs and thereby replace the Northwest Forest Plan for the management of BLM-administered lands in western Oregon. The purpose and need for this RMP revision are different from the purpose and need for the Northwest Forest Plan. As such, the action alternatives and the Proposed RMP in this Proposed RMP/Final EIS do not contain all elements of the Northwest Forest Plan.

The BLM conducted plan evaluations, which concluded that a plan revision is needed to address the changed circumstances and new information that has led to a substantial, long-term departure from the timber management outcomes predicted under the 1995 RMPs. Moreover, the BLM needs to revise existing plans to replace the 1995 RMPs' land use allocations and management direction because of new scientific information and policies related to the northern spotted owl.

The purpose of the RMP revision is to—

- Provide a sustained yield of timber;
- Contribute to the conservation and recovery of threatened and endangered species, including—
  - Maintaining a network of large blocks of forest to be managed for late-successional forests; and
  - Maintaining older and more structurally-complex multi-layered conifer forests;
- Provide clean water in watersheds;
- Restore fire-adapted ecosystems;
- Provide recreation opportunities; and
- Coordinate management of lands surrounding the Coquille Forest with the Coquille Tribe.

The Alternatives and the Proposed RMP

The BLM designed the range of alternatives in the Draft RMP/EIS to span the full spectrum of alternatives that would respond to the purpose and need for the action. The BLM developed the alternatives to represent a range of overall management approaches, rather than exemplify gradations in design features. In the Draft RMP/EIS, the BLM analyzed in detail the No Action alternative and four action alternatives. In addition, the BLM analyzed how two sub-alternatives, which modify an individual component of northern spotted owl conservation in an alternative, would alter effects on timber production and northern spotted owls. The BLM is carrying forward the action alternatives and sub-alternatives as presented in the Draft RMP/EIS into the Proposed RMP/Final EIS.

The No Action alternative is implementation of the 1995 RMPs as written (in contrast to the BLM's current implementation practices under the 1995 RMPs). Implementation of the timber management program has departed substantially from the outcomes predicted in the 1995 RMPs, and continuing to harvest timber at the declared annual productive capacity level for multiple decades into the future would not be possible using the current practices.

The action alternatives and the Proposed RMP include the following land use allocations: Congressionally Reserved Lands and National Landscape Conservation System, District-Designated Reserves, Late-Successional Reserve, Riparian Reserve, Harvest Land Base, and Eastside Management Area (**Figure i**). The location and acreage of these allocations, with the exception of Congressionally Reserved Lands, vary by alternative and the Proposed RMP. Within the action alternatives and the Proposed RMP, the Harvest Land Base, Late-Successional Reserve, and Riparian Reserve have specific, mapped sub-allocations with differing management direction.

Alternative A has a Late-Successional Reserve larger than the No Action alternative. The Harvest Land Base is comprised of the Uneven-aged Timber Area and the High Intensity Timber Area. The High Intensity Timber Area includes regeneration harvest with no retention (i.e., clearcuts).

Alternative B has a Late-Successional Reserve similar in size to Alternative A, though of a different spatial design. The Harvest Land Base is comprised of the Uneven-aged Timber Area, Low Intensity Timber Area, and Moderate Intensity Timber Area. The portion of the Harvest Land Base in Uneven-aged Timber Area is the largest of the action alternatives. The Low Intensity Timber Area and Moderate Intensity Timber Area include regeneration harvest with varying levels of retention.

Sub-alternative B is identical to Alternative B, except that it includes protection of habitat within the home ranges of all northern spotted owl known and historic sites.

Alternative C has the largest Harvest Land Base of any of the alternatives. The Harvest Land Base is comprised of the Uneven-aged Timber Area and the High Intensity Timber Area. The High Intensity Timber Area includes regeneration harvest with no retention (i.e., clearcuts). Alternative C has the smallest acreage in the Riparian Reserve of the action alternatives.

Sub-alternative C is identical to Alternative C, except that the Late-Successional Reserve includes all stands 80 years old and older.

Alternative D has the smallest Late-Successional Reserve of any of the action alternatives. The Harvest Land Base is comprised of the Uneven-aged Timber Area, Owl Habitat Timber Area, and Moderate Intensity Timber Area. The Owl Habitat Timber Area includes timber harvest applied in a manner that would maintain northern spotted owl habitat. The Moderate Intensity Timber Area includes regeneration harvest with retention. Alternative D has the largest acreage in the Riparian Reserve of all of the action alternatives.

The Proposed RMP

The BLM has developed the Proposed RMP as a variation on Alternative B, which the BLM identified in the Draft RMP/EIS as the preferred alternative. The Proposed RMP has a Late-Successional Reserve that is a refinement of the Late-Successional Reserve design in Alternative B and is within the spectrum of Late-Successional Reserve designs of the action alternatives. The Harvest Land Base is comprised of the Uneven-aged Timber Area, Low Intensity Timber Area, and Moderate Intensity Timber Area, as in Alternative B. The geographic extent of the portion of the Harvest Land Base in Uneven-aged Timber Area in the Proposed RMP is intermediate between Alternative B and Alternative C. As in Alternative B, the Low Intensity Timber Area and Moderate Intensity Timber Area include regeneration harvest with varying levels of retention.

To reduce the risk of adverse effects to ESA-listed fish and water quality compared to Alternative B, the Proposed RMP includes a Riparian Reserve design that is intermediate among the alternatives and incorporates elements of each of the alternatives. The Proposed RMP carries forward the concept of key watersheds from the No Action alternative, in that it varies riparian management based on the importance of the subwatershed to the conservation and recovery of ESA-listed fish. For fish-bearing streams and perennial streams in all subwatersheds, the Riparian Reserve design is similar to Alternative D. For non-fish-bearing intermittent streams, the Riparian Reserve design in Class I and II subwatersheds is a slight modification of Alternative A, and the Riparian Reserve design in Class III subwatersheds is similar to Alternative C.

To increase protection of unique recreation settings and increase recreation use compared to Alternative B, the Proposed RMP includes an approach to the management of recreation resources modified from Alternative C.

To increase protection of identified lands with wilderness characteristics compared to Alternative B, the Proposed RMP includes an approach to the management of lands with wilderness characteristics from Alternative A.

To minimize the spread of sudden oak death compared to Alternative B, the Proposed RMP includes the sudden oak death treatment approach of the No Action alternative, Alternative C, and Alternative D.

Table i summarizes key features of the alternatives and the Proposed RMP that vary substantially and are easily quantified and summarized.

Table i. Key features of the alternatives and the Proposed RMP

Alternative/ Proposed RMP	Total Late-Successional Reserve (Acres)	Protection of Structurally-complex Forest	Riparian Reserve Total Width	Riparian Reserve Inner Zone Width	Marbled Murrelet Survey and Protection
No Action	478,860	None specified	2 SPTH* on fish-bearing streams; 1 SPTH* on non-fish-bearing streams	None specified	Survey in Zones 1 and 2; protect contiguous recruitment and existing habitat within 1/2 mile of sites
Alt. A	1,147,527	≥ 120 years	1 SPTH* on all streams	120’ on perennial and fish-bearing streams; 50’ on non-fish-bearing intermittent streams	None
Alt. B	1,127,320	District-defined map based on existing, district-specific information	1 SPTH* on perennial and fish-bearing streams; 100’ on debris-flow-prone non-fish-bearing intermittent streams; 50’ on other non-fish-bearing intermittent streams	60’ on perennial and fish-bearing streams; 50’ on non-fish-bearing intermittent streams	Survey in Zone 1; protect contiguous habitat within 300’ of sites
Sub. B	1,422,933				
Alt. C	949,279	≥ 160 years	150’ on perennial and fish-bearing streams; 50’ on non-fish-bearing streams	60’ on perennial and fish-bearing streams; 50’ on non-fish-bearing intermittent streams	Survey stands >120 years; protect contiguous habitat within 300’ of sites
Sub. C	1,373,206	≥ 80 years			None
Alt. D	714,292	≥ 120/140/160 years on high/moderate/low productivity sites	1 SPTH* on all streams	120’ on all streams	Survey in Zones 1 and 2; protect habitat within 1/2 mile of sites
PRMP	948,466	District-defined map based on existing, district-specific information (updated from Alternative B)	Class I and II subwatersheds: 1 SPTH* on all streams	Class I subwatersheds: 120’ on perennial and fish-bearing streams; 50’ on non-fish-bearing intermittent streams; Middle zone from 50’ to 120’ on non-fish-bearing intermittent streams	Survey nesting habitat in all land use allocations in Zone 1, survey nesting habitat in reserve land use allocations in Zone 2; protect contiguous habitat within 300’ of sites
			Class III subwatersheds: 1 SPTH* on perennial and fish-bearing streams; 50’ on non-fish-bearing intermittent streams	Class II and III subwatersheds: 120’ on perennial and fish-bearing streams; 50’ on non-fish-bearing intermittent streams	

* Site-potential tree height

Alternative/ Proposed RMP	Total Harvest Land Base (Acres)	Green Tree Retention	Areas of Critical Environmental Concern (Number Designated)	Recreation Management Areas		District-Designated Reserve–Lands Managed for their Wilderness Characteristics (Acres)	Wild and Scenic Rivers Recommended for National System Inclusion (Number of River Segments)
				Special Recreation Management Area (Acres)	Extensive Recreation Management Area (Acres)		
No Action	691,998	GFMA[†]: 6–8 TPA[‡] Connectivity/Diversity: 12–18 TPA[‡] Southern GFMA[†]: 16–25 TPA	86 *(and 55 potential)*	168,968	2,397,460	-	- *(all 51 eligible would continue receiving interim protections)*
Alt. A	343,900	No retention	107	20,065	-	79,709	-
Alt. B	556,335	Low Intensity Timber Area: 15–30% retention Moderate Intensity Timber Area: 5–15% retention	105	24,972	139,320	76,525	6
Sub. B	298,121						
Alt. C	741,332	No retention	101	59,046	357,771	66,190	6
Sub. C	495,507						
Alt. D	650,382	Owl Habitat Timber Area: maintain owl habitat Moderate Intensity Timber Area: 5–15% retention	107	86,693	580,458	-	51
PRMP	469,215	Low Intensity Timber Area: 15–30% retention Moderate Intensity Timber Area: 5–15% retention	108	70,730	420,311	79,107	6

† GFMA = General Forest Management Area
‡ TPA = Trees per acre

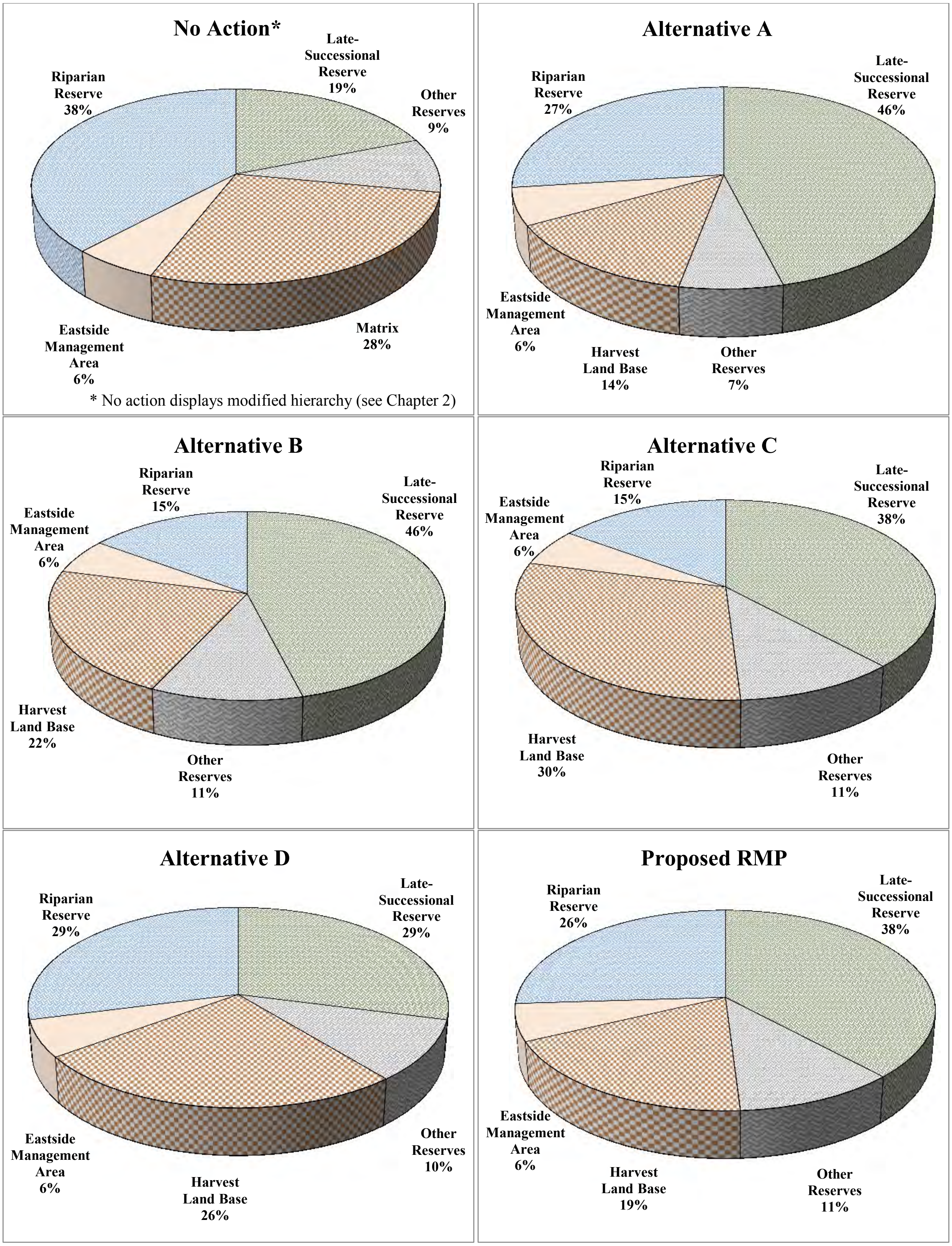

Figure i. Land use allocations under the alternatives and the Proposed RMP

Affected Environment and Environmental Consequences

This section summarizes the existing conditions and environmental consequences for each resource that the RMPs are likely to affect. Throughout this document, the BLM uses the term ‘planning area’ to refer to the 22 million acres of land within the geographic boundary of this planning effort regardless of jurisdiction, and uses the term ‘decision area’ to refer to the 2.5 million acres of BLM-administered lands within the planning area.

Air Quality

The action alternatives and the Proposed RMP would produce more particulate emissions than the No Action alternative and current conditions. However, adherence to the requirements of the Oregon Smoke Management Plan would continue to limit impacts to human health and visibility from prescribed fires.

Areas of Critical Environmental Concern

The alternatives and the Proposed RMP consider the designation of 131 potential Areas of Critical Environmental Concern. The Proposed RMP would designate the most and Alternative C the fewest areas as Areas of Critical Environmental Concern at 108 and 101, respectively.

Climate Change

Carbon storage would increase under the alternatives and the Proposed RMP. Greenhouse gas emissions associated with BLM-administered lands would increase under the alternatives and the Proposed RMP, but would remain less than 1 percent of the 2010 statewide greenhouse gas emissions. Climate change provides uncertainty that reserves will function as intended and that planned timber harvest levels can be attained, with the uncertainty increasing over time.

Cultural and Paleontological Resources

The BLM can reduce or eliminate effects to cultural and paleontological resources through systematic and thorough cultural and paleontological resource inventories. Implementation of Alternatives A and D would be the least likely to result in potential adverse impacts to cultural and paleontological resources.

Fire and Fuels

The action alternatives and the Proposed RMP would increase stand-level fire resistance and reduce wildfire hazard on BLM-administered lands compared to current conditions. The BLM-administered lands constitute only a small portion of the entire interior/south dry forest landscape. Consequently, the modest shifts under the alternatives and the Proposed RMP would not result in any substantial change in the overall landscape fire resilience. The dry forest landscape would continue to have an overabundance of mid-seral closed forest and a deficit of late-seral open forest.

Fisheries

The alternatives and the Proposed RMP would increase the potential large wood and small functional wood contribution to streams from the current conditions over time. Sediment production from road construction and operation would increase by less than one percent under the alternatives and the Proposed RMP, and the effects to fish would not differ at this scale of analysis. These effects to fish would be short-term and localized and could result from increases in turbidity or deposition of fines in the stream channel substrates affecting habitat.

Forest Management

Even-aged systems with clear-cutting would produce more uniform stands in a mix of age classes without structural legacies. Two-aged systems with variable-retention regeneration harvesting would produce stands in a mix of age classes with legacy structures and multiple canopy layers. Uneven-aged management systems with selection harvesting regimes would produce mostly older, structurally-complex stands and mature forests with multiple canopy layers.

The allowable sale quantity (ASQ) of timber under the alternatives and the Proposed RMP would range from 120 million board feet (MMbf) per year under Sub-alternative B to 486 MMbf per year under Alternative C. Non-ASQ timber harvest volumes in the first decade would range from 4 MMbf per year under Alternative D to 122 MMbf per year under the No Action alternative. The ASQ under the Proposed RMP would be 205 MMbf per year, and the non-ASQ would be 73 MMbf per year in the first decade.

Hydrology

Under the No Action alternative, Alternatives A and D, and the Proposed RMP, less than 0.5 percent of all perennial and fish-bearing stream reaches in the decision area would currently be susceptible to shade reductions that could affect stream temperature if the BLM applies thinning in the outer zone of the Riparian Reserve. Under Alternative B and C, approximately 5 percent of all perennial and fish-bearing reaches in the decision area would currently be susceptible to shade reductions that could affect stream temperature if the BLM applies thinning in the outer zone of the Riparian Reserve.

Under all alternatives and the Proposed RMP, potential sediment delivery to streams from new road construction would constitute less than a 1 percent increase above current levels of fine sediment delivery from existing roads. Less than 2 percent of the decision area would be susceptible to peak flow increases over time under any alternative or the Proposed RMP. Less than 1 percent of the Harvest Land Base would be susceptible to landsliding with the potential to deliver sediment to streams over time under the alternatives and the Proposed RMP.

Invasive Species

The risk of introducing and spreading invasive plant species over the next 10 years, and in the long term, would be lowest under Alternative D, and highest under Alternatives B and C. The No Action alternative, Alternatives C and D, and the Proposed RMP would result in the smallest increase in sudden oak death infestation, because the BLM would treat all detected infestations.

Lands and Realty

Under all alternatives and the Proposed RMP, BLM-administered lands would generally be available for rights-of-way. Alternative D would most constrain the BLM’s ability to grant rights-of-way compared to the current conditions.

Lands with Wilderness Characteristics

Alternative A and the Proposed RMP would provide the largest protection of identified lands with wilderness characteristics within the decision area. Alternatives B and C would provide intermediate protection of lands identified with wilderness characteristics within the decision area. Alternative D provides no protection of lands identified with wilderness characteristics with the decision area.

Livestock Grazing

Under Alternatives A, B, and C, public land available for livestock grazing would decrease from 490,047 acres to 366,231 acres. This change would occur through the BLM making 47 allotments or leases unavailable for grazing. Under the Proposed RMP, the BLM-administered lands available for livestock grazing would decrease from 490,047 acres to 360,303 acres. This change would occur through the BLM making 51 allotments or leases unavailable for grazing. Under Alternative D, the BLM would no longer authorize livestock grazing within the decision area, a change that would affect 490,047 acres. This change would occur through the BLM terminating existing grazing authorizations and making all allotments unavailable for grazing.

Minerals

Under the action alternatives and the Proposed RMP, the BLM would recommend for withdrawal from locatable mineral entry between 6 and 8 percent of the decision area, in addition to the 4 percent already withdrawn. Approximately 90 percent of the decision area would remain open to locatable mineral entry and salable mineral material disposal. All of the decision area would remain open to leasable mineral development.

National Trails System

Alternative D would provide the largest National Trail Corridor and protect the largest number of acres of BLM-administered lands within the viewshed. However, these acres only account for 9 percent of all viewable acres. Under the Proposed RMP, the BLM would administer 23 percent of the visible acres of BLM-administered lands within the viewshed as the Pacific Crest Trail's National Trail Management Corridor.

Rare Plants and Fungi

Only two ESA-listed plant species occur within forest and woodland habitat in the decision area: Kincaid's lupine and Gentner's fritillary; the BLM would conduct pre-disturbance surveys and apply conservation measures for these species. The BLM would manage Bureau Sensitive plant and fungi species under the Bureau's Special Status Species program under all alternatives and the Proposed RMP. Species that are currently Survey and Manage and not included on the Bureau Sensitive species list would receive no specific protections under any action alternative or the Proposed RMP.

Recreation and Visitor Services

Alternative A would provide a reduction in recreation opportunities when compared to the existing management situation. Alternative D would provide the largest number and acres of recreation management areas in closest proximity to the twelve most populated communities in the planning area. The Proposed RMP would provide more acres allocated as recreation management areas than Alternatives A, B, and C, and fewer acres than Alternative D.

Socioeconomics

BLM-administered lands provide a wide variety of market and non-market goods and services to the planning area such as timber, recreation, carbon storage, minerals, and source water protection. The annual harvest value of timber, compared to $23 million in 2012, would increase under all alternatives and the Proposed RMP, from $37 million under Alternative D to $135 million under Alternative C. Under the Proposed RMP, the annual harvest value of timber would increase to $51 million. Using non-market valuation techniques, recreation on BLM-administered lands had a value of $223 million in 2012. Based on a phased recreation development timeline of 50 years, the value of recreation in 2023 would range from $243 million under Alternative A to $278 million under Alternative D. Under the Proposed RMP, the value of recreation in 2023 would be $271 million. Assuming a 20-year phase-in period rather than a 50-year period, the value of recreation in 2023 would range from $230 to $331 million, with the Proposed RMP value at $311 million. Carbon storage on BLM-administered lands had a value of $85 million in 2012. The annual value of net carbon storage would increase under the Proposed RMP and all alternatives except Alternative C, under which it would fall to $43 million. Under the Proposed RMP, the annual value of net carbon storage would increase to $159 million in 2022.

In 2012, BLM management contributed 7,900 jobs and $355 million in earnings to the planning area, which is about 0.4 percent of the total jobs and earnings. Under the action alternatives, these contributions from BLM management would range from a low of 7,100 jobs and $310 million in earnings (Alternative D) to a high of 12,200 jobs and $573 million in earnings (Alternative C). Under the Proposed RMP, contributions from BLM management would be 8,500 jobs and $330 million in earnings. Employment effects to low-income populations in Coos and Curry Counties would be disproportionately negative under Alternatives A, B, and D, and the Proposed RMP. Under Alternative D, employment effects in Douglas and Klamath Counties would also be disproportionately negative. Low-income communities and Tribes in these counties would be vulnerable to these disproportionately negative effects.

There is uncertainty regarding the source and amounts of future payments to counties from activities on BLM-administered lands. Congress has not authorized payments under the Secure Rural Schools and Community Self-Determination Act (SRS) beyond 2016. SRS payments to counties totaled $38 million in 2012. Had payments in 2012 been based on the O&C Act formula, they would have been $12 million. Under the action alternatives, assuming payments were based on the formula in the O&C Act, payments in 2018 would range from a low of $19 million under Alternative D, to a high of $67 million under Alternative C. The Proposed RMP would result in payments of $26 million.

Soil Resources

All alternatives and the Proposed RMP would increase the acreage of detrimental soil disturbance from timber harvest, road construction, and fuels treatments by 13–29 percent of current amounts during the first decade. The BLM would be able to reduce the acreage of detrimental soil conditions from timber harvest, road construction, and fuels treatments through management practices that would limit initial compaction levels, remove existing or created compacted surfaces, and improve soil water and organic matter levels.

Sustainable Energy

Under the alternatives and the Proposed RMP, the majority of the land in the decision area would be available for the potential development of sustainable energy resources. While there is no current geothermal development and limited potential in the decision area, the action alternatives and the Proposed RMP would be less constraining to geothermal development than the current condition.

Trails and Travel Management

The action alternatives and the Proposed RMP would increase the acreage designated as *closed* for public motorized access and decrease the acreage designated as *open* for public motorized access when compared to the No Action alternative.

Tribal Interests

An ongoing dialogue between BLM representatives and designated Tribal representatives and their leadership produced the issues addressed in the Tribal Interests section. A large portion of the tribally identified issues are covered under specific resource sections (e.g., fish, water, socioeconomics, and cultural resources), though the effects specific to tribal communities may differ due to the unique relationships that Tribes have with the landscape and resources on it.

Visual Resources Management

Under the action alternatives and the Proposed RMP, visual landscape character would be subject to change and would result in a reduction to the scenic resource value over time. The BLM would manage a substantial acreage of land at a less protective Visual Resource Management class than what would be commensurate with the assigned Visual Resource Inventory class. Alternative D would provide the most protection, and Alternatives A, B, and C would provide the least protection of visual resources. The Proposed RMP would provide more protection of visual resources within the decision area than Alternatives B and C, and less protection than Alternatives A and D and the No Action alternative.

Wildlife

Northern spotted owl

The northern spotted owl population is under severe biological stress in much of western Oregon and has an even chance of being extirpated from the Coast Range within 20 years. This population risk is predominately due to competitive interactions between northern spotted owls and barred owls. Under current barred owl encounter rates, the BLM has no opportunity through habitat management alone in the Coast Range to reduce risks to the northern spotted owl during the next 50 years, and there are no substantive differences among the alternatives and the Proposed RMP in their potential effects from habitat management on those risks. However, in the western Cascades and Klamath Basin, the BLM would contribute to self-sustaining northern spotted owl populations during the next 50 years under the alternatives and the Proposed RMP. Under the Proposed RMP, the BLM would participate in, cooperate with, and provide support for an interagency program for barred owl management to implement Recovery Action 30 when the U.S. Fish and Wildlife Service determines the best manner in which barred owl management can contribute to the recovery of the northern spotted owl. Additionally, under the Proposed RMP, the BLM would not authorize timber sales that would cause the incidental take of northern spotted owls from timber harvest until implementation of a barred owl management program has begun.

Marbled Murrelet

All alternatives would result in an increase in the amount of marbled murrelet high-quality nesting habitat and total nesting habitat in 50 years. Alternatives A, B, and C would result in the loss of 106, 23, and 189 future marbled murrelet sites, respectively, because of timber harvest in the Harvest Land Base in the absence of surveys. The Proposed RMP would result in the loss of 13 future marbled murrelet sites because of timber harvest in the Harvest Land Base in the absence of surveys.

Wild Horses

The Pokegama herd is the only wild horse herd in the decision area and is currently 40 percent over appropriate management level of 30–50 horses. Alternative D, which would eliminate livestock grazing, would reduce competition for forage and provide the potential for increased growth of the Pokegama herd. Otherwise, the alternatives and the Proposed RMP would not differ in their effects on the Pokegama herd.

Wild and Scenic Rivers

Under the No Action alternative, the BLM would continue to manage the 51 eligible Wild and Scenic River segments under interim management to protect their Outstandingly Remarkable Values (ORVs), water quality, free-flowing characteristics, and tentative classification as Wild, Scenic, or Recreational until suitability is determined during subsequent land use planning efforts. Under Alternative A, the BLM would not recommend any of the 51 eligible Wild and Scenic River segments for inclusion into the National System, resulting in impacts to all eligible river segments and their associated values. Under Alternatives B and C, and the Proposed RMP, the BLM would recommend the 6 eligible Wild and Scenic River segments determined to be suitable. Under Alternative D, the BLM would recommend all 51 eligible Wild and Scenic River segments for inclusion into the National System, resulting in the largest protection for all segments and their associated river values.

Consultation and Coordination

The preparation of the Draft RMP/EIS included 38 public involvement efforts, including formal scoping, regional workshops on recreation management, community listening sessions, and public meetings about the Planning Criteria and preliminary alternatives.

On April 24, 2015, the BLM released the Draft RMP/EIS, announcing, at that time, a 90-day comment period that would conclude on July 23, 2015. On July 13, 2015, the BLM extended the comment period on the Draft RMP/EIS until August 21, 2015. During the comment period, the BLM held 17 scheduled public meetings in May and June of 2015. These meetings included open houses in Roseburg, Springfield, Salem, Klamath Falls, Medford, Coos Bay, and Portland. These public meetings also included workshops on socioeconomics in Salem and Roseburg, workshops on recreation in Roseburg, Grants Pass, Salem, and Springfield, workshops on forest management and wildlife in Salem and Medford, and a workshop on riparian management in Springfield. The BLM also held a public meeting with an invitation for elected officials in Salem. The BLM received approximately 4,500 comments on the Draft RMP/EIS during the comment period.

The BLM is consulting on a government-to-government level with the nine federally recognized Tribes located within, or that have interests within, the planning area. The Confederated Tribes of Grand Ronde, the Confederated Tribes of Siletz Indians, the Coquille Indian Tribe, the Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians, the Cow Creek Band of Umpqua Tribe of Indians, and the Klamath Tribes are formal cooperators in the RMP revisions, in addition to their government-to-government status.

The BLM has been assisted in the preparation of the Proposed RMP/Final EIS by a Cooperating Agency Advisory Group, which includes representatives of Federal and State agencies, counties, and Tribes. In addition to meeting as a full group periodically throughout the development of the Draft RMP/EIS and the Proposed RMP/Final EIS, the Cooperating Agency Advisory Group also created five working groups in order to facilitate a more detailed level of engagement with the BLM on the following topics: aquatics, outreach, terrestrial, socio-economics, and tribal issues.

Working through a robust engagement process with neutral facilitation, the cooperators have provided expertise on much of the subject matter the BLM is addressing in the Proposed RMP/Final EIS, as well as advice based on experience with similar planning efforts. The cooperators have provided feedback on public outreach sessions, data sources and analytical methods, and components of the alternatives. They have provided oral and written feedback and ideas throughout the process of developing the Draft RMP/EIS and the Proposed RMP/Final EIS. Nearly all cooperators have been positive about the level of engagement and the general direction of the planning process. However, the Association of O&C Counties (which is the designated representative of 15 counties) has continued to express a high level of concern about the BLM’s planning process. Specifically, the Association of O&C Counties continues to assert that the BLM’s Purpose and Need statement was fatally flawed by failing to place sustained sustained-yield timber production as the primary purpose of the planning effort.

The BLM district managers and planning personnel have met with individual county commissioners on an ongoing basis to provide updates on progress and key milestones. As noted above, several county governments are formal cooperators in the planning process. While the Association of O&C Counties represents most of the counties at the Cooperating Agency Advisory Group meetings, BLM district managers also maintain relationships with local county representatives.

The BLM has begun consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service under Section 7(a)(2) of the Endangered Species Act (ESA) and will complete consultation before signing Records of Decision for the RMP revision. The BLM, U.S. Fish and Wildlife

Service, and National Marine Fisheries Service signed an ESA Consultation Agreement, which identifies responsibilities for each agency and defines the processes, products, actions, timeframe, and expectations for the consultation process.

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Chapter 1 – Introduction

The Bureau of Land Management (BLM) is revising the resource management plans (RMPs) for its Coos Bay, Eugene, Medford, Roseburg, and Salem Districts, and the Klamath Falls Field Office of the Lakeview District (1995 RMPs; USDI BLM 1995 a, b, c, d, e, f). This Proposed RMP/Final Environmental Impact Statement (Proposed RMP/Final EIS) provides a description and analysis of the management approach that the BLM is proposing for these lands, along with the various alternative management approaches that the BLM analyzed in the Draft RMP/EIS.

In 2012, the BLM conducted an evaluation of the 1995 RMPs in accordance with its planning regulations, which require that RMPs "shall be revised as necessary based on monitoring and evaluation findings, new data, new or revised policy and changes in circumstances affecting the entire plan or major portions of the plan" (43 CFR 1610.5–6). This evaluation contains the conclusion that "[a] plan revision is needed to address the changed circumstances and new information that has led to a substantial, long-term departure from the timber management outcomes predicted under the 1995 RMPs" (USDI BLM 2012a, p. 12). Included in this evaluation was the identification of new information related to northern spotted owls, (including new demographic studies, the Revised Recovery Plan for the Northern Spotted Owl (*Strix occidentalis caurina*)(owl recovery plan; USDI FWS 2011), and revision of critical habitat by the U.S. Fish and Wildlife Service (77 FR 71875)), and the BLM concluded that the EIS supporting the 1995 RMPs contains outdated analysis relative to the development of suitable habitat for the northern spotted owl (USDI BLM 2012, p. 14). From this evaluation, the BLM identified a need to modify or update management direction for most of the other resource management programs due to changed circumstances and new information.

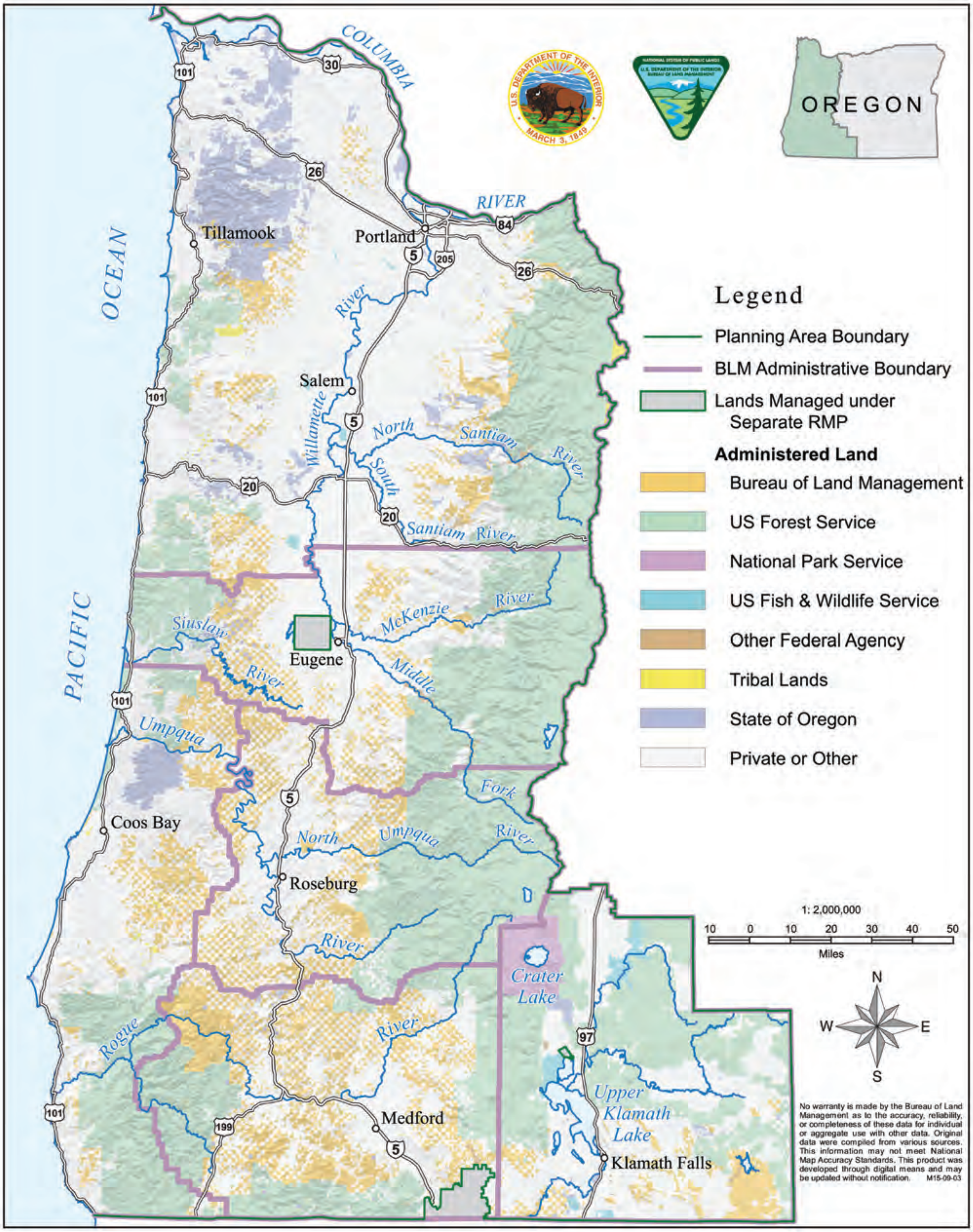
Summary of Notable Changes from the Draft RMP/EIS

Chapter 1 of this Proposed RMP/Final EIS—

- Expands the discussion in "Relationship of the RMPs to Other Plans and Programs" to address the relationship of the Proposed RMP to the Aquatic Conservation Strategy in the Northwest Forest Plan, and
- Updates the list of existing decisions that will be carried forward into the RMPs.

The Planning Area

The planning area includes approximately 2.5 million acres of BLM-administered lands in western Oregon managed by the BLM's Coos Bay, Eugene, Medford, Roseburg, and Salem Districts and the Klamath Falls Field Office of the Lakeview District (**Map 1-1**).



Map 1-1: Major Ownership within the Planning Area

Throughout this document, the BLM will use the term 'planning area' to refer to all lands within the geographic boundary of this planning effort regardless of jurisdiction. However, the BLM will only make decisions on lands that fall under BLM jurisdiction (including mineral estate). The BLM will use the term 'decision area' to refer to the lands within the planning area for which the BLM has authority to make land use and management decisions. In general, the BLM has jurisdiction over all BLM-administered lands (surface and subsurface) and over mineral estate in areas of split estate (i.e., areas where the BLM administers Federal mineral estate, but the surface is not administered by the BLM).

Within the western Oregon offices, three BLM-administered areas are not included in the decision area: the Cascade Siskiyou National Monument (Medford District), the Upper Klamath Basin and Wood River Wetland (Klamath Falls Field Office), and the West Eugene Wetlands (Eugene District). These areas have independent RMPs, and this revision process will not alter these independent RMPs.

Planning Process

The BLM integrates its planning process with its compliance with the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq*.), which requires that Federal agencies prepare an environmental impact statement (EIS) for all actions that significantly affect the quality of the human environment. The BLM planning regulations direct: "Approval of a resource management plan is considered a major Federal action significantly affecting the quality of the human environment. The environmental analysis of alternatives and the proposed plan shall be accomplished as part of the resource management planning process and, wherever possible, the proposed plan and related environmental impact statement shall be published in a single document" (43 CFR 1601.0–6). Therefore, the BLM presents this Proposed RMP integrated with the Final Environmental Impact Statement as a single document (Proposed RMP/Final EIS).

Preparing a RMP involves the following nine interrelated actions or steps:

1. Conduct scoping and identify issues.
2. Collect inventory data.
3. Analyze management situation.
4. Develop planning criteria.
5. Formulate alternatives.
6. Analyze effects of alternatives.
7. Select the preferred alternative; issue Draft RMP/EIS.
8. Issue Proposed RMP/Final EIS.
9. Sign Record of Decision.

The BLM has prepared a single Proposed RMP/Final EIS for the revision of the RMPs for the Coos Bay, Eugene, Medford, Roseburg, and Salem Districts and the Klamath Falls Field Office of the Lakeview District. At this time, the BLM anticipates issuing two Records of Decision/Resource Management Plans (RODs/RMPs): one ROD/RMP that would apply to the Coos Bay District, Eugene District, Salem District, and the Swiftwater Field Office of the Roseburg District; and another ROD/RMP that would apply to the Klamath Falls Field Office of the Lakeview District, the Medford District, and the South River Field Office of the Roseburg District.

Decision to be Made

Through this effort, the BLM will decide on an approach to managing the public land it administers in western Oregon. As described in the Federal Land Policy and Management Act (FLPMA; 43 U.S.C, 1701(a)(2)), RMPs are tools by which "present and future use is projected." The BLM's planning regulations make clear that RMPs are a preliminary step in the overall process of managing public lands, and are “designed to guide and control future management actions and the development of subsequent, more detailed and limited scope plans for resources and uses” (43 CFR 1601.0–2).

The major provisions of the RMPs will include the following land use plan decisions:

- Objectives for the management of BLM-administered lands and resources;
- Land use allocations relative to future uses for the purposes of achieving the various objectives; and
- Management direction that identifies where future actions may or may not be allowed and what restrictions or requirements may be placed on those future actions to achieve the objectives set for the BLM-administered lands and resources.

Management objectives are descriptions of desired outcomes for BLM-administered lands and resources in an RMP; the resource conditions that the BLM envisions or desires would eventually result from implementation of the RMP. As such, management objectives are not rules, restrictions, or requirements by which the BLM determines which implementation actions to conduct or how to design specific implementation actions.

Through the RMPs, the BLM will determine and declare the annual productive capacity for sustained-yield timber production.[1] The annual productive capacity is the timber volume that a forest can produce continuously under the intensity of management described in the RMPs for those lands allocated for sustained-yield timber production. The BLM will make the determination and declaration of the annual productive capacity for each of the six sustained yield units, which match the five western Oregon BLM district boundaries and the western portion of the Klamath Falls Field Office in the Lakeview District.[2] The determination of the annual productive capacity includes compliance with other laws and consideration of the objectives, land use allocations, and management direction of the RMPs, which affect the amount of timber that each of the sustained yield units can produce. Chapter 3 contains additional discussion of the determination of the annual productive capacity under Vegetation Modeling Products.

In both the 1995 RMPs and in the 2008 RMPs, the BLM identified that there would be some level of variation in the annual amount of timber offered for sale. In this plan revision process, the BLM will consider whether the plan will include some level of variation in the amount of sustained-yield timber volume that the BLM will offer on an annual basis or over a longer period of time. In making a decision about the extent to which the plan will identify such variation in the amount of sustained-yield timber volume to be offered, the BLM will take into account a number of factors, including the availability of resources and compliance with applicable law, among other agency considerations. The BLM would identify the level of variation in the amount of sustained-yield timber volume that may be offered as part of the declaration of the annual productive capacity in this RMP.

The Proposed RMP does not include any implementation decisions to be included in the eventual Records of Decision/RMPs.[3] That is, the BLM anticipates that all of the decisions in the Records of Decision/RMPs will be land use plan decisions.

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[1] The terms ‘annual productive capacity,’ ‘annual sustained yield capacity,’ ‘sustained yield capacity,’ and ‘allowable sale quantity’ are synonymous.

[2] The BLM is in the process of consolidating the Eugene District and Salem District under a single administrative and operational unit with one District Manager. This consolidation does not alter the Eugene sustained-yield unit or the Salem sustained-yield unit, and these sustained-yield units remain the basis upon which the BLM determines and declares the ASQ.

[3] Implementation decisions authorize implementation of on-the-ground projects. Land use plan decisions (land use allocations, management objectives, and management direction) do not directly authorize implementation of on-the-ground projects. Land use plan decisions guide and control future implementation decisions, which can be carried

Purpose and Need for Action

The purpose and need statement describes why the BLM is revising the 1995 RMPs and what outcomes the BLM intends the RMPs to achieve. The purpose and need statement defines the range of alternatives that will be analyzed in the planning process, because alternatives must respond to the purpose and need for action to be considered reasonable.

The proposed action is to revise the 1995 RMPs with land use allocations, management objectives, and management direction that best meet the purpose and need.

This plan revision process takes place against the backdrop of past planning efforts. These previous planning efforts and their supporting analyses, including the Record of Decision for the Northwest Forest Plan (USDA FS and USDI BLM 1994a), the 1995 RMPs (the plans currently in effect; USDI BLM 1995 a, b, c, d, e, f), and the 2008 RMPs (which are no longer in effect; USDI BLM 2008 a, b, c, d, e, f), together with the results of the scoping process for this planning effort help to inform the BLM's discretion in determining the purpose and need for this action and to identify the scope of alternatives and impacts that need to be explored in this planning effort.

Need for the Action

The BLM conducted plan evaluations in accordance with its planning regulations, which require that RMPs "shall be revised as necessary based on monitoring and evaluation findings, new data, new or revised policy and changes in circumstances affecting the entire plan or major portions of the plan" (43 CFR 1610.5–6). These evaluations concluded that "[a] plan revision is needed to address the changed circumstances and new information that has led to a substantial, long-term departure from the timber management outcomes predicted under the 1995 RMPs" (USDI BLM 2012a, p. 12). These evaluations also concluded that the management direction for most of the other resource management programs need to be modified or updated because of changed circumstances and new information. These evaluations concluded that changes are particularly indicated for the fisheries, aquatics, recreation, off-highway vehicle, and fire and fuels programs.

Moreover, the BLM needs to revise existing plans to replace the 1995 RMPs' land use allocations and management direction because of new scientific information and policies related to the northern spotted owl. Since the 1995 RMPs were approved, there have been analyses on the effects of land management on northern spotted owl habitat, demographic studies, and analyses of the effects of barred owls on northern spotted owls. In addition, since that time, new policies for northern spotted owls have been put in place, including a revised recovery plan and a new designation of critical habitat.

Purpose of the Action

The purpose of this proposed action is to make land use plan decisions to guide the management of BLM-administered lands.

Several of the purposes of the action are necessary for the BLM to be able to deliver a predictable supply of timber from the BLM-administered lands, based on the BLM's almost two decades of experience implementing the Northwest Forest Plan, new scientific information, and the advice of other Federal

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out only after completion of further appropriate NEPA analysis or documentation, consultation, and decision-making processes.

agencies, as discussed below. Harvesting timber on a sustained-yield basis for the Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act (O&C Act; 43 U.S.C. 1181a *et seq*.) purposes is required under the O&C Act. Harvesting timber on a sustained-yield basis ensures that the BLM will achieve the purposes of the O&C Act, which include continuing to be able to provide, over the long term, a sustained volume of timber within the management direction in the RMP. Declining populations of species now listed under the Endangered Species Act (16 U.S.C. 1531 *et seq*.) have caused the greatest reductions and instability in the BLM's supply of timber in the past. Any further population declines of listed species or new species listings would likely lead to additional reductions in timber harvest. Contributing to the conservation and recovery of listed species is essential to delivering a predictable supply of timber. Specifically, the BLM recognizes that providing large, contiguous blocks of late-successional forest and maintaining older and more structurally-complex multi-layered conifer forests are necessary components of the conservation and recovery of the northern spotted owl. Providing clean water is essential to the conservation and recovery of listed fish, and a failure to protect water quality would lead to restrictions that would further limit the BLM's ability to provide a predictable supply of timber. Furthermore, the O&C Act recognizes the importance of water quality; the purposes of sustained yield include, among others, "protecting watersheds and regulating stream flow." Finally, in fire-prone ecosystems in southern Oregon, the BLM must manage forests to reduce the likelihood of catastrophic fires and the attendant loss of timber. These purposes require the BLM to exercise its discretion to determine how best to achieve sustained-yield timber production over the long term and avoid future limitations on timber production.

Provide a Sustained Yield of Timber

The purpose of the action includes providing a sustained yield of timber. The O&C Act requires that the revested Oregon and California Railroad Grant lands and reconveyed Coos Bay Wagon Road Grant lands (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." 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, including harvest methods, rotation length, silvicultural regimes under which these forests would be managed, or minimum level of harvest. In addition, the FLPMA specifically provides that if there is any conflict between its provisions and the O&C Act related to 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 note (b)). Thus, the multiple-use management direction of the FLPMA does not apply to the O&C lands that are suitable for timber production. The planning process established by the FLPMA is applicable to the O&C lands, because it is not in conflict with the O&C Act's management direction for those lands.

For the public domain lands, the FLPMA requires that public lands be managed "on the basis of multiple use and sustained yield unless otherwise specified by law" (43 U.S.C. 1701 [Sec. 102.a.7]). The FLPMA also 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]).

Conservation and Recovery of Threatened and Endangered Species

The purpose of the action includes contributing to the conservation and recovery of threatened and endangered species within the planning area, including the northern spotted owl, marbled murrelet, and threatened and endangered anadromous fish. The Endangered Species Act requires agencies to ensure that their actions are not likely to jeopardize the continued existence of ESA-listed species or result in the adverse modification or destruction of critical habitat. Since the adoption of the Northwest Forest Plan, BLM has recognized that additional species listings could have the effect of further limiting the BLM's ability to provide a sustained yield of timber under the O&C Act (USDA FS and USDI BLM 1994a, pp. 49–50). Using its discretion and authority under the O&C Act and the FLPMA, the BLM can direct sustained-yield management of the O&C lands and public domain lands in western Oregon in a manner that contributes to the conservation and recovery of ESA-listed species and helps limit or avoid future listings, and thereby best ensures a permanency of timber production over the long term, while, among other benefits of sustained yield, contributing to the economic stability of local communities.

The purpose of contributing to the conservation and recovery of the northern spotted owl necessarily includes maintaining a network of large blocks of forest to be managed for late-successional forests and maintaining older and more structurally-complex multi-layered conifer forests, based on the existing scientific information on the conservation needs of the northern spotted owl and the results of previous analyses as described below.

Large, Contiguous Blocks of Late-successional Forests

Large, contiguous blocks of late-successional forest have been an element of northern spotted owl conservation strategies for over two decades. Thomas *et al*. (1990, pp. 23–27) described that a conservation strategy for the northern spotted owl requires large blocks of nesting, roosting, and foraging habitat (i.e., suitable habitat) that support clusters of reproducing owls, distributed across a variety of ecological conditions and spaced so as to facilitate owl movement between the blocks. Courtney *et al*. (2004, pp. 9-11, 9-15), in the status review for the northern spotted owl, evaluated the conservation needs of the northern spotted owl and concluded that, based on existing knowledge, large contiguous blocks of suitable habitat are still necessary for northern spotted owl conservation. Culminating this confirmation of the scientific information on the conservation needs of the northern spotted owl, the owl recovery plan recommends managing for large, contiguous blocks of late-successional forest (USDI FWS 2011, p. III-19).

Based on the results of previous analyses, large contiguous blocks of late-successional forest would not develop in the absence of a land use allocation reserving a network of large blocks of forest. The Supplemental EIS for the Northwest Forest Plan (USDA FS and USDI BLM 1994b, p. 2-22) explicitly required that all alternatives analyzed in detail include the allocation of a network of Late-Successional Reserves. Other previous planning efforts have considered alternatives that would not allocate such a network, including:

- Alternative A in the 1994 RMP/EIS, which would have reserved no late-successional forest outside of special areas and sites occupied by ESA-listed species
- Alternative B in the 1994 RMP/EIS, which would have reserved small blocks of late-successional forest
- Alternative 3 in the 2008 Final EIS (FEIS), which would have allocated the majority of the landscape to a General Landscape Area that directed timber harvest on long rotations

For each of those alternatives, the analyses concluded that these alternatives would have resulted in less contribution to northern spotted owl conservation than alternatives that allocated a network of large blocks of forest. Notably, Alternative 3 in the 2008 FEIS would have resulted in a total acreage of northern spotted owl habitat comparable to most other action alternatives, but would have failed to meet the conservation needs of the spotted owl because of the arrangement of that habitat. Overall, these previous analyses demonstrated that large, contiguous blocks of late-successional forest would not have developed under these alternatives, further demonstrating that reserving a network of large blocks of forest from programmed timber harvest is a necessary part of the purpose of contributing to the conservation and recovery of the northern spotted owl.

Older and More Structurally-complex Multi-Layered Conifer Forests

The scientific foundation for the importance of older, more structurally-complex multi-layered conifer forests as habitat for the northern spotted owl has been clearly established. Thomas *et al*. (1990) described high-quality northern spotted owl habitat as older, multilayered, structurally-complex forests characterized by large-diameter trees, high amounts of canopy cover, numerous large snags, and lots of downed wood and debris. Courtney *et al*. (2004, pp. 5–18), in the status review for the northern spotted owl, evaluated the existing scientific information on spotted owl habitat and confirmed that nesting, foraging, and roosting habitat is associated with older, more structurally-complex multi-layered conifer forests in the Pacific Northwest. The 15-year spotted owl monitoring report concluded that the highest stand-level habitat suitability for spotted owls is provided by older, more structurally-complex forests (Davis *et al*. 2011, p. 38).

The owl recovery plan recommends maintaining older and more structurally-complex multi-layered conifer forests. As noted in the owl recovery plan, the maintenance of older, more structurally-complex multi-layered conifer forests has scientific support at several scales: "At the scale of a spotted owl territory, Dugger *et al*. (in press) found an inverse relationship between the amount of old forest within the core area and northern spotted owl extinction rates from territories. At the population scale, Forsman *et al*. (2011) found a positive relationship between recruitment of spotted owls into the overall population and the percent cover of spotted owl NRF [nesting, roosting, and foraging] habitat within study areas" (USDI FWS 2011, p. III-67). The U.S. Fish and Wildlife Service noted that, in dry forest areas, maintaining these older and more structurally-complex multi-layered conifer forests may require active management to meet the overlapping goals of spotted owl recovery and restoration of dry forest structure, composition, and processes including fire, insects, and disease.

Previous planning efforts have considered a wide variety of approaches to the management of older, more structurally-complex multi-layered conifer forests, including—

- Alternative A in the 1994 RMP/EIS, which would have reserved no late-successional forest outside of special areas and sites occupied by ESA-listed species;
- The 1995 RMP, which reserved approximately 83 percent of old-growth forest;
- The Proposed RMP in the 2008 FEIS, which would have reserved 81 percent of old-growth forest and would have deferred harvest of any forest older than 160 years old for 15 years;
- Alternative E in the 1994 RMP/EIS, which would have reserved all old-growth forest;
- A sub-alternative for Alternative 1 in the 2008 FEIS, which would have reserved all forests older than 200 years old; and
- A sub-alternative for Alternative 1 in the 2008 FEIS, which would have reserved all forests older than 80 years old.

None of these alternative approaches defined management direction explicitly in terms of older, more structurally-complex multi-layered conifer forests, but used a variety of different terms, such as older forest, old-growth forest, late-successional forests, or a specific stand age. Nevertheless, these different management approaches would have resulted in the maintenance of differing amount of older and more structurally-complex multi-layered conifer forests. Those analyses demonstrated that alternatives that would have maintained more older and more structurally-complex multi-layered conifer forests would have maintained more northern spotted owl habitat and would have provided better conditions for northern spotted owl movement between large blocks of habitat than alternatives that would have maintained less older and more structurally-complex multi-layered conifer forests.

The existing science clearly establishes the importance of older and more structurally-complex multi-layered conifer forests as northern spotted owl habitat; the owl recovery plan recommends the maintenance of older and more structurally-complex multi-layered conifer forests; and the results of previous analyses demonstrate that maintaining older and more structurally-complex multi-layered conifer forests would contribute to meeting conservation needs of the northern spotted owl. Therefore, maintaining older and more structurally-complex multi-layered conifer forest is a necessary part of the purpose of contributing to the conservation and recovery of the northern spotted owl.

To respond to this purpose for the action, alternatives would explore differing approaches to defining older and more structurally-complex multi-layered conifer forest, by such criteria as stand age, structure, size, or landscape context. In addition, alternatives would explore differing management approaches to maintaining older and more structurally-complex multi-layered conifer forest, such as active management in dry forest areas to reduce fire risk and restore fire resiliency.

The purpose of this action includes maintaining marbled murrelet habitat. The status review of the marbled murrelet prepared for the U.S. Fish and Wildlife Service reviewed the existing scientific information and confirmed the importance of maintaining suitable nesting habitat to the conservation and recovery of the marbled murrelet (McShane *et al*. 2004, pp. 4-61 – 4-63). Additionally, the recovery plan for the marbled murrelet (USDI FWS 1997) recommends protecting adequate nesting habitat for the marbled murrelet.

The purpose of this action includes protecting existing habitat and restoring degraded habitat for threatened and endangered anadromous fish. The status review of threatened and endangered anadromous fish prepared by the National Marine Fisheries Service reviewed the existing scientific information and confirmed the importance of maintaining existing habitat and restoring degraded habitat to the conservation and recovery of threatened and endangered fish (Good *et al*. 2005). The National Marine Fisheries Service has prepared several final and draft recovery plans for ESA-listed salmonid fish within the planning area, including the Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead (ODFW/USDC NMFS 2011), which recommend maintaining existing habitat and restoring degraded habitat.

Provide Clean Water in Watersheds

The purpose of the action includes continuing to comply with the Clean Water Act (33 U.S.C. 1251 *et seq*.), which directs the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. The policy declaration in the FLPMA states that the BLM should manage the public lands in a manner that protects many resources and their values, including the water resource (43 U.S.C. 1701[a][8]). The FLPMA directs that land use plans provide for compliance with applicable State and Federal air, water, noise, or other pollution control laws, standards, or implementation plans (43 U.S.C. 1712[c][8]).

In addition, the O&C Act includes reference to protecting watersheds and regulating stream flows, requiring 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 … protecting watersheds, regulating stream flow …" (43 U.S.C. 1181a).

Restore Fire-adapted Ecosystems

The purpose of the action includes restoring fire-adapted ecosystems to increase fire resiliency. Previous analyses have shown that active management in the dry forest landscape of southern Oregon can positively influence fire risk and fire resiliency, thereby restoring fire-adapted ecosystems (2008 FEIS). Further, as noted in the owl recovery plan, natural landscape resilience mechanisms in the dry forest landscape of southern Oregon have been decoupled by fire exclusion and wildfire suppression activities. The owl recovery plan recommends active management within the dry forest landscape to restore ecosystem resiliency. Additionally, in order to provide for sustained yield of timber from public lands under the O&C Act, BLM management must account for potential loss of this timber to fire. Based on the BLM's authority under the O&C Act, the results of previous analyses showing the benefits of active management in restoring fire-adapted ecosystems, and in light of the recommendations in the owl recovery plan, the purpose of this action includes restoring fire-adapted ecosystems to increase fire resiliency.

Provide for Recreation Opportunities

The purpose of the action includes providing for recreation opportunities. The FLPMA requires that, among other uses, "the public lands be managed in a manner that will … provide for outdoor recreation" 43 CFR 1701 [Sec. 102.a.8]. In addition, the O&C Act states that O&C lands shall 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 recreational facilities" (43 U.S.C. 1181a). Finally, changes in BLM policy since the 1995 RMPs for recreation land use allocations and management objectives necessitate plan revision, as concluded in the BLM plan evaluations (USDI BLM 2012, pp. 28–29).

Coordinate Management of Lands Surrounding the Coquille Forest with the Coquille Tribe

The management of the Coquille Forest is subject by law (25 U.S.C. 715c (d)) to the standards and guidelines of forest plans for adjacent or nearby Federal forest lands. Title V of the Oregon Resource Conservation Act of 1996 (Pub. L. 104-208) created the Coquille Forest to be held in trust for the benefit of the Coquille Tribe. This 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." This Act also requires the Secretary of the Interior to take the Coquille Forest lands into trust for the benefit of the Coquille Tribe. As such, the purpose of the action includes coordinating the management of BLM-administered lands "adjacent or nearby" the Coquille Forest with the Coquille Tribe.

Guidance for Development of All Action Alternatives and the Proposed RMP

The BLM developed all action alternatives and the Proposed RMP to meet the purposes for the action, described above in the Purpose and Need for Action. To be considered reasonable, action alternatives and the Proposed RMP had to make a substantial and meaningful contribution to meeting each of the purposes, rather than a minimal contribution. The alternatives and the Proposed RMP explored various ways of contributing to these purposes and meeting the requirements of the management guidance provided in this document.

In developing all action alternatives and the Proposed RMP, the BLM—

- Reviewed existing Areas of Critical Environmental Concern (ACECs) and nominations for new ACECs. In this review, the BLM did the following:
    - Determined if they meet the Relevance and Importance criteria
    - Determined, for those on O&C lands that meet Relevance and Importance criteria, if designation would be in conflict with the O&C Act, as detailed below under The O&C Act and the FLPMA
    - Eliminated from further consideration those areas that do not meet criteria for designation as ACECs
    - Determined the relevant and important resource values of the remaining nominations which could be protected and maintained through other features of the alternatives or if special management attention is needed
    - Included in the development of the alternatives those nominations that meet criteria for designation as ACECs
- Designated areas as Special Recreation Management Areas or Extensive Recreation Management Areas; lands not designated as one of these two categories are public lands not designated for recreation. Developed a range of recreation management area scenarios in relationship to various land use allocations and management objectives among the alternatives, consistent with the discussion of recreation management areas below under The O&C Act and the FLPMA
- Designated Visual Resource Management classifications for all areas; developed a range of Visual Resource Management classification scenarios in relationship to various land use allocations and management objectives among the alternatives, consistent with the discussion of visual resources below under The O&C Act and the FLPMA
- Evaluated all eligible Wild and Scenic River segments and determined which were suitable or non-suitable per Section 5(d)(1) of the Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1271 *et seq*.) and consistent with BLM Manual 6400 – Wild and Scenic Rivers (USDI BLM 2012b).
- Designated areas as *open*, *limited*, or *closed* to public motorized access in accordance with 43 CFR 8342.1; developed a range of travel management area scenarios in relationship to various land use allocations and management objectives among the alternatives; and deferred implementation-level travel and transportation management planning until after completion of the RMP revision process. For those areas designated as *limited* in the RMP, defined interim management objectives and clearly identified the process leading from the interim area designation of 'limited to existing roads, primitive roads and trails' to the development of a designated network of roads, primitive roads and trails, consistent with BLM Handbook 8342 – Travel and Transportation Handbook (USDI BLM 2012c)
- Considered a range of management alternatives for addressing lands with wilderness characteristics, consistent with the discussion of lands with wilderness characteristics below under The O&C Act and the FLPMA
- Designated areas that are available and have the capacity for planned, sustained-yield timber harvest, and declared an Allowable Sale Quantity of timber that represents the annual productive capacity for sustained-yield timber production
- Designated lands that are available or not available for livestock grazing; for lands available for livestock grazing, identified the amount of forage available for livestock
- Designated land tenure zones identifying lands for retention, disposal, or acquisition
- Designated lands as open, stipulated, or closed to the several forms of mineral entry location, leasing, or sale as appropriate to the type of commodity and land status; identified areas, if any, that the BLM would recommend for withdrawal from locatable mineral entry

In developing the action alternatives and the Proposed RMP, the BLM considered the concepts contained in the Framework to Guide Forest Service and Bureau of Land Management Land Use Plan Revisions and Amendments, dated April 11, 2011 (RIEC 2011).

The BLM did not constrain the development of alternatives by current or projected BLM budget or staff levels. As long as alternatives were economically feasible, the analysis of the alternatives assumed that BLM budget and staff would be sufficient to implement all alternatives and the Proposed RMP. The analysis of alternatives and the Proposed RMP included an evaluation of the cost of implementation.

In accordance with national BLM planning policy (USDI BLM 2005, pp. 11–13), the RMP will emphasize management direction for allowable uses and management actions needed to achieve desired resource goals and objectives, rather than administrative process, reviews, or analysis requirements. The BLM will use program guidance issued outside the land use planning process to provide direction on administrative process, reviews, and analysis. Ongoing program guidance provides more flexibility to respond to changing national or state-level BLM administrative process or analysis requirements. Of course, the RMP process itself will be conducted consistent with procedural, review, and analysis requirements necessary to comply with Federal law and regulations applicable to planning for BLM-administered lands.

The BLM developed action alternatives and the Proposed RMP to provide a high degree of predictability and consistency about implementing land management actions and a high degree of certainty of achieving management objectives (desired outcomes), especially those outcomes related to discrete statutory mandates.

The BLM developed action alternatives and the Proposed RMP to provide cumulative effects analysis, which provides a framework to simplify and facilitate project-level NEPA analysis for management actions implementing the RMP.

The BLM developed action alternatives to simplify implementation of management actions and reduce the costs of implementation.

Working closely with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, the BLM developed the action alternatives and the Proposed RMP to provide sufficient detail in the analysis to facilitate RMP-level Endangered Species Act consultation, as well as eventual project-level consultation for management actions implementing the RMP.

Working closely with the Oregon Department of Environmental Quality, in coordination with the Environmental Protection Agency, the BLM developed the action alternatives and the Proposed RMP to satisfy State and Federal water quality rules and regulations at the RMP level.

Major Authorizing Laws

This section discusses how various laws affect management of the BLM-administered lands in the planning area. The planning area includes lands of different status: O&C lands, public domain lands, and acquired lands. This section only addresses the laws that have a substantial effect on the development and design of alternatives in this RMP revision. In addition to the laws presented here, many other legal authorities affect management of BLM-administered lands (**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 implement concurrently all these laws, in a manner that harmonizes any seeming conflict between them, unless

Congress has provided that one law would override another law, such as with the O&C Act and the FLPMA, as described below.

Endangered Species Act

Section 7 of the Endangered Species Act 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 U.S. Fish and Wildlife Service or the National Marine Fisheries Service to ensure that actions these agencies authorize, fund, or carry out will not jeopardize species listed as threatened or endangered under the Endangered Species Act 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 Endangered Species Act and that may need special management or protection. The BLM will complete Section 7 consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service prior to signing Records of Decision/RMPs for this RMP revision.

Clean Water Act

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 anti-degradation policies and programs, including ambient monitoring, be employed to keep the water quality at acceptable levels. In accord with this statute, the responsibility for establishing these standards, developing a strategy for meeting these standards, and monitoring their attainment in Oregon has been delegated to the Oregon Department of Environmental Quality.

Sections 303(d), 313(a), and 319 of the Clean Water Act are relevant to management of water resources on BLM-administered lands. Section 303(d) (codified as 33 U.S.C. 1313[d]) directs the 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. The total maximum daily loads 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 authorized by the Clean Water Act, along with other tools available from Federal, state, and local governments and nongovernmental organizations. Section 313(a) (codified as 33 U.S.C. 1323[a]) directs that the Federal Government, "(1) having jurisdiction over any property or facility, or (2) engaged in any activity resulting, or which may result, in the discharge or runoff of pollutants," shall comply with requirements for the control and abatement of water pollution. Section 319 (codified as 33 U.S.C. 1329) established management programs to control water pollution from nonpoint sources, such as sediment.

Federal Land Policy and Management Act

The FLPMA provides the legal authority to the Secretary of the Interior for the management of public lands. The FLPMA 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 archaeological 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 use" (43 U.S.C. 1701 [Sec. 102.a.8]). In addition, the FLPMA 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]). The FLPMA directs that acquired lands "… shall, upon acceptance of title, become public lands, and, for the administration of public land laws not repealed by this Act, shall remain public lands" (43 U.S.C. 1701 [Sec. 205.c]).

Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act

The O&C Act provides the legal authority to the Secretary of the Interior for management of the O&C lands. The O&C Act requires that the O&C lands "classified as timberlands … shall be managed … for permanent forest production, and the timber thereon shall be sold, cut, and removed in conformity with the principal [sic] 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). Section 701(b) of the FLPMA states, "Notwithstanding any provision of this Act, in the event of conflict with or inconsistency between this Act and [the O&C Act] …, insofar as they relate to management of timber resources, and disposition of revenues from lands and resources, the latter Acts shall prevail." In this case, the "latter Acts" refers to the O&C Act.

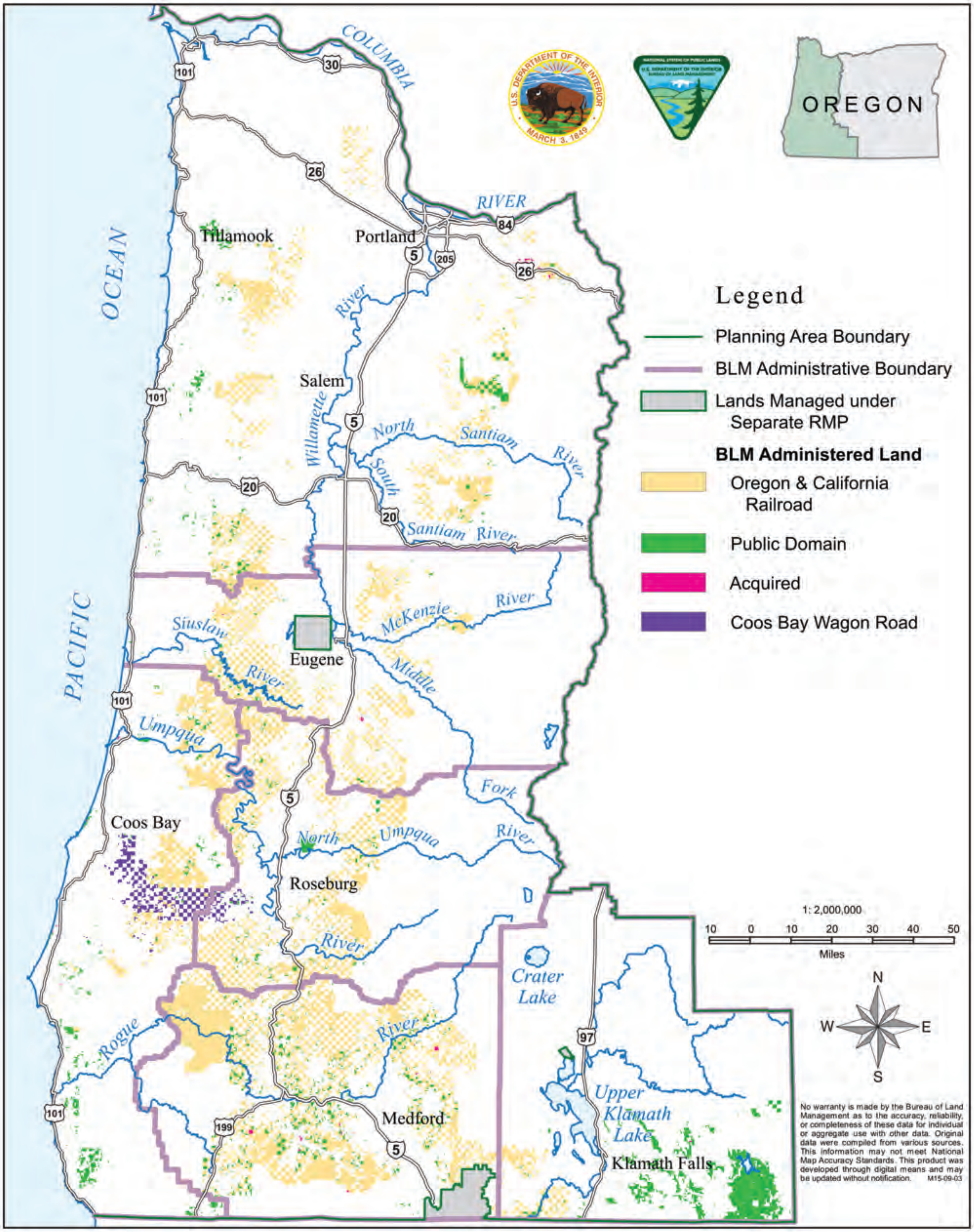
The O&C Act and the FLPMA

On August 28, 1937, Congress enacted the O&C Act, which provides the legal authority for the management of O&C lands and Coos Bay Wagon Road lands. Approximately 81 percent of the BLM-administered lands in the planning area are O&C lands, and approximately 3 percent are Coos Bay Wagon Road lands (**Map 1-2**). The provision of the O&C Act that provides the management direction for the O&C lands states, in part, that these lands:

> *"shall be managed except as provided in section 3 hereof, for permanent forest production, and the timber thereon shall be sold, cut, and removed in conformity with the [principle] 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…"*

Based on the language of the O&C Act, the O&C Act's legislative history, and case law, it is clear that sustained-yield timber production is the primary or dominant use of the O&C lands in western Oregon. In managing the O&C lands for that primary or dominant use, the BLM must exercise its discretion to determine how to manage the forest to provide for sustained-yield timber production, including harvest methods, rotation length, silvicultural regimes under which these forests would be managed, or minimum level of harvest. In addition, the BLM must conduct this management "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." Finally, when implementing the O&C Act, the BLM must do so in full compliance with a number of subsequent laws that direct how the BLM accomplishes the statutory direction.

The FLPMA provides the legal authority for the management of public domain lands and acquired lands. These lands and resources are to be managed under the principles of multiple use and sustained yield. Approximately 15 percent of the BLM-administered lands in the planning area are public domain lands, and less than 1 percent is acquired lands (**Map 1-2**). The FLPMA specifically provides that if there is any conflict between its provisions and the O&C Act related to 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 note (b)). However, provisions of the FLPMA that do not conflict with the O&C Act related to management of timber resources or the disposition of revenues from the O&C lands are applicable to the O&C lands. Preparation of the RMPs and EIS will conform to these land laws as described in this section and will comply with other Federal laws, including, but not limited to, the Endangered Species Act, the Clean Water Act, and the National Environmental Policy Act.



Map 1-2: Land Status within the Planning Area

In developing the range of alternatives in this planning process, the BLM will need to apply the direction set forth in the O&C Act to key issues associated with the management of areas or resources that typically arise during land use planning. These areas or resources include:

- Areas of Critical Environmental Concern
- Lands with wilderness characteristics
- Visual resources
- Recreation management areas
- Sensitive species

Areas of Critical Environmental Concern (ACECs)

The FLPMA provides authority for designation of Areas of Critical Environmental Concern (43 U.S.C. 1712 [Sec. 202.c.3]). In this planning process, the BLM will evaluate nominated and existing ACECs to determine whether relevant and important values are present and if special management is needed to maintain those values.

For areas that have relevant and important values and need special management to maintain those values, the BLM will designate and manage ACECs on public domain lands and acquired lands. The BLM will also designate and manage ACECs on O&C lands where the special management needed to maintain relevant and important values would not conflict with the planning for sustained-yield timber production for the purposes of the O&C Act. For example, designating and managing ACECs on O&C lands would not conflict with sustained-yield timber production in the following circumstances: on non-forested lands; on O&C lands that would otherwise be allocated to a land use allocation that would preclude sustained-yield timber production; or on lands for which the Timber Productivity Capability Classification[4] category is 'not included in the harvest land base.' In addition, designating and managing ACECs on O&C lands would not conflict with sustained-yield timber production if the special management needed to maintain relevant and important values were compatible with sustained-yield timber production, even if that special management might condition how sustained-yield timber production would be conducted. Finally, designation and management of Research Natural Areas, which are a type of ACEC, on O&C lands would not conflict with sustained-yield timber production when the scientific value of the research is relevant to sustained-yield timber production.

Lands with Wilderness Characteristics

Designated Wilderness Areas will be managed pursuant to the Wilderness Act of 1964 (16 U.S.C. 1131 *et seq*.), the area's designating statute, the BLM's wilderness regulations at 43 CFR 6300 – Management of Designated Wilderness, and BLM Manual 6340 – Management of Designated Wilderness Areas (USDI BLM 2012d). In this planning process, the BLM will consider whether to manage lands outside of designated Wilderness Areas for wilderness characteristics on public domain lands and acquired lands. The BLM will also consider whether to manage lands outside of designated Wilderness Areas for wilderness characteristics on O&C lands where management for wilderness characteristics would not conflict with the planning for sustained-yield timber production for the purposes of the O&C Act. For example, management for wilderness characteristics on O&C lands would not conflict with sustained-yield timber production in the following circumstances: on non-forested lands; on lands that would otherwise be allocated to a land use allocation that would preclude sustained-yield timber production; or on lands for which the Timber Productivity Capability Classification category is 'not included in the harvest land base.'

[4] Timber Productivity Capability Classification is the process of partitioning forestland into major classes indicating relative suitability to produce timber. See Chapter 2.

However, management for wilderness characteristics cannot be compatible with sustained-yield timber production, because the selling, cutting, and removing timber in conformance with the principles of sustained yield would alter such areas to the point of reducing or eliminating their wilderness characteristics. Thus, in developing the range of alternatives for this planning effort, alternatives should not include managing O&C lands outside of designated Wilderness Areas for wilderness characteristics in areas dedicated to sustained-yield timber production.

Visual Resources

The FLPMA provides authority for protection of scenic values (43 U.S.C. 1701 [Sec. 102.a.8]). Through this planning process, the BLM will designate Visual Resource Management classes for all BLM-administered lands, based on an inventory of visual resources and management considerations for other land uses.

In this planning process, the BLM will designate Visual Resource Management classes that 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 legislation, such as the Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1271 *et seq*.). In this planning process, the BLM will consider designating Visual Resource Management classes that would conflict with sustained-yield timber production to protect scenic values as identified through a visual resource management inventory on public domain lands and acquired lands; on non-forested O&C lands; on O&C lands that would otherwise be allocated to a land use allocation that would preclude sustained-yield timber production; or on O&C lands for which the Timber Productivity Capability Classification category is 'not included in the harvest land base.' Finally, in this planning process, the BLM will consider designating Visual Resource Management classes to protect scenic values as identified through a visual resource management inventory on O&C lands. This would occur to the extent that the protection of scenic values is compatible with sustained-yield timber production, even if that protection might condition how sustained-yield timber production would be conducted. The O&C Act contemplates that sustained-yield forest management can be conducted in a manner to provide for purposes including recreation, and the BLM recognizes that scenery can be an important component of recreation.

Recreation Management Areas

The FLPMA provides authority for management for outdoor recreation (43 U.S.C. 1701 [Sec. 102.a.8]). The O&C Act contemplates that sustained-yield timber production can be conducted in a manner to provide for purposes including recreation. A Special Recreation Management Area is an administrative unit where the existing recreation opportunities and recreation setting characteristics are recognized for their unique value, importance, and distinctiveness, as compared to other areas used for recreation. Consistent with BLM Manual 8320 – Planning for Recreation and Visitor Services (USDI BLM 2011a), within a Special Recreation Management Area, recreation and visitor services management is recognized as the predominant land use plan focus, where specific recreation opportunities and recreation setting characteristics are managed and protected on a long-term basis.

In this planning process, the BLM will consider designating Special Recreation Management Areas on public domain lands and acquired lands; on non-forested O&C lands; on O&C lands that would otherwise be allocated to a land use allocation that would preclude sustained-yield timber production; or on O&C lands for which the Timber Productivity Capability Classification category is not included in the harvest land base. Finally, in this planning process, the BLM will consider designating Special Recreation Management Areas on O&C lands to the extent that the management for recreation and visitor services would be compatible with planning for sustained-yield timber production for the purposes of the O&C

Act, even if that management might condition how sustained-yield timber production would be conducted. However, in developing the range of alternatives for this planning effort, alternatives should not include Special Recreation Management Areas on O&C lands if the management for recreation and visitor services would conflict with planning for sustained-yield timber production for the purposes of the O&C Act.

An Extensive Recreation Management Area is an administrative unit that requires specific management consideration in order to address recreation use, demand, or recreation and visitor services program investments. Extensive Recreation Management Areas do not necessarily conflict with sustained-yield timber production. Consistent with BLM Manual 8320, management of Extensive Recreation Management Areas "…is commensurate with the management of other resources and resource uses." Furthermore, this manual explains that land use plan decisions for management of Extensive Recreation Management Areas will be "…compatible with other resource objectives." Because management for recreation values in Extensive Recreation Management Areas is intended to be done in a manner that is compatible with other resource uses, such as sustained-yield timber production, designation of Extensive Recreation Management Areas would not necessarily conflict with sustained-yield timber production. Therefore, the BLM will consider designating Extensive Recreation Management Areas on all lands in the planning area, including O&C lands.

Sensitive Species

The FLPMA provides authority for management for ecological and environmental values and to provide food and habitat for fish and wildlife (43 U.S.C. 1701 [Sec. 102.a.8]). Consistent with BLM Manual 6840 – Special Status Species (USDI BLM 2008g), the BLM shall designate Bureau Sensitive species and implement measures to conserve these species and their habitats. It is in the interest of the BLM to undertake conservation actions for such species before listing under the Endangered Species Act is warranted. By doing so, the BLM will have greater flexibility in managing the public lands to accomplish native species conservation objectives and other legal mandates. BLM Manual 6840 also directs that specific protection to species that are listed by the BLM as sensitive on lands governed by the O&C Act must be consistent with timber production as the dominant use of those lands.

In developing the range of alternatives to be considered in this planning process, the BLM will consider providing measures to conserve Bureau Sensitive species and their habitats on O&C lands to the extent that the conservation measures are compatible with planning for sustained-yield timber production for the O&C Act purposes. The BLM will consider providing these measures even if the conservation measures might condition how sustained-yield timber production would be conducted. Furthermore, the BLM will consider providing measures to conserve Bureau Sensitive species and their habitats on O&C lands to the extent that the conservation measures are necessary to prevent the need to list Bureau Sensitive species under the Endangered Species Act. Future listings under the Endangered Species Act could have the effect of limiting the BLM's ability to provide a sustained yield of timber under O&C Act; limiting or avoiding future listings could best ensure a permanency of timber production over the long term.

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

Out of the approximately 2.5 million acres of BLM-administered lands in the planning area, 384,273 acres are public domain lands. While the FLPMA 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 RMPs, these public domain parcels will be managed in accordance with the 1975 Public Land Order No. 5490 (40 FR 7450), which reserves these intermingled public domain lands for multiple-use management, including the sustained yield of forest resources in connection with the intermingled O&C lands. The alternatives include a range of uses and management objectives for public domain lands in the planning area, which permits the BLM to consider multiple uses for the public domain lands, consistent with the requirements of the FLPMA.

Relationship of the RMPs to Other Plans and Programs

The 1995 RMPs are consistent with the 1994 Northwest Forest Plan, which was 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 April 1994 Record of Decision for the Northwest Forest Plan, signed jointly by the Secretary of the Interior and the Secretary of Agriculture amended the BLM's land use plans in effect at the time. In 1995, the BLM completed new RMPs, which were designed to be consistent with the Northwest Forest Plan's land use allocations and its standards and guidelines.

The Northwest Forest Plan is not a statute or regulation. It was a coordinated, multi-agency amendment to the then-current RMPs of the BLM and forest plans of the U.S. 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 or modifications to these plans was that they would be "coordinated" through the "Regional Interagency Executive Committee and the Regional Ecosystem Office" (USDA FS and USDI BLM 1994a, p. 58). In keeping with the intention of the Northwest Forest Plan to encourage cooperation and coordination of programs among the Federal agencies, the BLM has coordinated with the Regional Interagency Executive Committee on this RMP revision. Furthermore, many of the agencies that are represented on the Regional Interagency Executive Committee are cooperating agencies in this RMP Revision. Those cooperating agencies include the U.S. Forest Service, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and the Environmental Protection Agency (Chapter 4).

The Northwest Forest Plan did not change the authority of the BLM, provided under the FLPMA and its promulgating regulations, for amending or revising RMPs. The 1995 RMPs, consistent with FLPMA planning regulations, anticipated the possibility that periodic plan evaluations could lead to RMP amendments and revisions. The BLM has subsequently amended the 1995 RMPs, as described below.

The interagency 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 (USDA FS and USDI BLM 2001), amended all of the 1995 RMPs.[5]

The BLM has also amended the Coos Bay, Medford, and Roseburg District RMPs with the Record of Decision and Resource Management Plan Amendment for Management of Port-Orford-cedar in Southwest Oregon, Coos Bay, Medford, and Roseburg District (USDI BLM 2004), which was based on

[5] 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 (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 NEPA procedures. The court then invalidated the re-categorizations regarding the red tree vole, because the BLM had not prepared a plan amendment and appropriate environmental analysis consistent with the FLPMA and NEPA.

an interagency supplemental EIS. Under all alternatives in this RMP revision, the BLM would continue to manage Port-Orford-cedar in accordance with this 2004 Record of Decision.[6]

In addition, the BLM has amended individual RMPs with amendments of more limited scope than the above amendments, and has periodically maintained individual RMPs.[7] Individual District Annual Program Summaries have documented these RMP amendments and RMP maintenance actions.

In contrast to these amendments of the 1995 RMPs, this RMP revision would replace the 1995 RMPs and thereby replace the Northwest Forest Plan for the management of BLM-administered lands in western Oregon. The purpose and need for this RMP revision, as described earlier in this chapter, is different from the purpose and need for the Northwest Forest Plan. As such, the action alternatives and the Proposed RMP do not contain all elements of the Northwest Forest Plan.

Survey and Manage

The BLM adopted a purpose and need for this RMP revision that is consistent with the agency's discretion and obligations under the FLPMA and the O&C Act. Under the O&C Act, the BLM has no specific wildlife conservation mandate, but has a range of discretion on how to manage the O&C timberlands for permanent, sustained-yield timber production. The purpose and need for this RMP revision differs from the purpose and need for the Northwest Forest Plan, and reflects the BLM's determination that it can achieve the goals of the O&C Act without the Survey and Manage measures. While neither the Proposed RMP nor any of the action alternatives in this Proposed RMP/Final EIS therefore includes the Survey and Manage measures, Survey and Manage is reflected in the Proposed RMP/Final EIS's No Action alternative described in Chapter 2.[8]

The purpose and need for the Northwest Forest Plan was guided by the policy pronouncements of President Clinton at the 1993 Forest Conference directing the BLM and U.S. Forest Service to adopt a "comprehensive … common management approach to the [federal] lands administered throughout an entire ecological region" (USDA FS and USDI BLM 1994a, p. 1). To achieve this comprehensive approach, the Northwest Forest Plan included a goal of supporting "viable populations, well-distributed across their current range, of species known (or reasonably expected) to be associated with old-growth forest conditions" (FEMAT 1993, p. II-5; USDA FS and USDI BLM 1994b, p. 3&4-113). This goal was founded on the Forest Service planning regulation issued under the National Forest Management Act (NFMA) "to maintain viable populations of existing native and desired nonnative vertebrate species in the planning area" (36 CFR 219.19).[9] This Forest Service planning regulation did not and does not apply to

[6] The Standards and Guidelines in the 2004 Port-Orford-cedar ROD describe all currently available disease-control practices, dividing them between those that should be applied generally and those that may be applied to specific management activities. The Standards and Guidelines include a Risk Key (pp. 32–37) to clarify the environmental conditions that require implementation of one or more of the listed disease-controlling management practices. The BLM would apply the Risk Key during site-specific project planning. This approach precludes the need for additional analysis because BLM would continue to implement the Port-Orford-cedar ROD under any alternative or the Proposed RMP in accordance with the conditions described in the Risk Key for risk reduction management practices.

[7] RMP maintenance actions respond to minor data changes and incorporation of activity plans and are limited to further refining or documenting a previously approved decision incorporated in the plan. Plan maintenance does not result in expansion of the scope of resource uses or restrictions or change the terms, conditions, and decisions of the approved RMP.

[8] As further explained in Chapter 2, the No Action alternative in this Proposed RMP/Final EIS is implementation of the 1995 RMPs as written (in contrast to the BLM's current implementation practices under the 1995 RMPs).

[9] Since the adoption of the Northwest Forest Plan, the Forest Service adopted new planning regulations at 36 CFR 219 in 2000 and in 2012, which replaced the cited regulation.

the BLM, and is not a part of the purpose for this RMP revision. There is no comparable regulation for maintaining "viable populations" in the BLM's regulations implementing the FLPMA or O&C Act. In carrying out this goal, the Secretaries for the respective departments included what is known as 'Survey and Manage' as mitigation in the Northwest Forest Plan to provide benefits to these species and increase the likelihood of viable, well-distributed populations across all Federal lands in the planning area, including BLM-administered lands (USDA FS and USDI BLM 1994b, p. 3&4-129).

The Northwest Forest Plan species viability objective is not part of this RMP revision. However, the purpose of this revision does include contributing to the conservation and recovery of threatened and endangered species, consistent with the BLM's mandate under the Endangered Species Act. Furthermore, all of the action alternatives and the Proposed RMP would implement the BLM's Special Status Species policy, which is described in detail in the Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines, which is incorporated here by reference (USDA FS and USDI BLM 2004, pp. 45–54), and include conservation measures to the extent necessary to prevent the need to list Bureau Sensitive species under the Endangered Species Act (BLM Manual 6840 – Special Status Species Management).

In addition, in developing a plan consistent with the purpose and need for this RMP revision, the BLM will not need the Survey and Manage measures to protect species associated with older and more structurally-complex forests. This is because the purpose of this RMP revision includes maintaining a network of large blocks of forest to be managed for late-successional forests and maintaining older and more structurally-complex multi-layered conifer forests, as necessary components of contributing to the conservation and recovery of the northern spotted owl. All action alternatives and the Proposed RMP therefore allocate a Late-Successional Reserve network, where sustained-yield timber harvest would not occur, that is larger than what is provided in the Northwest Forest Plan and broadly encompasses "old-growth forests." Each alternative and the Proposed RMP would more than sufficiently address maintenance of older and more structurally-complex forests, without the need for additional mitigation like that provided by Survey and Manage. Further, even if the larger Late-Successional Reserve and protection of older and more structurally-complex forests were not sufficient to provide adequate habitat for Survey and Manage species, before such species could need listing under the Endangered Species Act, the BLM would be able to include such species on the BLM Sensitive species list and provide necessary management to avoid the need for listing (see the Rare Plants and Fungi and Wildlife sections of Chapter 3).

Finally, based on this analysis, the BLM concludes that the action alternatives and the Proposed RMP would avoid potential disruptions to sustained-yield timber production by avoiding contributing to future listing of any Survey and Manage species under the Endangered Species Act. Even if the habitat and site protection under action alternatives and the Proposed RMP were not sufficient to provide adequate habitat for Survey and Manage species, before such species could need listing under the Endangered Species Act, the BLM would be able to include such species on the BLM sensitive species list and provide necessary management to avoid the need for listing and thus avoid potential disruptions to future sustained-yield timber production on BLM-administered lands.

Aquatic Conservation Strategy

As described earlier in this chapter, this RMP revision would replace the 1995 RMP's and thereby replace the Northwest Forest Plan for the management of BLM-administered lands in western Oregon. The BLM adopted a purpose and need for this RMP revision that is consistent with the agency's discretion and obligations under the FLPMA and the O&C Act. The purpose and need differs from the purpose and need for the Northwest Forest Plan and reflects BLM's determination that it can achieve the goals of the O&C Act without the Aquatic Conservation Strategy (ACS) in its entirety as constituted in the Northwest

Forest Plan. Because of these differences, none of the action alternatives or the Proposed RMP in this Proposed RMP/Final EIS includes the ACS in its entirety as constituted in the Northwest Forest Plan. The ACS in its entirety as constituted in the Northwest Forest Plan is reflected in the Proposed RMP/Final EIS's No Action alternative described in Chapter 2.

As previously discussed, the purpose and need for the Northwest Forest Plan was guided by the policy pronouncements of President Clinton at the 1993 Forest Conference directing the BLM and U.S. Forest Service to adopt a "comprehensive … common management approach to the [federal] lands administered throughout an entire ecological region" (USDA FS and USDI BLM 1994a, p. 1). To achieve this comprehensive approach, the Northwest Forest Plan includes the ACS, which was intended to fulfill nine broad objectives, including restoring and maintaining the ecological health of watersheds and aquatic ecosystems and supporting well-distributed populations of riparian-dependent species. These objectives were based on the Forest Service organic statute and implementing regulations. The ACS consists of four components: riparian reserves, key watersheds, watershed analysis, and watershed restoration.

The Proposed RMP addresses all four of the components of the ACS of the Northwest Forest Plan (see Chapter 2 and **Appendix B** for more detailed description of the land use allocations, management objectives, and management direction of the Proposed RMP). The BLM has modified several of the ACS components from how they are constituted in the Northwest Forest Plan, consistent with the purpose and need and guidance for the development of all action alternatives for this RMP revision (discussed earlier in this chapter) and in light of monitoring results and new scientific information (discussed in the Fisheries and Hydrology sections of Chapter 3).

Riparian Reserves

The Northwest Forest Plan allocates 'interim' Riparian Reserve widths along all streams, wetlands, and water bodies. These 'interim' widths have not been modified in practice as anticipated. The Northwest Forest Plan ties requirements for management actions within the Riparian Reserve to consistency with the nine broad ACS objectives.

The Proposed RMP allocates a Riparian Reserve along all streams, wetlands, and water bodies, with management objectives related to fish habitat and water quality, and management direction for actions within the Riparian Reserve. In the Proposed RMP, the Riparian Reserve widths vary by class of watershed, as described below.

Key Watersheds

The Northwest Forest Plan designates three categories of watersheds: Tier 1 Key Watersheds, Tier 2 Key Watersheds, and non-key watersheds. Tier 1 and Tier 2 Key Watersheds have the same management approach, which has three requirements that differ from non-key watersheds:

- No net increase in road mileage
- Key watersheds are highest priority for watershed restoration
- Watershed analysis is required prior to most management activities

The Proposed RMP defines three classes of subwatersheds and varies Riparian Reserve widths and management direction for actions within the Riparian Reserve by these classes of subwatershed.

Watershed Analysis

The Northwest Forest Plan directs the process of conducting watershed analysis: a systematic procedure to characterize the aquatic, riparian, and terrestrial features within a watershed. The Northwest Forest Plan requires the use of watershed analyses to refine Riparian Reserve boundaries, prescribe land management activities including watershed restoration, and develop monitoring programs. The Northwest

Forest Plan required the completion of watershed analysis prior to approval of several types of implementation actions.

As noted earlier in this chapter, the guidance for the development of all action alternatives includes emphasizing management direction for allowable uses and management actions needed to achieve desired resource goals and objectives, rather than administrative process, reviews, or analysis requirements. Consistent with this guidance, the Proposed RMP does not include management direction requiring or directing a specific watershed analysis procedure. However, as discussed in more detail in **Appendix X**, the BLM will compile watershed-scale information on aquatic and riparian resources, including identifying resource conditions, watershed processes, risks to resources, and restoration opportunities, as needed for planning and analysis of implementation actions under the approved RMP.

Watershed Restoration

The Northwest Forest Plan directs watershed restoration actions to control road-related runoff and sediment production, restore riparian vegetation, and restore in-stream habitat complexity.

The Proposed RMP includes management direction for watershed restoration similar to the watershed restoration described in the Northwest Forest Plan (see **Appendix B** and **Appendix V**).

Existing Decisions

Under all alternatives and the Proposed RMP, this RMP revision would not alter the following existing decisions, which remain valid for continued implementation within the decision area:

- Record of Decision for Implementation of a Wind Energy Development Program and Associated Land Use Plan Amendments (USDI BLM 2005b)
- Record of Decision and Resource Management Plan Amendments for Geothermal Leasing in the Western United States (USDA FS and USDI BLM 2008)
- Approved Resource Plan Amendments/Record of Decision for Designation of Energy Corridors on Bureau of Land Management-administered lands in the 11 Western States (USDI BLM 2009)
- Vegetation Treatments Using Herbicides on BLM Lands in Oregon Record of Decision (USDI BLM 2010)
- Record of Decision for Management of Port-Orford-cedar in Southwest Oregon (Coos Bay, Medford, and Roseburg Districts; USDI BLM 2004a)
- Seed Orchard Records of Decision for Integrated Pest Management (Eugene, Medford and Salem Districts; USDI BLM 2005c, 2006, 2005d)
- Pokegama Wild Horse Herd Management Area Plan (Klamath Falls Field Office; USDI BLM 2002)
- Rogue National Wild and Scenic River Comprehensive Management Plan (Medford District; 37 FR 13408)
- Rogue National Wild and Scenic River: Hellgate Recreation Area Recreation Area Management Plan (Medford District; USDI BLM 2004b)
- North Bank Habitat Management Area and Area of Critical Environmental Concern Record of Decision (Roseburg District; USDI BLM 2001)
- North Umpqua River Management Plan (Roseburg District; USDA FS, USDI BLM, and Oregon State Parks and Recreation Department 1992)
- Molalla River-Table Rock Recreation Area Management Plan (Salem District; USDI BLM 2011b)
- Quartzville Creek National Wild and Scenic River Management Plan (Salem District; USDI BLM 1992)

- Salmon National Wild and Scenic River Management Plan (Salem District; USDA FS and USDI BLM 1993)
- Sandy Wild and Scenic River and State Scenic Waterway Management Plan (Salem District; USDI BLM 1993)
- Table Rock Wilderness Management Plan (Salem District; USDI BLM 1987)
- Yaquina Head Outstanding Natural Area Management Plan (Salem District; USDI BLM 1983)

The BLM would continue to implement actions directed by these decisions unless and until the BLM amends, revises, or rescinds these existing decisions in decision-making separate from this RMP revision. The BLM provided separate NEPA compliance to support these existing decisions. This RMP revision does not alter these existing decisions or analyses; accordingly, this Proposed RMP/Final EIS considers such actions among the past, present, and reasonably foreseeable future actions in cumulative effects analyses. For the purpose of NEPA analysis, the BLM summarizes and cites these decisions and their supporting analyses to incorporate them by reference into Chapter 3 of this Proposed RMP/Final EIS where they are relevant to the analysis, consistent with 40 CFR 1502.21.

The Medford District is currently preparing an environmental assessment for an amendment to the 1995 Medford RMP to change the boundary of the Table Rocks Area of Critical Environmental Concern (ACEC) to include newly acquired Federal lands and to encompass lands administered by The Nature Conservancy. If the BLM acquires The Nature Conservancy parcels in the future, The Nature Conservancy lands would become part of the ACEC. The environmental assessment will also analyze the impacts of an implementation action of converting temporary public use restrictions into permanent supplementary rules. The Table Rocks ACEC was originally designated in the 1986 Medford Management Framework Plan to recognize and protect botanical and geological features, threatened, endangered, and special status species, and natural systems.

This RMP revision would not alter the Cascade Siskiyou National Monument Record of Decision and Resource Management Plan (Medford District; USDI BLM 2008h), the Upper Klamath Basin and Wood River Wetland Record of Decision and Resource Management Plan (Klamath Falls Field Office; USDI BLM 1995g), or the West Eugene Wetlands Record of Decision and Resource Management Plan (Eugene District; USDI BLM 2015). The BLM-administered lands under these RMPs are not within the decision area for this RMP revision.

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Chapter 2 – Alternatives

Introduction

This chapter describes the alternatives and the Proposed RMP. The range of alternatives considered in this Proposed RMP/Final EIS builds on the alternatives considered in the Draft RMP/EIS. The BLM is carrying forward the No Action alternative and action alternatives and sub-alternatives as presented in the Draft RMP/EIS. The BLM has developed the Proposed RMP as a variation on Alternative B from the Draft RMP/EIS.

The Council on Environmental Quality regulations direct that an EIS shall "...rigorously explore and objectively evaluate all reasonable alternatives..." 40 CFR 1502.14. Guidance from the Council on Environmental Quality further explains, "When there are potentially a very large number of alternatives, only a reasonable number of examples, covering the full spectrum of alternatives, must be analyzed and compared in the EIS" ("Forty Most Asked Questions..." 46 FR 18027). The purpose and need for action dictates the range of alternatives that must be analyzed, because action alternatives are not reasonable if they do not respond to the purpose and need for the action (USDI BLM 2008, pp. 35–36, 49–50).

For an RMP, there are potentially endless variations in design features or combinations of different plan components. The BLM designed the range of alternatives in the Draft RMP/EIS to span the full spectrum of alternatives that would respond to the purpose and need for the action. The BLM developed those alternatives to represent a range of overall management approaches, rather than exemplify gradations in design features. The BLM has developed the Proposed RMP from the alternatives considered in the Draft RMP/EIS, and the Proposed RMP represents a management approach that is within the spectrum of the alternatives analyzed in detail in the Draft RMP/EIS.

This chapter describes the Proposed RMP, the No Action alternative, and the action alternatives that are analyzed in detail. This chapter also discusses alternatives that the BLM considered but did not analyze in detail. Finally, this chapter presents a comparison of the alternatives and the Proposed RMP, including a summary of the environmental effects of the alternatives and the Proposed RMP.

Summary of Notable Changes from the Draft RMP/EIS

Chapter 2 of this Proposed RMP/Final EIS has added a description of the Proposed RMP. The Proposed RMP/Final EIS has corrected an error in the section-scale illustrations in **Map 2-3** and **Map 2-4** in the Draft RMP/EIS, which displayed incorrect widths for the Riparian Reserve on perennial streams and fish-bearing streams under Alternative B and Sub-alternative B. The Proposed RMP/Final EIS also has corrected an error in the description of the management approach for Visual Resources Management under all action alternatives, and an error in the description of the management approach for Recreation Management Areas under all action alternatives. Finally, the Proposed RMP/Final EIS has expanded the discussion of alternatives considered but not analyzed in detail.

No Action Alternative

The BLM is carrying forward the No Action alternative as presented in the Draft RMP/EIS.

The Council on Environmental Quality NEPA regulations require that an EIS analyze a No Action alternative (40 CFR 1502.14(d)). The Council on Environmental Quality guidance explains that, for plans such as this RMP revision, No Action means there is no change from current management direction or level of management intensity (CEQ 1981). The No Action alternative, as presented in the Draft RMP/EIS, is implementation of the 1995 RMPs as written (in contrast to the BLM's current implementation practices under the 1995 RMPs).[10] A section later in this chapter, titled Alternatives Considered but not Analyzed in Detail, includes further discussion of an alternative that would seek to continue the current practices. That section also includes discussion of an alternative that would seek to implement the 1995 RMPs at the sustained-yield timber harvest levels declared in the 1995 RMPs.

The land use allocations and management actions/direction in the 1995 RMPs for the Coos Bay, Eugene, Medford, Roseburg, and Salem Districts and the Klamath Falls Field Office of the Lakeview District, as amended and modified by court order, describe the No Action alternative (**Figure 2-1**, **Table 2-1**, and **Map 2-1**) and are incorporated here by reference. The No Action alternative, as analyzed in this Proposed RMP/Final EIS, includes Survey and Manage measures, 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;
- The 2001, 2002, and 2003 Annual Species Review modifications to the Survey and Manage species list, except for the changes made for the red tree vole; and
- The Pechman exemptions.[11]

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[10] Implementation of the 1995 RMPs as written includes the incorporation of all amendments and plan maintenance of the 1995 RMPs. The BLM has documented all amendments and plan maintenance of the 1995 RMPs in the district annual program summaries and monitoring reports from 1996 through 2015.

[11] The District Court for the Western District of Washington issued a remedy order on February 18, 2014, in the case of *Conservation Northwest et al.* v. *Boonie et al.*, No. 08-1067-JCC (W.D. Wash.)/No. 11-35729 (9th Cir.) that vacated the 2007 Records of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines. Vacatur of the 2007 RODs has the effect of returning the BLM to the status quo in existence prior to the 2007 RODs, which was defined by three previous legal rulings, as follows:

- Judge Pechman reinstated the 2001 ROD, including any amendments or modifications to the 2001 ROD that were in effect as of March 21, 2004 (CV-04-00844-MJP, January 9, 2006), and this ruling incorporated the 2001, 2002, and 2003 Annual Species Reviews;
- The Ninth Circuit Court of Appeals in *Klamath-Siskiyou Wildlands Center v. Boody*, 468 F3d 549 (2006) vacated the 2001 Annual Species Review category change and 2003 Annual Species Review removal for the red tree vole in the mesic zone; and
- Judge Pechman ordered four categories of projects exempt from compliance with the Survey and Manage standards and guidelines (CV-04-00844-MJP, October 11, 2006, 'Pechman exemptions'): thinnings in forest stands younger than 80 years of age, culvert replacement/removal, riparian and stream improvement projects, and hazardous fuels treatments applying prescribed fire for noncommercial projects.

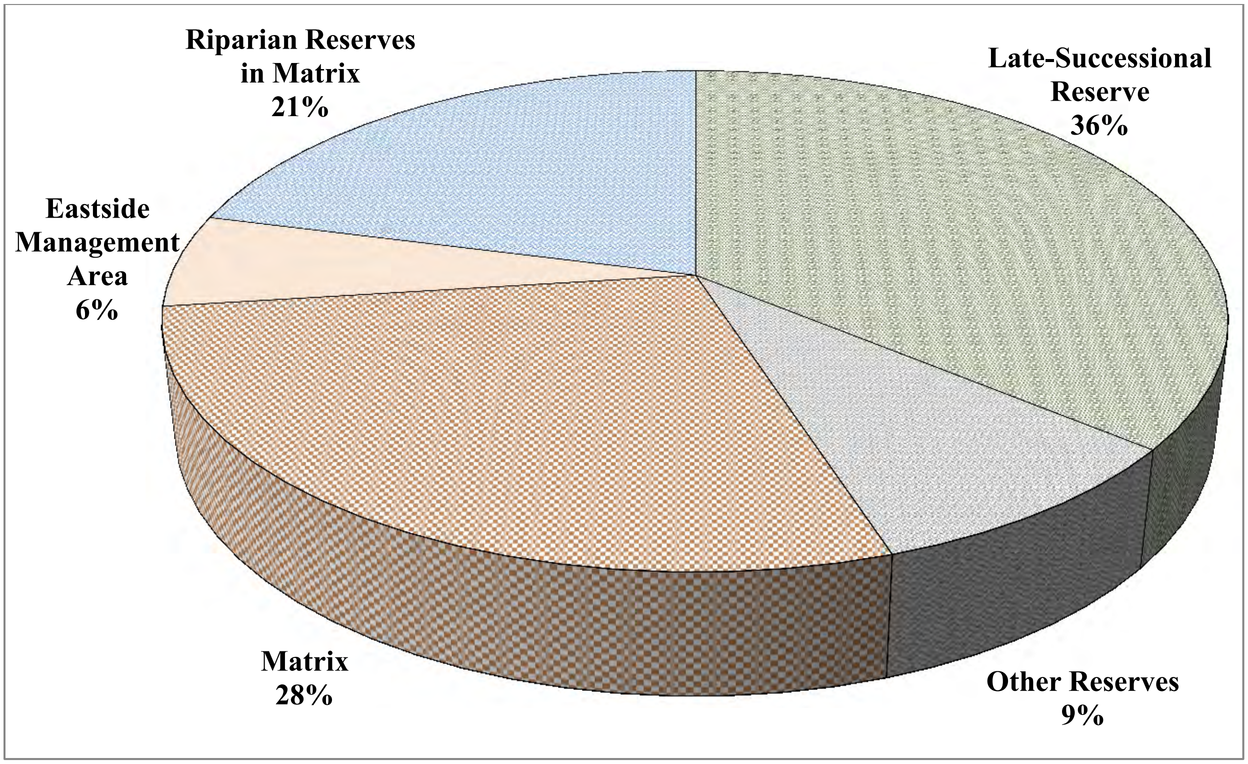
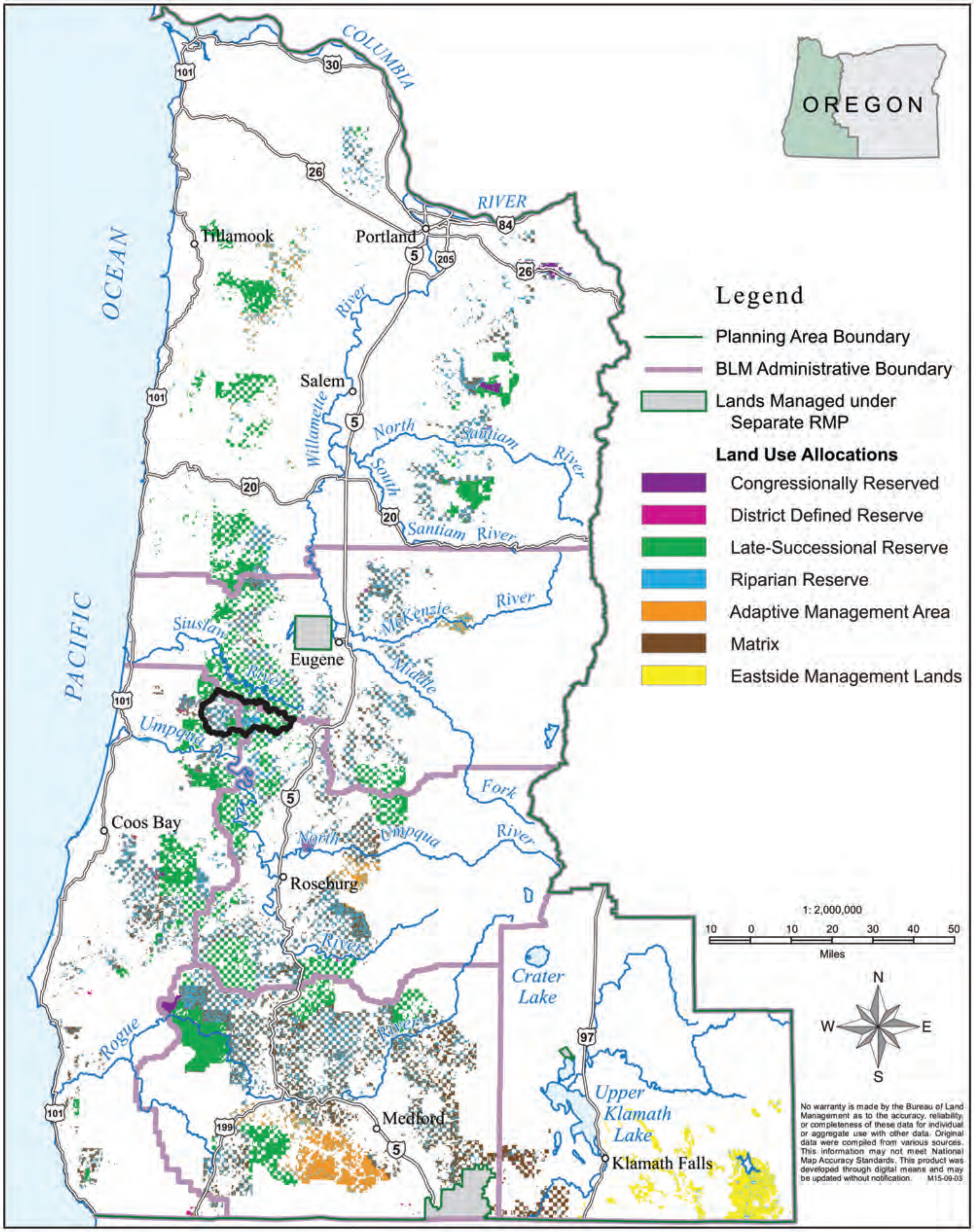


Figure 2-1. No Action alternative land use allocations

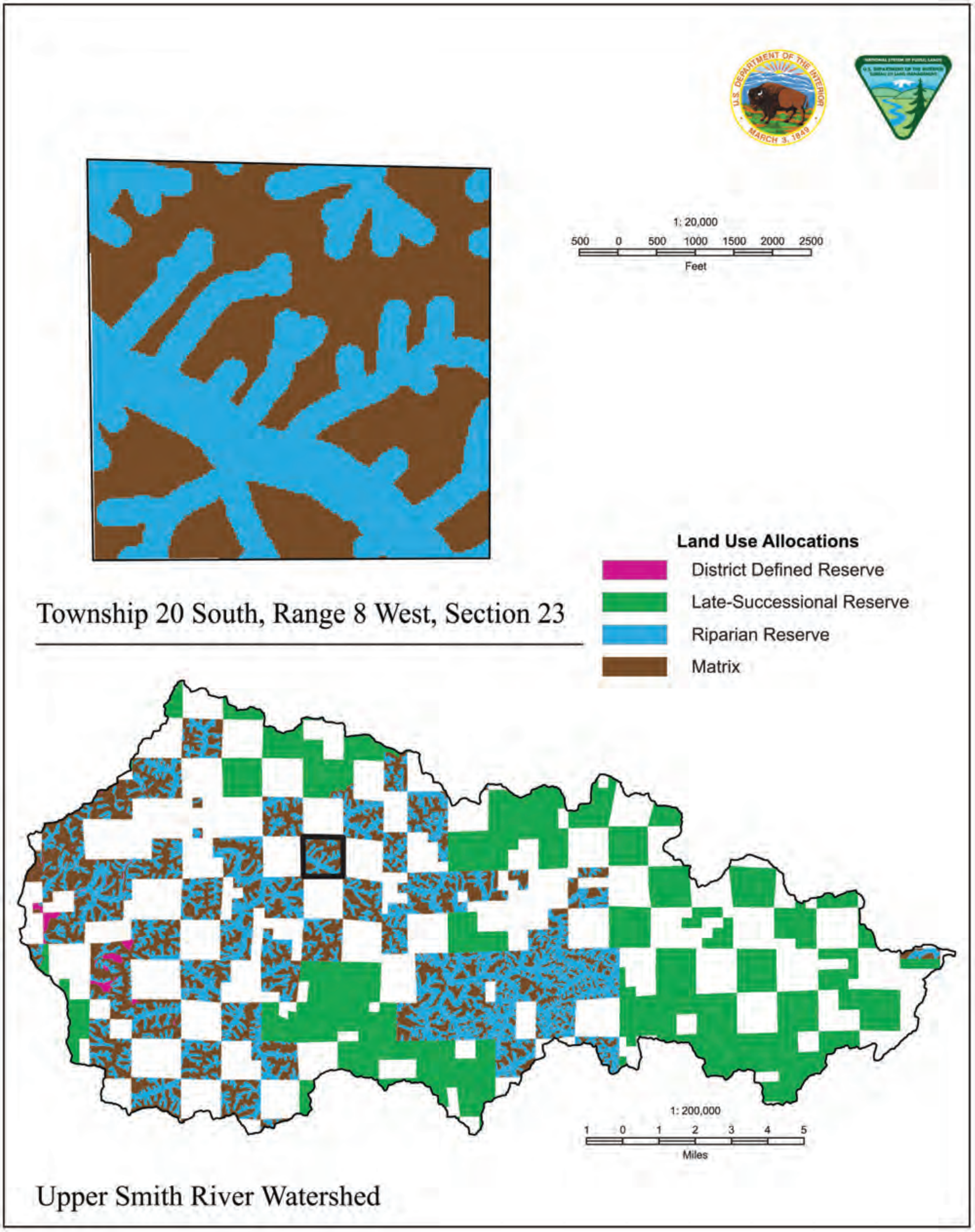
Table 2-1. No Action alternative land use allocations

Land Use Allocation	Acres	Total Acres (Percent)
Late-Successional Reserve*	879,031	36%
Riparian Reserve in Matrix	527,550	21%
Other Reserves†	233,410	9%
Matrix‡	691,998	28%
Eastside Management Area	146,867	6%

* Late-Successional Reserve includes Adaptive Management Areas within the Late-Successional Reserve and predictions of the acreage of newly discovered marbled murrelet sites.
† Other Reserves in the No Action alternative include Congressionally Reserved lands, District-Designated Reserves, and lands reserved within the Matrix.
‡ Matrix includes the General Forest Management Area, Connectivity/Diversity Blocks, and Adaptive Management Areas.



Map 2-1: The No Action Alternative Land Use Allocations


1: 20,000
500 0 500 1000 1500 2000 2500
Feet
Land Use Allocations
District Defined Reserve
Late-Successional Reserve
Riparian Reserve
Matrix
Township 20 South, Range 8 West, Section 23
1: 200,000
1 0 1 2 3 4 5
Miles
Upper Smith River Watershed

For comparing the acreage by land use allocation for the No Action alternative to the action alternatives and the Proposed RMP, the Matrix land use allocation in the No Action alternative is comparable to the Harvest Land Base land use allocation in the action alternatives and the Proposed RMP.

The Eastside Management Area in the No Action alternative comprises those BLM-administered lands in the Klamath Falls Field Office outside the range of the northern spotted owl. In the action alternatives and the Proposed RMP, the Eastside Management Area comprises those BLM-administered lands in the Klamath Falls Field Office east of Highway 97. Because of these different boundaries, the acreage for the Eastside Management Area is slightly higher in the No Action alternative than in the action alternatives and the Proposed RMP.

The No Action alternative defined interim Riparian Reserve widths that could be modified after watershed analysis. For this analysis, the BLM assumed that the Riparian Reserve under the No Action alternative would remain at the interim widths.

The Riparian Reserve acreage for the No Action alternative in **Figure 2-1** and **Table 2-1**, presents only the Riparian Reserve within the Matrix, which is how the 1995 RMPs presented the hierarchy of land use allocations. The Late-Successional Reserve acreage for the No Action alternative does not account for the Riparian Reserve within the Late-Successional Reserve. In the No Action alternative, the Riparian Reserve would overlay the Late-Successional Reserve, and implementation in those overlapping areas would apply the management objectives and management direction for both land use allocations (USDA FS and USDI BLM 1994, pp. A-5 – A-6). As a result, the 1995 RMPs only accounted for the Riparian Reserve acreage in the Late-Successional Reserve as Late-Successional Reserve; the only Riparian Reserve acreage calculated were those in the Matrix. Thus, the acreage of Riparian Reserve and Late-Successional Reserve presented in the 1995 RMPs cannot be directly compared to the acreages presented in this analysis for the action alternatives and the Proposed RMP.

To facilitate more direct comparison of these acreages by land use allocation for the No Action alternative to the action alternatives and the Proposed RMP, **Figure 2-2** and **Table 2-2**, present a modified hierarchy of land use allocations in the No Action alternative to display the Riparian Reserve acreage regardless of the underlying land use allocation (**Figure 2-1** and **Table 2-1**). The results are a reduction in acreage identified as Late-Successional Reserve and a corresponding increase in acreage identified as Riparian Reserve that allows for direct comparative analysis in this Proposed RMP/Final EIS.

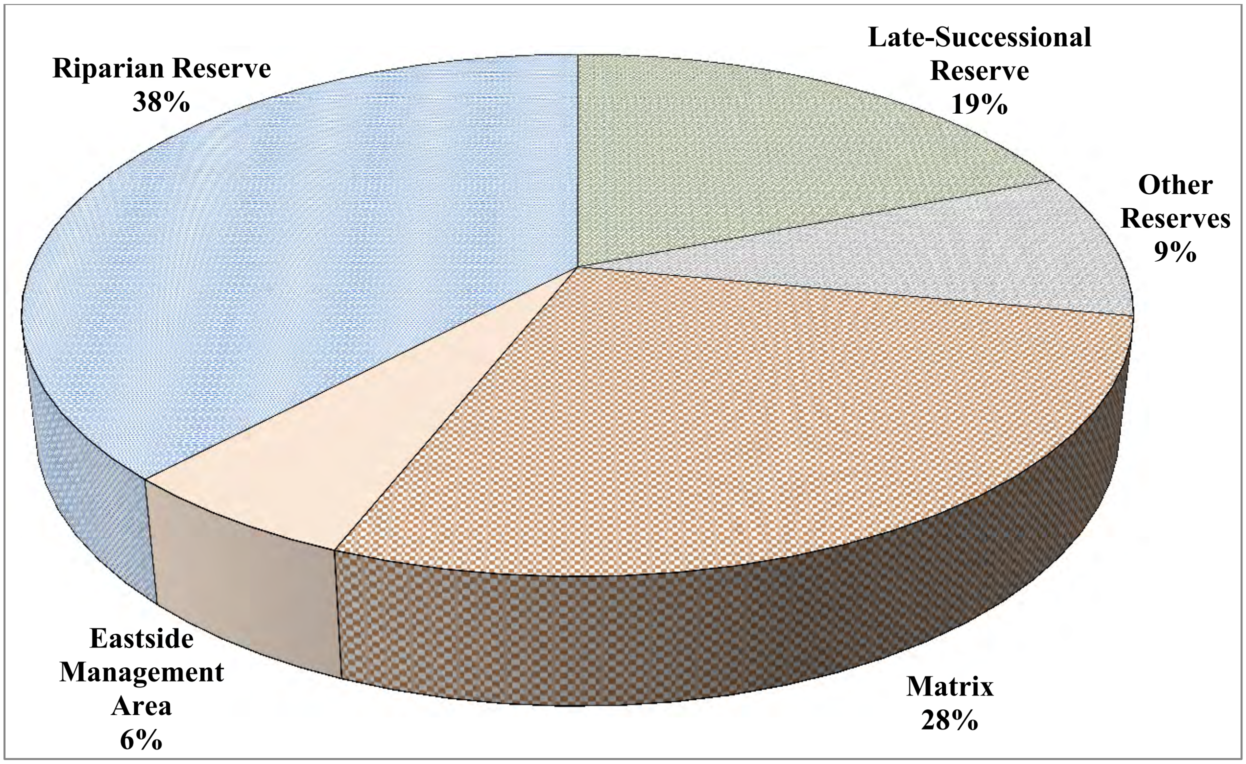


Figure 2-2. No Action alternative land use allocations with modified hierarchy

Table 2-2. No Action alternative land use allocations with modified hierarchy

Land Use Allocation	Acres	Total Acres (Percent)
Late-Successional Reserve	478,860	19%
Riparian Reserve	927,721	38%
Other Reserves*	233,410	9%
Matrix	691,998	28%
Eastside Management Area	146,867	6%

* Other Reserves in the No Action alternative include Congressionally Reserved lands, District-Designated Reserves, and lands reserved within the Matrix.

The Action Alternatives and the Proposed RMP

The BLM is carrying forward the action alternatives and sub-alternatives as presented in the Draft RMP/EIS. The Proposed RMP and four action alternatives with two sub-alternatives comprise a range of management strategies that the BLM designed in the Draft RMP/EIS to meet the purpose and need discussed in Chapter 1. In addition, the BLM developed the action alternatives and the Proposed RMP to be consistent with the guidance for the formulation of alternatives discussed in Chapter 1. The action alternatives and the Proposed RMP examine potential management strategies through land use allocations, management objectives, and management direction. Some land use allocations, management objectives, and management direction are common to all action alternatives and the Proposed RMP, and some vary by action alternative, as described below. The BLM has developed the Proposed RMP as a variation on Alternative B from the Draft RMP/EIS.

The BLM developed the action alternatives in response to input received during external and internal scoping, and developed the Proposed RMP in consultation with cooperating agencies and Tribes and based on further input from public comments and analysis results from the Draft RMP/EIS. The action alternatives and the Proposed RMP described below include land use allocations designed to respond to the purpose and need for action, including areas managed for sustained-yield timber production that would provide the annual productive capacity of timber and areas reserved from sustained-yield timber production for purposes such as the protection of clean water and the conservation and recovery of ESA-listed species. Within the context of the purpose and need for action, the BLM developed the action alternatives and the Proposed RMP to mitigate adverse effects on natural resources. Several of the purposes of the action directly address avoiding or reducing adverse effects on natural resources, such as providing clean water in watersheds and restoring fire-adapted ecosystems. As such, the action alternatives and the Proposed RMP primarily address mitigating adverse effects through their design, specifically the land use allocations and the management direction. Additionally, the BLM developed two sub-alternatives, as described below, to consider how specific design changes might further mitigate adverse effects to specific resources.

Sub-alternatives

Sub-alternatives are variations of an action alternative that modify an individual component of the alternative to explore how these changes would alter certain outcomes. These examinations provide the responsible official with information that is useful for both fully understanding the alternatives and for informing the development of the Proposed RMP.

The BLM focuses and limits the analysis of the sub-alternatives to the specific analytical question that is associated with a sub-alternative; that is, how modifying a single component would alter the effects on the resources associated with that component. This is in contrast to the broader analysis that is associated with the No Action alternative, the four action alternatives, and the Proposed RMP, which explore the effects of the alternatives and the Proposed RMP on all resources. The sub-alternatives are variations on the action alternatives and, as such, could be carried forward as the Proposed RMP; their individual components could also be incorporated into the Proposed RMP.

The BLM developed two sub-alternatives in the Draft RMP/EIS, which vary individual components to test specific questions about alternative design based on input received during external and internal scoping. For both sub-alternatives, the BLM focused analysis on how the changes in the sub-alternative would alter effects on timber production and northern spotted owls. The BLM focused the analysis of these sub-alternatives on these two resources, because the modification of the alternative component would vary the approach to an element of northern spotted owl conservation, and the change in the sub-alternatives would directly and explicitly alter the approach to timber production. The specific features of these sub-alternatives are described under the pertinent action alternatives.

Features Common to the Action Alternatives and the Proposed RMP

This section contains a summary of those features that are common to all action alternatives and the Proposed RMP. The subsequent section contains a description of the features that differ among the action alternatives and the Proposed RMP.

All action alternatives and the Proposed RMP include several types of land use allocations or administrative designations that the BLM will use to manage different resources or groups of resources. These types of allocations or designations include but are not limited to—

- Vegetation and habitat management (Congressionally Reserved and National Landscape Conservation System, District-Designated Reserves, Late-Successional Reserve, Riparian Reserve, Harvest Land Base, and Eastside Management Area);
- Land tenure (Zones 1, 2, or 3);
- Visual Resource Management (VRM) (Class I, II, III, or IV); and
- Public motorized access (*open*, *limited*, or *closed*).

Within each type of allocation or designation, including the examples above, all action alternatives and the Proposed RMP would assign each acre within the decision area to one, and only one category.[12] For example, in the land tenure designation type, every acre in the decision area would be assigned to a single Land Tenure Zone 1, 2, or 3 category. Similarly, for visual resource management, every acre within the decision area would be assigned to a single VRM Class I, II, III, or IV category. See **Figure 2-3** for a graphic example.

[12] An exception are Areas of Critical Environmental Concern (ACECs) that would overlap the Harvest Land Base where the special management needed to maintain the relevant and important values of the ACEC would be compatible with sustained-yield timber production. In these areas, the BLM would apply the management direction for both ACECs and the Harvest Land Base.

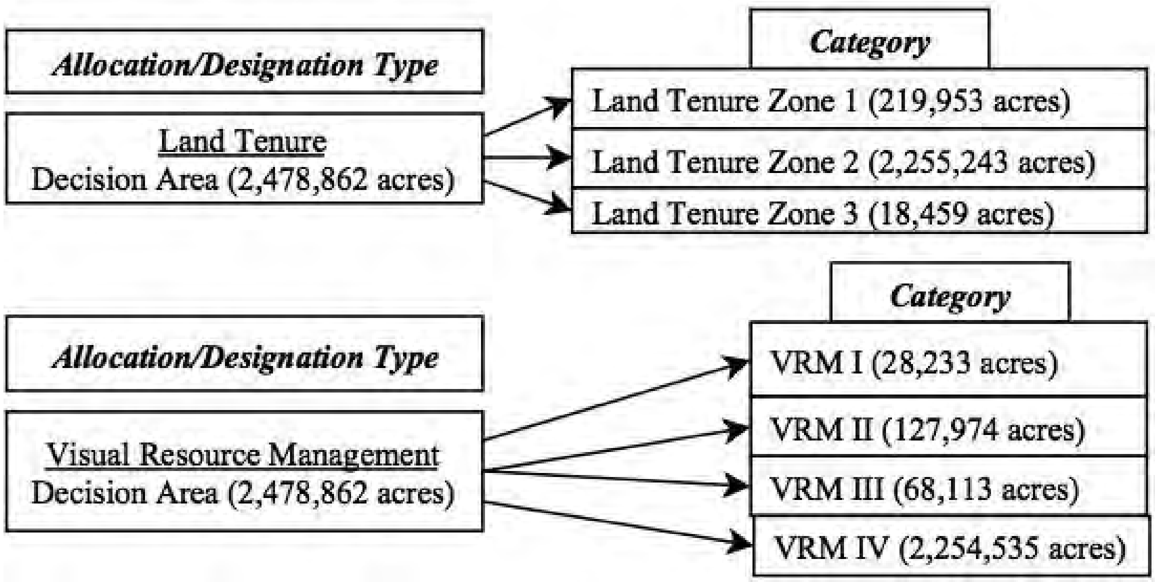


Figure 2-3. Example of how decision area acres are assigned by land use allocation/administrative designation type

These different types of allocations or designations overlap. For example, the BLM might allocate an individual acre to the Riparian Reserve, Land Tenure Zone 2, Visual Resource Management Class IV, and *closed* to public motorized vehicle use.

The action alternatives and the Proposed RMP include the following land use allocations categories for vegetation and habitat management: Congressionally Reserved Lands and National Landscape Conservation System, District-Designated Reserves, Late-Successional Reserve, Riparian Reserve, Harvest Land Base, and Eastside Management Area. The location and acreage of these categories of allocations, with the exception of Congressionally Reserved Lands, vary by the alternatives and the Proposed RMP.

Within each action alternative and the Proposed RMP, the land use allocation categories of District-Designated Reserves, Eastside Management Area, Harvest Land Base, Late-Successional Reserve, and Riparian Reserve have been further divided into sub-allocations with differing management direction. The Harvest Land Base has multiple sub-allocations with differing management direction for forest management summarized in **Table 2-3**. **Appendix B** of this Proposed RMP/Final EIS contains detailed descriptions of the management direction for the sub-allocations of the Harvest Land Base for the Proposed RMP. **Appendix B** – Management Objectives and Direction in the Draft RMP/EIS contains detailed descriptions of the management direction for the sub-allocations of the Harvest Land Base for Alternatives A–D and Sub-alternatives B and C, which are hereby incorporated by reference (USDI BLM 2014, pp. 905–986).

Table 2-3. Forest management practices by Harvest Land Base sub-allocation

Harvest Land Base Sub-allocation	Alternatives that Include Sub-allocation	Forest Management Practices
High Intensity Timber Area	Alt. A Alt. C	Thinning and regeneration harvest with no retention
Moderate Intensity Timber Area	Alt. B Alt. D Proposed RMP	Thinning and regeneration harvest with retention of 5–15 percent of the pre-harvest basal area of the stand
Low Intensity Timber Area	Alt. B Proposed RMP	Thinning and regeneration harvest with retention of 15–30 percent of the pre-harvest basal area of the stand
Uneven-aged Timber Area	All action alternatives Proposed RMP	Prescribed fire, thinning, single tree selection harvest, and group selection harvest
Owl Habitat Timber Area	Alt. D	Thinning and uneven-aged timber harvest applied in a manner that would maintain and promote the development of northern spotted owl habitat

In the context of these land use allocations, the term 'reserve' indicates that the BLM or Congress have reserved lands within the allocation from sustained-yield timber production. These reserve land use allocations—Congressionally Reserved Lands and National Landscape Conservation System Lands, District-Designated Reserves, Late-Successional Reserve, and Riparian Reserve—are in contrast to the Harvest Land Base, which includes management objectives for sustained-yield timber production. This does not mean that the BLM is necessarily prohibiting active management in these reserve allocations. On the contrary, the action alternatives and the Proposed RMP include management direction to conduct the management actions necessary to achieve the management objectives for these reserve allocations.

Congressionally Reserved Lands and National Landscape Conservation System

Congressionally Reserved Lands are those lands that Congress has designated and defined management through law, such as designated Wilderness and designated Wild and Scenic Rivers. The mandated management of these lands requires that the BLM reserve these lands from sustained-yield timber production. The location and acreage of Congressionally Reserved Lands does not vary among the alternatives and the Proposed RMP, including the No Action alternative.

In addition to Congressionally Reserved Lands, the BLM has also identified Wilderness Study Areas in the decision area, pursuant to Section 603 of the FLPMA. Until Congress makes a final determination on a Wilderness Study Area, the BLM manages these areas to preserve their suitability for designation as Wilderness.

District-Designated Reserves

District-Designated Reserves[13] include lands that are reserved from sustained-yield timber production for a variety of reasons, including—

[13] These areas have been termed Administratively Withdrawn in previous planning efforts. This Proposed RMP/Final EIS does not use the term withdrawn in this context to avoid confusion with the withdrawal of areas from operation of public land laws, location, and entry under mining laws, or application and offers under mineral leasing laws.

- Areas that the BLM has constructed for specific purposes (e.g., roads, buildings, maintenance yards, seed orchards, and other facilities and infrastructure);
- Areas that the BLM has identified through the Timber Production Capability Classification[14] system as unsuitable for sustained-yield timber production (e.g., rock outcrops);
- Areas of Critical Environmental Concern, including Research Natural Areas, that would not overlap the Harvest Land Base; and
- Other reserves (e.g., Special Recreation Management Areas that would not overlap the Harvest Land Base, areas protected for Bureau Sensitive species, and District-Designated Reserve – Lands Managed for their Wilderness Characteristics).

Under the action alternatives and the Proposed RMP, the BLM would manage roads, maintenance yards, buildings, and other facilities for the purpose for which they were constructed.

The BLM identifies lands as unsuitable for sustained-yield timber production through the Timber Production Capability Classification system and may manage these areas for other uses, if those uses are compatible with the reason for which the BLM has reserved these lands (as identified by the Timber Production Capability Classification codes). The BLM will periodically add additional areas to those areas reserved through updates to the Timber Production Capability Classification system, when examinations indicate that an area meets the criteria for reservation. The BLM may also delete areas from those areas reserved and return the area to sustained-yield timber production through updates to the Timber Production Capability Classification system, when examinations indicate that an area does not meet the criteria for reservation. The BLM will implement these additions and deletions to the Timber Production Capability Classification through plan maintenance, because such changes will represent minor changes based on further refining the decision in the RMP (**Appendix X**).

Areas of Critical Environmental Concern are lands where special management attention is needed to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish, and wildlife resources or other natural systems or processes or to protect life and provide safety from natural hazards, pursuant to Section 202(c)(3) of the FLPMA. For areas that have relevant and important values and need special management to maintain those values, the BLM will designate and manage Areas of Critical Environmental Concern on public domain lands and acquired lands. The BLM will also designate and manage Areas of Critical Environmental Concern on O&C lands where the special management needed to maintain relevant and important values would not conflict with the planning for sustained-yield timber production for the purposes of the O&C Act. For example, designating and managing Areas of Critical Environmental Concern on O&C lands would not conflict with sustained-yield timber production in the following circumstances: on non-forested lands; on O&C lands that would otherwise be allocated to a land use allocation that would preclude sustained-yield timber production; or on lands for which the Timber Productivity Capability Classification category is 'not included in the harvest land base.' In addition, designating and managing Areas of Critical Environmental Concern on O&C lands would not conflict with sustained-yield timber production if the special management needed to maintain relevant and important values were compatible with sustained-yield timber production, even if that special management might condition how sustained-yield timber production would be conducted. In these areas, the BLM would designate Areas of Critical Environmental Concern within the Harvest Land Base and apply the management direction for both Areas of Critical Environmental Concern and the Harvest Land Base. For Areas of Critical Environmental Concern not within the O&C Harvest Land Base, such as those

[14] The Timber Production Capability Classification is an analytical classification system by which the BLM inventories and identifies sites as capable of supporting sustained-yield timber production without degrading the site's productive capacity. This classification considers factors such as soil depth, available moisture, slope, drainage, and stability. Sites that are not capable of supporting sustained-yield timber production are not included in the Harvest Land Base.

that would be within the Late-Successional Reserve or are on acquired lands within the Harvest Land Base, the BLM would allocate these as District-Designated Reserves where identified that special management is needed to maintain the relevant and important values.

The BLM would designate Special Recreation Management Areas as District-Designated Reserves on public domain lands and acquired lands; on non-forested O&C lands; on O&C lands that would otherwise be allocated to a land use allocation that would preclude sustained-yield timber production; or on O&C lands for which the Timber Productivity Capability Classification category is not included in the Harvest Land Base. The BLM would designate Special Recreation Management Areas on the Harvest Land Base on O&C lands to the extent that the management for recreation and visitor services would be compatible with planning for sustained-yield timber production for the purposes of the O&C Act, even if that management might condition how sustained-yield timber production would be conducted, consistent with the discussion in Chapter 1 under 'The O&C Act and the FLPMA.' In these areas, the BLM would manage recreation as the predominant use of the lands, applying the management direction and achieving the management objectives for both Special Recreation Management Areas and the Harvest Land Base.

District-Designated Reserve – Lands Managed for Their Wilderness Characteristics are areas outside of designated Wilderness or Wilderness Study Areas that the BLM has decided to manage for their wilderness characteristics. The BLM would reserve lands with wilderness characteristics (outside of Wilderness or Wilderness Study Areas) on O&C lands consistent with the discussion in Chapter 1 under 'The O&C Act and the FLPMA.'

Land Use Allocation Objectives that are Common to the Action Alternatives and the Proposed RMP in the Proposed RMP/Final EIS

Eastside Management Area

All action alternatives and the Proposed RMP include an Eastside Management Area land use allocation, which applies to BLM-administered lands in the Klamath Falls Field Office east of Highway 97. On forested lands, this allocation includes management objectives to—

- Manage forested lands on a sustainable basis for multiple uses including wildlife habitat, recreational needs, riparian habitat, cultural resources, community stability, and commodity production, including commercial timber and other forest products.
- Promote development of fire-resilient forests.
- Offer for sale the probable sale quantity of 350 thousand board feet (Mbf) of timber per year.

On non-forested lands, this allocation includes management objectives to—

- Manage non-forested lands with the intent of maintaining or improving wildlife habitat and rangeland conditions based on ecological site parameters. Where conditions are currently late seral or potential natural community, maintain these conditions. Where conditions are early or mid seral, improve conditions towards late seral or potential natural community.
- Manage non-forested lands for multiple uses in addition to those listed above including recreational needs, community stability, and commodity production. Commodities include firewood, logs, biomass, chips, and other products and byproducts from juniper woodlands and rangelands.
- Promote development of fire-resilient woodlands and rangelands.
- Provide for the conservation of Bureau Special Status Species.

The Eastside Management Area – Riparian Reserve includes management objectives to—

- Provide for conservation of Bureau Special Status fish and other Bureau Special Status riparian-associated species.
- Provide for the riparian and aquatic conditions that supply stream channels with shade, sediment filtering, leaf litter and large wood sources, and stream bank stability.
- Maintain and restore water quality and hydrologic functions.
- Maintain and restore access to stream channels for all life stages of aquatic species.
  Maintain and restore the proper functioning condition and ecological site potential of riparian and wetland areas.

Harvest Land Base

The Harvest Land Base in the action alternatives and the Proposed RMP has management objectives to—

- Manage forests to achieve continual timber production that can be sustained through a balance of growth and harvest;
- Offer for sale the declared Allowable Sale Quantity of timber;
- Recover economic value from timber following disturbances, such as fires, windstorms, disease, or insect infestations;
- In harvested or disturbed areas, ensure the establishment and survival of desirable trees appropriate to the site and enhance their growth; and
- Enhance the economic value of timber in forest stands.

Late-Successional Reserve

The Late-Successional Reserve in the action alternatives and the Proposed RMP has management objectives to—

- Maintain nesting-roosting habitat for the northern spotted owl and nesting habitat for the marbled murrelet.
- Promote the development of nesting-roosting habitat for the northern spotted owl in stands that do not currently support northern spotted owl nesting and roosting.
- Promote the development of nesting habitat for the marbled murrelet in stands that do not currently meet nesting habitat criteria.
- Promote the development and maintenance of foraging habitat for the northern spotted owl, including creating and maintaining habitat to increase diversity and abundance of prey for the northern spotted owl.

Riparian Reserve

The Riparian Reserve (west of Highway 97) in the action alternatives and the Proposed RMP has management objectives to—

- Contribute to the conservation and recovery of ESA-listed fish species and their habitats and provide for conservation of Bureau Special Status fish and other special status riparian-associated species;
- Maintain and restore riparian areas, stream channels and wetlands by providing forest shade, sediment filtering, wood recruitment, stability of stream banks and channels, water storage and release, vegetation diversity, nutrient cycling, and cool and moist microclimates;
- Maintain water quality and stream flows within the range of natural variability, to protect aquatic biodiversity, and provide quality water for contact recreation and drinking water sources;
- Meet ODEQ water quality criteria;
- Maintain high-quality water and contribute to the restoration of degraded water quality downstream of BLM-administered lands; and
- Maintain high-quality waters within ODEQ designated Source Water Protection watersheds.

Resource-specific Objectives that are Common to all action alternatives and the Proposed RMP in the Proposed RMP/Final EIS

For many programs or resources, the management objectives and management direction differ from the No Action alternative, but do not vary among the action alternatives and the Proposed RMP. For some of these resources or programs, the management objectives and management direction do not vary among the action alternatives and the Proposed RMP, but the management of the resource is tied to allocations that do vary among action alternatives and the Proposed RMP. For example, the management objectives and management direction for designated Areas of Critical Environmental Concern do not vary among the action alternatives and the Proposed RMP. However, which specific areas the BLM would designate as Areas of Critical Environmental Concern would vary with the land use allocations of the action alternatives and the Proposed RMP. The following section summarizes the resource-specific management objectives that are common to the action alternatives and the Proposed RMP. **Appendix B** of this Proposed RMP/Final EIS contains detailed descriptions of the resource-specific management objectives for the Proposed RMP. **Appendix B** – Management Objectives and Direction in the Draft RMP/EIS contains detailed descriptions of the resource-specific management objectives for Alternatives A–D and Sub-alternatives B and C, which are hereby incorporated by reference.

Air Quality: The BLM would follow the Clean Air Act by protecting air quality in Class 1 areas, such as designated Wilderness Areas, and preventing exceedances of National, State, or local ambient air quality standards.

Areas of Critical Environmental Concern (ACECs): The BLM would manage designated ACECs to maintain and restore their relevant and important values (though the array of ACECs that the BLM would designate varies by the alternatives and the Proposed RMP).

Cultural/Paleontological Resources: The BLM would protect significant cultural resources and ensure that all land and resource uses comply with the National Historic Preservation Act. The BLM would protect and preserve significant localities from natural or human-caused deterioration or potential conflict with other resources.

Fire and Fuels: In responding to wildfires, the BLM would provide for public and firefighter safety while meeting land management objectives. The BLM would also manage the land to restore and maintain resilience to wildfires and to decrease the risk of catastrophic wildfires.

Fisheries: The BLM would manage riparian areas to maintain and improve the aquatic habitat across the landscape.

Forest Management: The BLM would enhance the health, stability, growth, and vigor of forest stands. The BLM would not allow management activities that would disrupt the Density Management study sites until data collection is complete.

Hydrology: The BLM would manage to provide water that meets Oregon Department of Environmental Quality water quality standards for drinking water, contact recreation, and aquatic biodiversity.

Invasive Species: The BLM would prevent the introduction and spread of non-native invasive species.

Lands, Realty, and Roads: The BLM would adjust land tenure zones to facilitate potential changes in ownership to improve the management of resources and enhance public resource values. The BLM would also provide legal access to BLM-administered lands and facilities and rights-of-way, permits, leases, and easements in a manner that is consistent with Federal and State laws.

Minerals: The BLM would manage mineral resources in a manner that allows for their orderly and efficient development.

Rare Plants and Fungi: The BLM would manage to contribute toward the recovery of ESA-listed plant species. The BLM would also manage for an array of natural communities including oak woodlands, shrublands, grasslands, cliffs, rock outcrops, talus slopes, meadows, and wetlands, and would support ecological processes and disturbance mechanisms to allow for a range of seral conditions.

Recreation: The BLM would provide diverse recreational opportunities.

National Landscape Conservation System: The BLM would conserve, protect, and restore areas that Congress has designated for their outstanding values.

Travel and Transportation: The BLM would maintain a transportation network that best meets the full range of public, resource management, and administrative access needs.

Visual Resource Management: The BLM would manage for the protection of scenic values on public lands. The BLM would consider higher levels of protection where visual resource management is an issue or where high value visual resources exist (i.e., high scenic quality, visual sensitivity, and public visibility).

Soils: The BLM would manage to maintain the overall soil quality of BLM-administered lands.

Sustainable Energy: The BLM would allow for the development of sustainable energy resources to the maximum extent possible without precluding other land uses.

Wild Horses: The BLM would maintain a healthy population of wild and free-roaming horses in the Pokegama Herd Management Area.

Wildlife: The BLM would manage to contribute to the conservation and recovery of ESA-listed wildlife species. It would also implement proactive conservation measures that reduce or eliminate threats to Bureau Sensitive species to minimize the likelihood of and need for listing of these species under the Endangered Species Act.

Under all action alternatives and the Proposed RMP, the BLM would implement administrative actions at approximately the same levels as during the past decade. Administrative actions are routine transactions and activities that are required to serve the public and to provide optimum management of resources, including:

- Competitive and commercial recreation activities
- Special forest product collection permit issuance
- Lands and realty actions (including the issuance of grants, leases, and permits)
- Trespass resolution
- Facility maintenance
- Facility improvements
- Road maintenance

- Hauling permit issuance
- Recreation site maintenance
- Recreation site improvement
- Hazardous materials removal
- Abandoned Mine Land physical closure or removal and environmental remedial actions
- Law enforcement
- Legal land or mineral estate ownership surveys
- Engineering support assistance in mapping
- Field visits for the design of projects (including clearance inventories) and contract administration
- Tree sampling (including using the 3P fall, buck, and scale sampling method)
- Project implementation monitoring and plan effectiveness monitoring
- Incidental live or dead tree removal for safety or operational reasons
- Wildlife, fisheries, or plant community and population survey or monitoring
- Native plant seed collection and material development

Wild and Scenic Rivers
Under the No Action alternative, the BLM would continue to manage the 51 eligible Wild and Scenic River segments under interim management to protect their ORVs, water quality, free-flowing characteristics, and tentative classification as Wild, Scenic, or Recreational until suitability is determined during subsequent land use planning efforts.

Action Alternative Descriptions

This section includes a summary of those features that differ among the action alternatives. **Appendix B** – Management Objectives and Direction of the Draft RMP/EIS contains detailed descriptions by alternative of the management objectives and management direction that differ among the action alternatives, which are incorporated here by reference.

Alternative A

Alternative A has a Late-Successional Reserve larger than the No Action alternative (**Figure 2-4**, **Table 2-4**, and **Map 2-2**; compare to **Figure 2-2**, **Table 2-2**). The Harvest Land Base is comprised of the Uneven-aged Timber Area and the High Intensity Timber Area. The High Intensity Timber Area includes regeneration harvest with no retention (i.e., clearcuts).

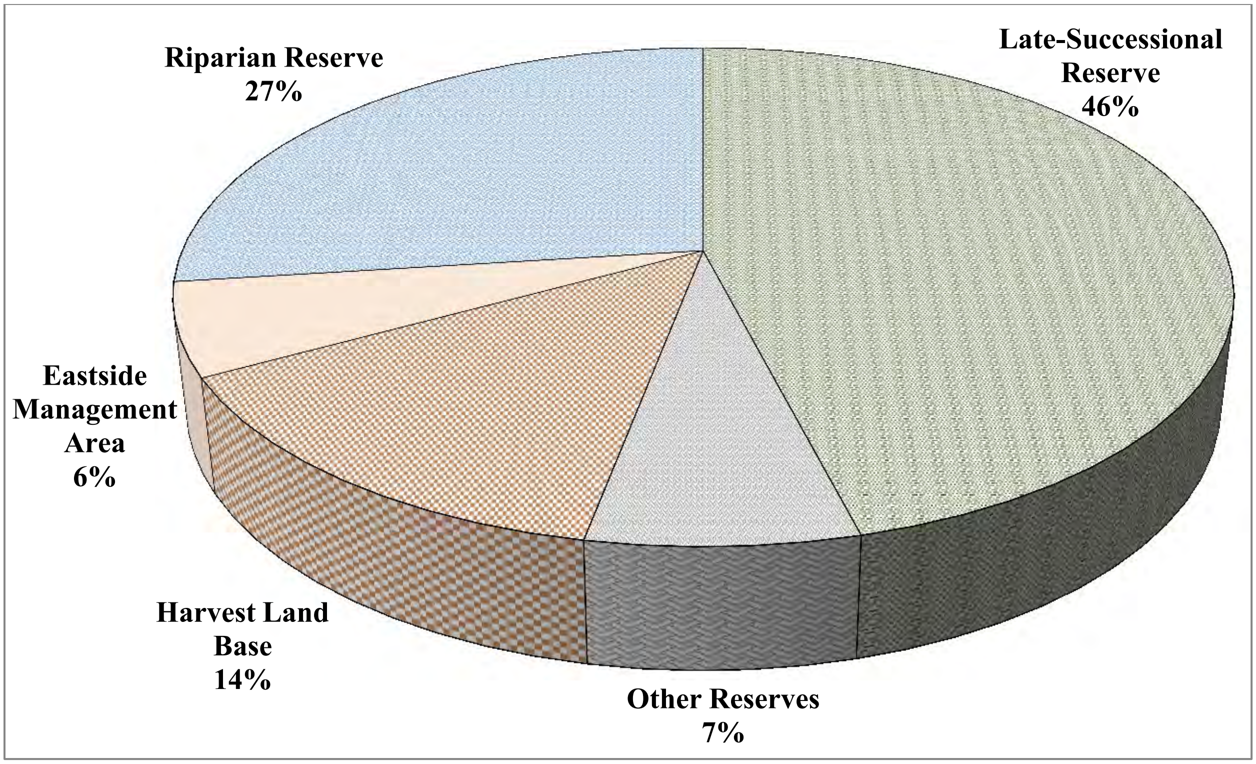


Figure 2-4. Alternative A land use allocations

Table 2-4. Alternative A land use allocations

Land Use Allocation	Acres	Total Acres (Percent)	Sub-allocation	Acres	Total Acres (Percent)
Late-Successional Reserve	1,147,527	46%	Structurally-complex Forest	655,125	26%
			Late-Successional Reserve – Moist	265,376	11%
			Late-Successional Reserve – Dry	188,440	8%
			Existing Occupied Marbled Murrelet Sites	38,312	2%
			Existing Red Tree Vole Sites*	274	<1%
Riparian Reserve	676,917	27%	Riparian Reserve – Moist	441,603	18%
			Riparian Reserve – Dry	235,313	9%
Other Reserves	170,540	7%	Congressionally Reserved	40,537	2%
			District-Designated Reserves	130,003	5%
Harvest Land Base	343,900	14%	High Intensity Timber Area	289,060	12%
			Uneven-aged Timber Area	54,840	2%
Eastside Management Area	139,972	6%	-	139,972	6%
			Totals	**2,478,856**	**-**

* Existing Red Tree Vole Sites means existing sites of the North Oregon Coast Distinct Population Segment of the red tree vole.

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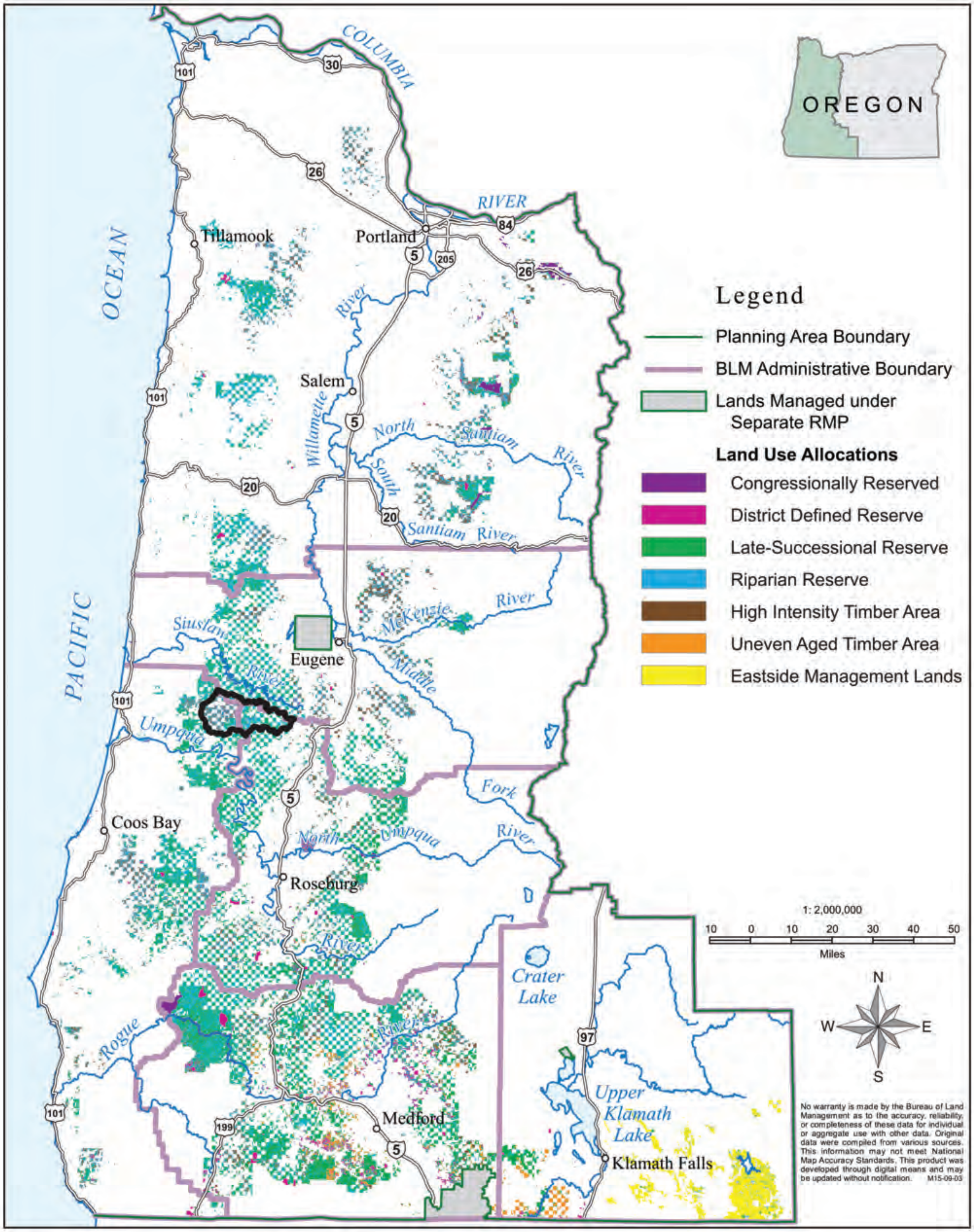
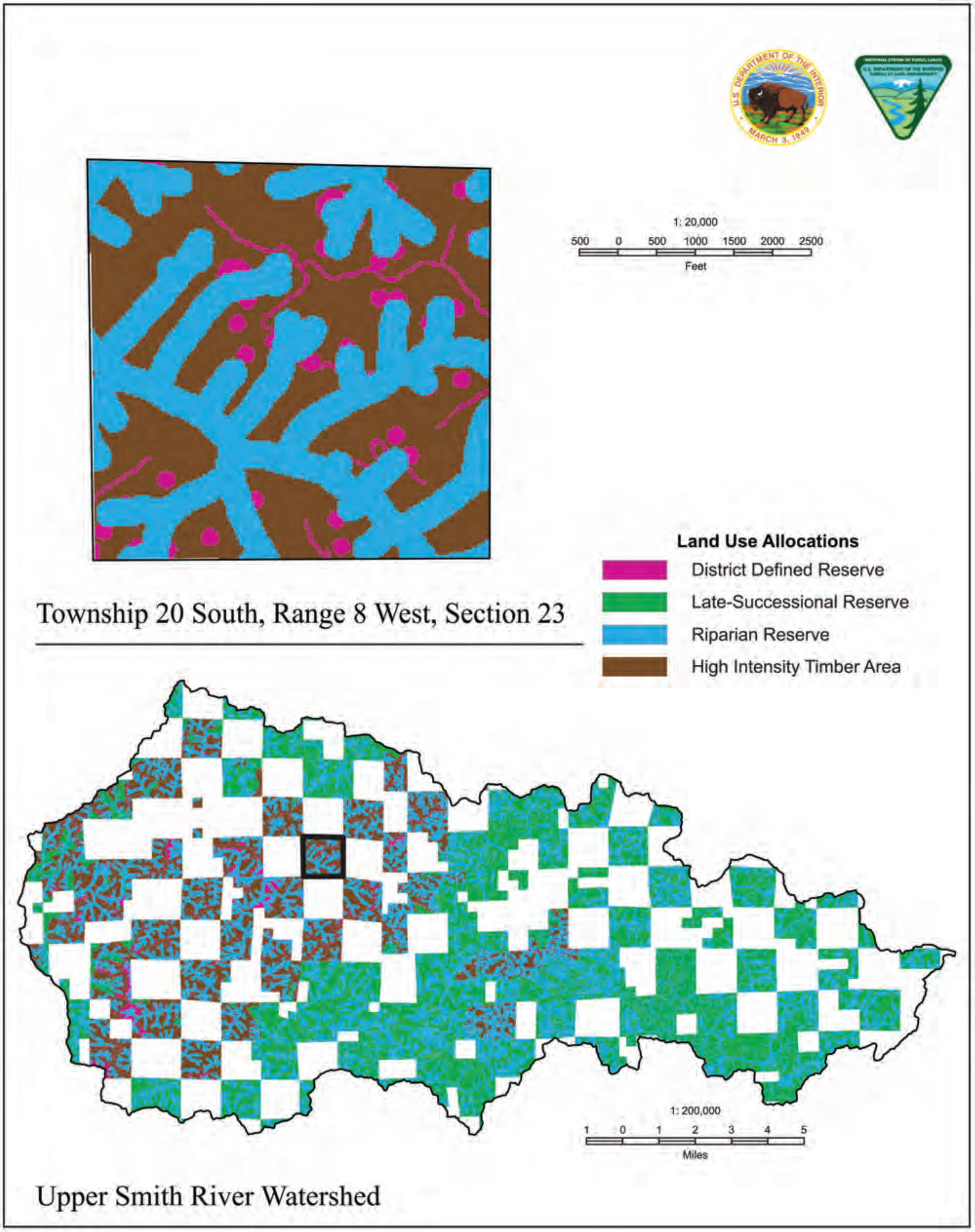


Map 2-2: Alternative A Land Use Allocations


1: 20,000
500 0 500 1000 1500 2000 2500
Feet
Land Use Allocations
District Defined Reserve
Late-Successional Reserve
Riparian Reserve
High Intensity Timber Area
Township 20 South, Range 8 West, Section 23
1: 200,000
1 0 1 2 3 4 5
Miles
Upper Smith River Watershed

Late-Successional Reserve
The Late-Successional Reserve includes, primarily, Structurally-complex Forest, Large Block Forest Reserves (Late-Successional Reserve – Moist and Late-Successional Reserve – Dry), and much smaller acreages from existing occupied marbled murrelet sites and existing sites of the North Oregon Coast Distinct Population Segment of the red tree vole. Within the Late-Successional Reserve, the BLM would not conduct timber salvage after disturbance, except when necessary to protect public health and safety, or to keep roads and other infrastructure clear of debris.

Structurally-complex Forest
Alternative A includes within the Late-Successional Reserve all stands 120-years old and older, based on the current age of stands in the BLM Forest Operations Inventory.

Large Block Forest Reserves: Late-Successional Reserve – Moist and Late-Successional Reserve – Dry[15]
Alternative A includes within the Late-Successional Reserve all northern spotted owl critical habitat designated in 2013 and marbled murrelet critical habitat designated in 2011. In moist forests, the BLM would conduct thinning to promote the development of structurally-complex forest, but without commercial removal of timber (i.e., down woody debris and snag creation only). In dry forests, the BLM would conduct activities including thinning and prescribed burning to promote the development of structurally-complex forest and to improve resilience to disturbance. In dry forests, thinning would include removing cut trees, including commercial removal, as needed to reduce the risk of uncharacteristic high-severity or high-intensity fire.

Riparian Reserve
In Alternative A, the Riparian Reserve encompasses lands within one site-potential tree height[16] on either side of all streams.

The Riparian Reserve includes an inner zone in which thinning is not permitted. Inner zone widths are—
- 120 feet on either side of perennial and fish-bearing intermittent streams; and
- 50 feet on either side of non-fish-bearing, intermittent streams.

Outside of the inner zone, the BLM would conduct thinning as needed to ensure that stands are able to provide trees to form stable instream structures. In moist forests, the BLM would conduct thinning without commercial removal of timber (i.e., down woody material and snag creation only). In dry forests, activities would include prescribed burning and thinning that would include removal of cut trees, including commercial removal, as needed to reduce the risk of uncharacteristic high-severity or high-intensity fire.

Harvest Land Base
The Harvest Land Base is comprised of the Uneven-aged Timber Area and the High Intensity Timber Area. The allocation of the Uneven-aged Timber Area in Alternative A is based on areas below an average annual precipitation threshold. Timber management in the High Intensity Timber Area includes thinning and regeneration harvest with no retention (i.e., clearcuts). The High Intensity Timber Area has no snag or down woody material retention requirements.

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[15] For the purpose of Late-Successional Reserve and Riparian Reserve management in Alternative A, dry forests are defined by dry and very dry forest types identified by potential vegetation types.
[16] Site-potential tree height is the average maximum height of the tallest dominant trees (200 years or older) for a given site class. Site-potential tree heights generally range from 140 feet to 240 feet across the decision area, depending on site productivity.

Wildlife
Within the Harvest Land Base, Alternative A does not include—

- Specific protections for northern spotted owl known or historic sites;
- A requirement for surveys for the marbled murrelet prior to management actions;
- Specific management requirements for trees capable of providing marbled murrelet nesting structures in younger stands; or
- A requirement for surveys for North Oregon Coast Distinct Population Segment of the red tree vole prior to management actions.

Rare Plants and Fungi
The BLM would create new populations and augment existing populations of ESA-listed and other special status plants and fungi to meet recovery plan or conservation strategy objectives.

Invasive Species
Alternative A does not include treatment of sudden oak death infection sites.

Livestock Grazing
The BLM would manage allotments in compliance with Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington (USDI BLM 1997). The BLM would adjust grazing levels and management practices when needed to meet or make progress toward meeting the standards for rangeland health. The BLM would make unavailable to grazing those allotments that have been generally been vacant or inactive for 5 years or more and currently have no Section 3 or Section 15 grazing preference.

Minerals
Under Alternative A, the BLM would recommend for withdrawal from locatable mineral entry 170,622 acres (in addition to the 98,400 acres previously withdrawn) and would close 200,878 acres to salable mineral material disposal.

Areas of Critical Environmental Concern
Under Alternative A, the BLM would designate 107 Areas of Critical Environmental Concern.

Recreation Management Areas
Alternative A includes designation of Special Recreation Management Areas where developed recreation sites or facilities currently exist. In the rest of the decision area, the BLM would not manage specifically for recreation.

Lands with Wilderness Characteristics
Alternative A includes management for wilderness characteristics of all identified lands with wilderness characteristics that are not within the Harvest Land Base.

Wild and Scenic Rivers
Under Alternative A, the BLM would not recommend any of the 51 eligible Wild and Scenic River segments for inclusion in the National Wild and Scenic River System.

Visual Resource Management
Under Alternative A, the BLM would manage Congressionally Reserved lands where decisions have been made to preserve a natural landscape (e.g., designated Wilderness Areas and the Wild sections of Wild and Scenic Rivers) as Visual Resource Management Class I. The BLM would manage the following as VRM Class II: designated and recommended suitable Wild and Scenic Rivers classified as Scenic;

National Trail management corridors; District-Designated Reserve – Lands Managed for their Wilderness Characteristics; and Special Recreation Management Areas that fall within the Primitive and Backcountry setting. The BLM would manage the following as VRM Class III: designated and recommended suitable Wild and Scenic Rivers classified as Recreational; and Special and Extensive Recreation Management Areas that fall within the Middle Country setting. The BLM would manage ACECs as a VRM class commensurate to the assigned Visual Resource Inventory class (e.g., VRI Class III as VRM Class III). The BLM would manage all other lands as Visual Resource Management Class IV.

Alternative B

Alternative B has a Late-Successional Reserve similar in size to Alternative A, though of a different spatial design (see **Figure 2-5**, **Table 2-5**, and **Map 2-3**). The Harvest Land Base is comprised of the Uneven-aged Timber Area, Low Intensity Timber Area, and Moderate Intensity Timber Area. The portion of the Harvest Land Base in Uneven-aged Timber Area is the largest of all the action alternatives. The Low Intensity Timber Area and Moderate Intensity Timber Area include regeneration harvest with varying levels of retention.

A sub-alternative of Alternative B (hereafter Sub-alternative B) includes reserving all known and historic northern spotted owl sites that would be in the Harvest Land Base in Alternative B. All other features of Sub-alternative B are the same as Alternative B. The description of Sub-alternative B, including the acreage of each land use allocation and a map, follows the description of Alternative B.

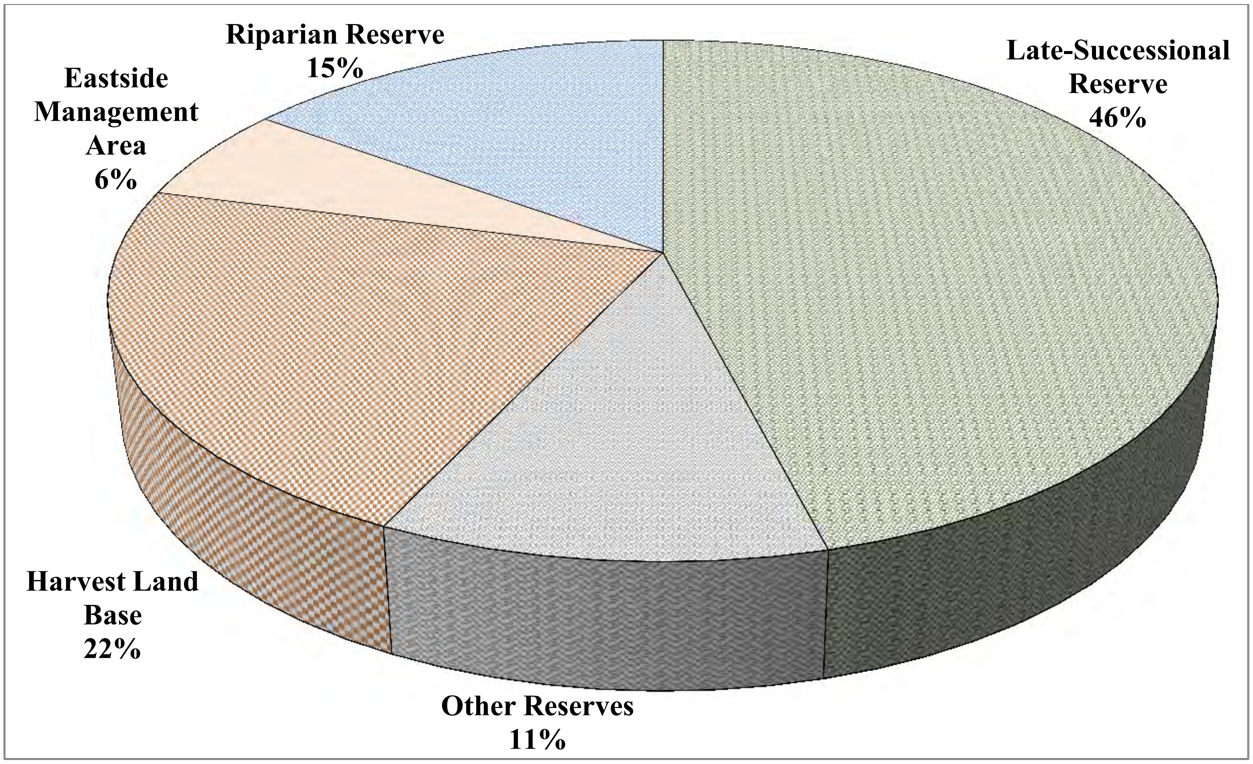
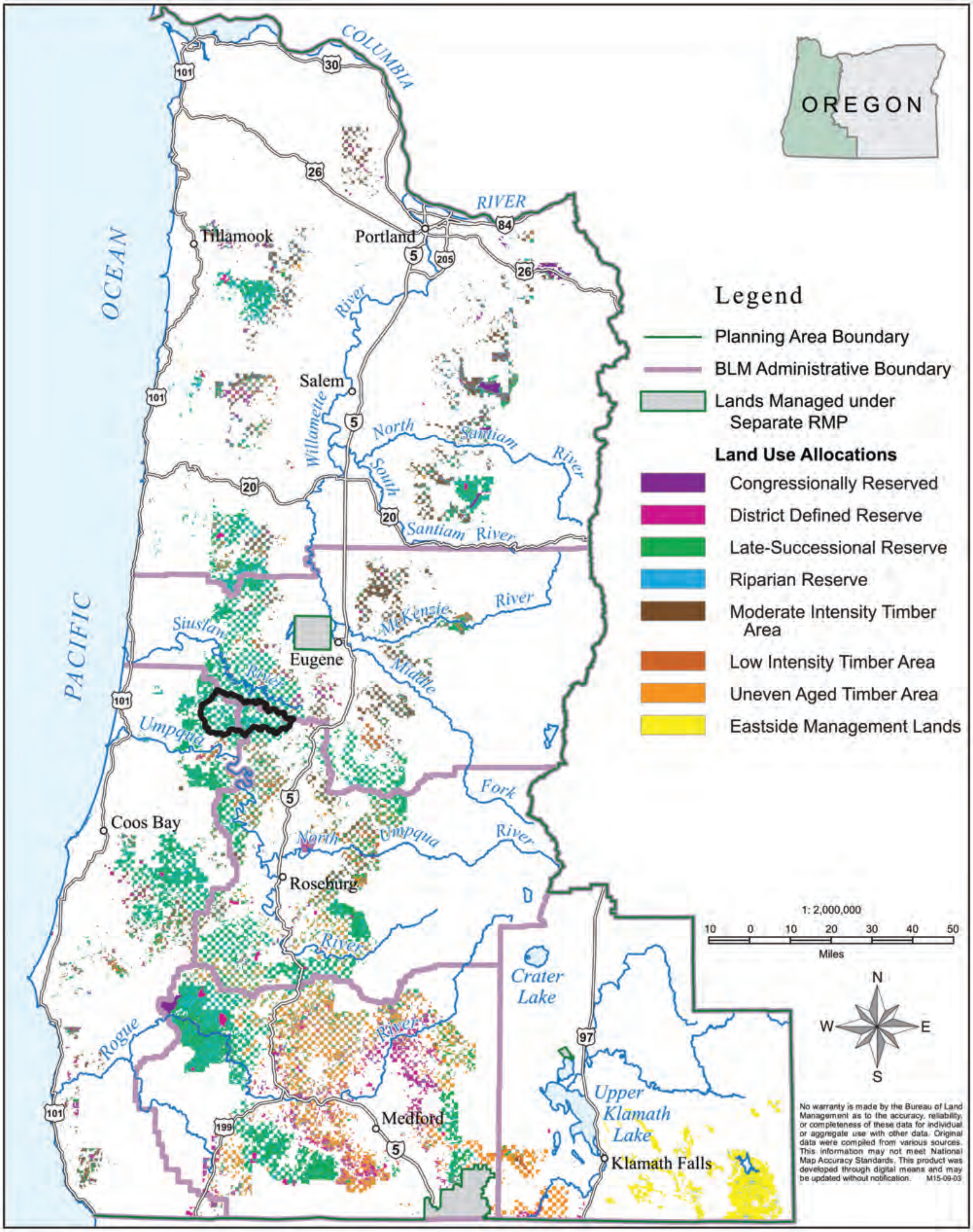


Figure 2-5. Alternative B land use allocations

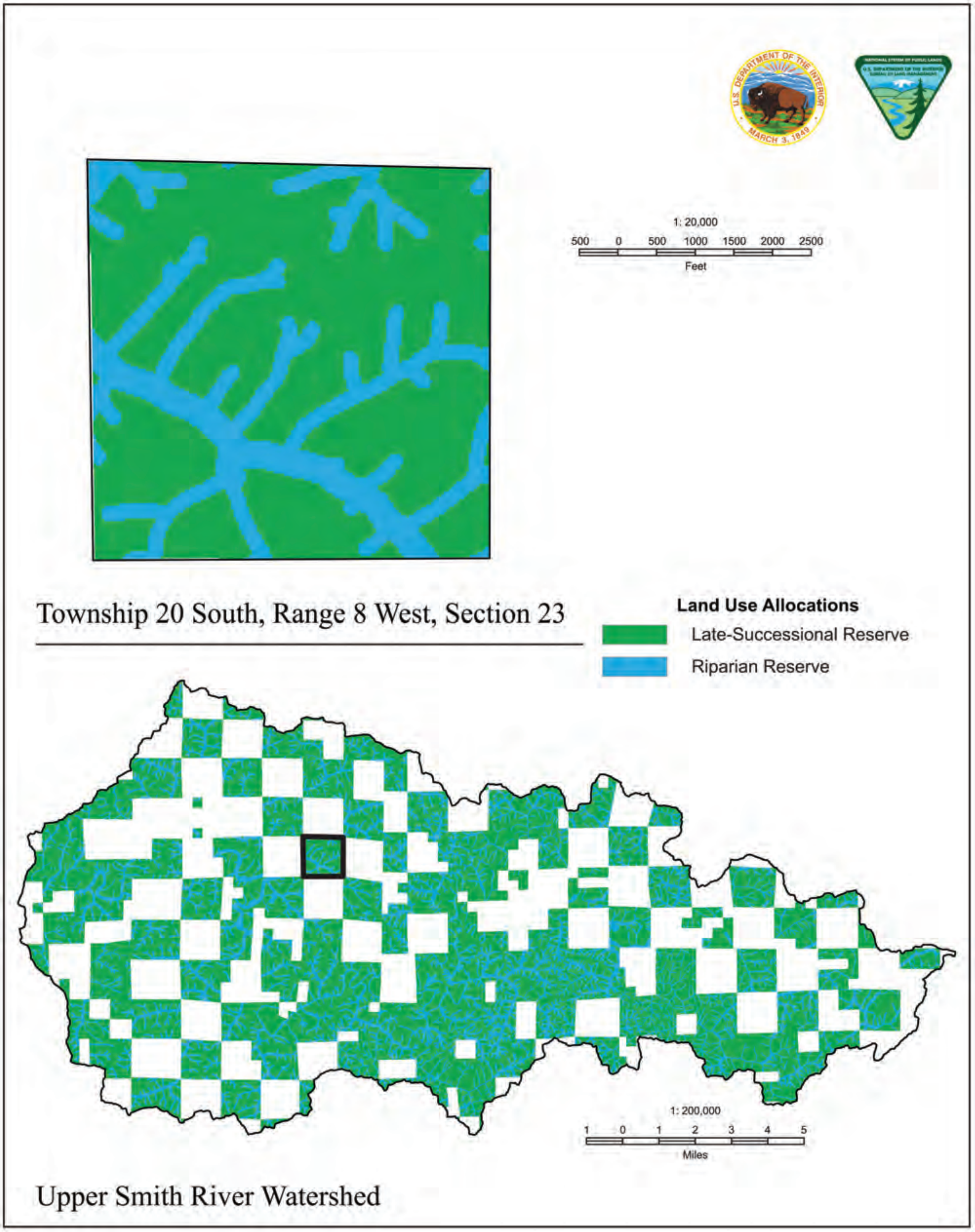
Table 2-5. Alternative B land use allocations

<table>
<tr><th>Land Use Allocation</th><th>Acres</th><th>Total Acres (Percent)</th><th>Sub-allocation</th><th>Acres</th><th>Total Acres (Percent)</th></tr>
<tr><td rowspan="7">Late-Successional Reserve</td><td rowspan="7">1,127,320</td><td rowspan="7">46%</td><td>Structurally-complex Forest</td><td>463,910</td><td>19%</td></tr>
<tr><td>Late-Successional Reserve – Moist</td><td>371,305</td><td>15%</td></tr>
<tr><td>Late-Successional Reserve – Dry</td><td>223,399</td><td>9%</td></tr>
<tr><td>Existing Occupied Marbled Murrelet Sites</td><td>41,633</td><td>2%</td></tr>
<tr><td>Predicted Marbled Murrelet Sites</td><td>13,738</td><td><1%</td></tr>
<tr><td>Existing Red Tree Vole Sites*</td><td>297</td><td><1%</td></tr>
<tr><td>Predicted Red Tree Vole Sites*</td><td>13,039</td><td><1%</td></tr>
<tr><td rowspan="2">Riparian Reserve</td><td rowspan="2">382,805</td><td rowspan="2">15%</td><td>Riparian Reserve – Moist</td><td>215,231</td><td>9%</td></tr>
<tr><td>Riparian Reserve – Dry</td><td>167,574</td><td>7%</td></tr>
<tr><td rowspan="2">Other Reserves</td><td rowspan="2">260,510</td><td rowspan="2">11%</td><td>Congressionally Reserved</td><td>40,537</td><td>2%</td></tr>
<tr><td>District-Designated Reserves</td><td>219,973</td><td>9%</td></tr>
<tr><td rowspan="3">Harvest Land Base</td><td rowspan="3">556,335</td><td rowspan="3">22%</td><td>Moderate Intensity Timber Area</td><td>210,087</td><td>8%</td></tr>
<tr><td>Low Intensity Timber Area</td><td>72,358</td><td>3%</td></tr>
<tr><td>Uneven-aged Timber Area</td><td>273,890</td><td>11%</td></tr>
<tr><td>Eastside Management Area</td><td>151,885</td><td>6%</td><td>-</td><td>151,885</td><td>6%</td></tr>
<tr><td colspan="4">Totals</td><td>2,478,856</td><td>-</td></tr>
</table>

* Existing Red Tree Vole Sites and Predicted Red Tree Vole Sites means those sites of the North Oregon Coast Distinct Population Segment.



Map 2-3: Alternative B Land Use Allocations


1: 20,000
500 0 500 1000 1500 2000 2500
Feet
Township 20 South, Range 8 West, Section 23
Land Use Allocations
Late-Successional Reserve
Riparian Reserve
1: 200,000
1 0 1 2 3 4 5
Miles
Upper Smith River Watershed

Late-Successional Reserve
The Late-Successional Reserve includes, primarily, Structurally-complex Forest, Large Block Forest Reserves (Late-Successional Reserve – Moist and Late-Successional Reserve – Dry), and much smaller acreages from existing occupied marbled murrelet sites and existing sites of the North Oregon Coast Distinct Population Segment of the red tree vole. In addition, Alternative B includes requirements for surveys for the marbled murrelet and the North Oregon Coast Distinct Population Segment of the red tree vole, as described below; newly discovered sites would be included in the Late-Successional Reserve. Thus, this description of the Late-Successional Reserve includes predictions of the acreage of newly discovered marbled murrelet and red tree vole sites. Within the Late-Successional Reserve, the BLM would not conduct timber salvage after disturbance, except when necessary to protect public health and safety, or to keep roads and other infrastructure clear of debris.

Structurally-complex Forest Alternative B includes within the Late-Successional Reserve all stands identified by existing, district-specific information on structurally-complex forests.

Large Block Forest Reserves: Late-Successional Reserve – Moist and Late-Successional Reserve – Dry[17]
Alternative B includes within the Late-Successional Reserve blocks of functional and potential northern spotted owl habitat, sufficient to meet block size and spacing requirements (Thomas *et al*. 1990, pp. 24, 28) in all provinces except the Coast Range province, where reserves include blocks of habitat without limitations for size and spacing. In moist forests, the BLM would conduct thinning to promote the development of structurally-complex forest, which may include commercial removal of cut trees. In dry forests, the BLM would conduct activities including thinning and prescribed burning to promote the development of structurally-complex forest and to improve resilience to disturbance, which may include commercial removal of cut trees.

Riparian Reserve
In Alternative B, the Riparian Reserve encompass lands within—
- One site-potential tree height on either side of fish-bearing and perennial streams;
- 100 feet on either side of debris-flow-prone, non-fish-bearing, intermittent streams; and
- 50 feet on either side of other non-fish-bearing, intermittent streams.

The Riparian Reserve includes an inner zone in which thinning is not permitted. Inner zone widths are—
- 60 feet on either side of perennial and fish-bearing intermittent streams; and
- 50 feet on either side of non-fish-bearing, intermittent streams.

Outside of the inner zone, the BLM would conduct thinning, which may include commercial removal, as needed to develop diverse and structurally-complex riparian stands.

Harvest Land Base
The Harvest Land Base is comprised of the Uneven-aged Timber Area, Low Intensity Timber Area, and Moderate Intensity Timber Area. The allocation bases the Uneven-aged Timber Area in Alternative B on dry and very dry forest types identified by potential vegetation types. The portion of the Harvest Land Base outside of the Uneven-aged Timber Area is divided between the Low Intensity Timber Area in designated northern spotted owl critical habitat and the Moderate Intensity Timber Area outside of designated northern spotted owl critical habitat. Timber harvest in the Low Intensity Timber Area includes thinning and regeneration harvest with retention of 15–30 percent of the stand. In the Low Intensity Timber Area, the BLM would rely on natural tree regeneration after timber harvest. Timber

[17] For the purpose of Late-Successional Reserve and Riparian Reserve management in Alternative B, dry forests are defined by dry and very dry forest types identified by potential vegetation types.

harvest in the Moderate Intensity Timber Area includes thinning and regeneration harvest with retention of 5–15 percent of the stand. In the Moderate Intensity Timber Area, the BLM would use either natural tree regeneration or replanting after timber harvest, but would maintain early seral habitat conditions for several decades after harvest.

Wildlife

Within the Harvest Land Base, Alternative B includes—

- No specific protections for northern spotted owl known or historic sites;
- A requirement for surveys for the marbled murrelet prior to management actions in marbled murrelet Zone 1 and protection of habitat within 300 feet around newly discovered occupied sites;
- The protection of trees capable of providing marbled murrelet nesting structures in younger stands in marbled murrelet Zone 1; and
- A requirement for surveys for North Oregon Coast Distinct Population Segment of the red tree vole prior to management actions and protection of habitat areas around newly discovered nest sites.

Rare Plants and Fungi

The BLM would manage mixed hardwood/conifer communities outside of the Harvest Land Base to maintain and enhance oak persistence and structure.

Invasive Species

Alternative B includes treatment at all sudden oak death infection sites outside of the Riparian Reserve and no treatment at infection sites in the Riparian Reserve.

Livestock Grazing

The BLM would manage allotments in compliance with Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington (USDI BLM 1997). The BLM would adjust grazing levels and management practices when needed to meet or make progress toward meeting the standards for rangeland health. The BLM would make unavailable to grazing those allotments that have been generally been vacant or inactive for 5 years or more and currently have no Section 3 or Section 15 grazing preference.

Minerals

Under Alternative B, the BLM would recommend for withdrawal from locatable mineral entry 168,072 acres (in addition to the 98,400 acres previously withdrawn) and would close 194,858 acres to salable mineral material disposal.

Areas of Critical Environmental Concern

Under Alternative B, the BLM would designate 105 Areas of Critical Environmental Concern.

Recreation Management Areas

Alternative B includes designation of Special Recreation Management Areas at currently developed recreation facilities, and on lands where there are both unique recreation opportunities and where designation would not conflict with sustained-yield timber harvest. Alternative B includes designation of Extensive Recreation Management Areas where the BLM has developed and currently manages recreation activities outside of developed facilities, primarily where the BLM has authorized motorized and non-motorized trails, and where the BLM currently manages dispersed recreation activities. In the rest of the decision area, the BLM would not manage specifically for recreation.

Lands with Wilderness Characteristics
Alternative B includes management for wilderness characteristics of all identified lands with wilderness characteristics that are outside of the Harvest Land Base, and where they are within compatible existing and potential Recreation Management Areas.

Wild and Scenic Rivers
Under Alternative B, the BLM would recommend for inclusion in the National Wild and Scenic River System six eligible river segments that the BLM found suitable during the BLM's suitability study (as outlined in BLM Manual 6400, USDI BLM 2012b).

Visual Resource Management
Under Alternative B, the BLM would manage Congressionally Reserved lands where decisions have been made to preserve a natural landscape (e.g., designated Wilderness Areas and the Wild sections of Wild and Scenic Rivers) as Visual Resource Management Class I. The BLM would manage the following as VRM II: designated and recommended suitable Wild and Scenic Rivers classified as Scenic; National Trail management corridors; District-Designated Reserve – Lands Managed for their Wilderness Characteristics and Special Recreation Management Areas that fall within the Primitive and Backcountry setting. The BLM would manage the following as VRM III: designated and recommended suitable Wild and Scenic Rivers classified as Recreational, and Special and Extensive Recreation Management Areas that fall within the Middle Country setting. The BLM would manage ACECs as a VRM class commensurate to the assigned Visual Resource Inventory class (e.g., VRI Class III as VRM Class III). The BLM would manage all other lands as Visual Resource Management Class IV.

Sub-alternative B

Sub-alternative B is identical to Alternative B, except that it includes protection of habitat within the home ranges of all northern spotted owl known and historic sites that would be within the Harvest Land Base. This single change in design increases the Late-Successional Reserve to 57 percent of the decision area, which is larger than any other alternative, and reduces the Harvest Land Base to 12 percent of the decision area, which is smaller than any other alternative (**Figure 2-6**, **Table 2-6**, and **Map 2-4**).

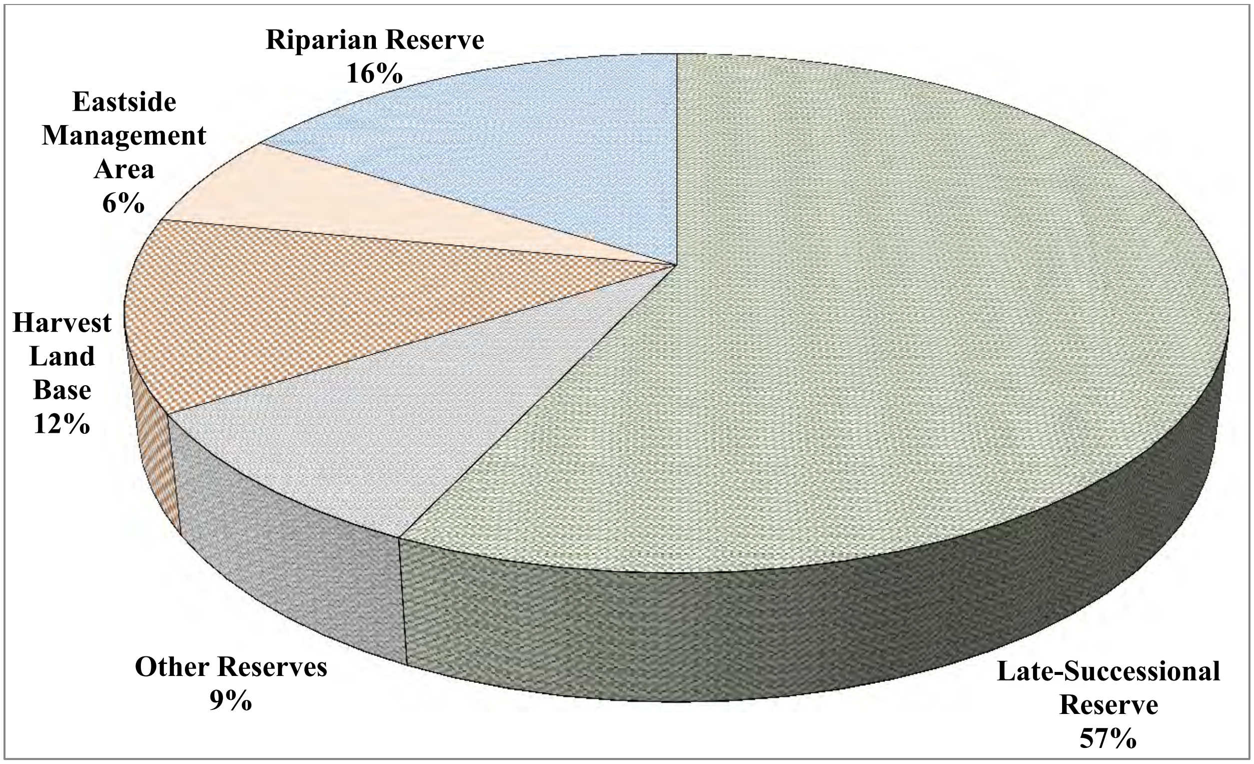


Figure 2-6. Sub-alternative B land use allocations

Table 2-6. Sub-alternative B land use allocations

Land Use Allocation	Acres	Total Acres (Percent)	Sub-allocation	Acres	Total Acres (Percent)
Late-Successional Reserve	1,422,933	57%	Structurally-complex Forest	463,910	19%
			Late-Successional Reserve – Moist	371,305	15%
			Late-Successional Reserve – Dry	223,399	9%
			Northern Spotted Owl Sites	295,614	12%
			Existing Occupied Marbled Murrelet Sites	41,633	2%
			Predicted Marbled Murrelet Sites	13,738	<1%
			Existing Red Tree Vole Sites*	297	<1%
			Predicted Red Tree Vole Sites*	13,039	<1%
Riparian Reserve	382,805	15%	Riparian Reserve – Moist	215,231	9%
			Riparian Reserve – Dry	167,574	7%
Other Reserves	223,111	9%	Congressionally Reserved	40,537	2%
			District-Designated Reserves	182,574	7%
Harvest Land Base	298,121	12%	Moderate Intensity Timber Area	129,120	5%
			Low Intensity Timber Area	30,761	1%
			Uneven-aged Timber Area	138,239	6%
Eastside Management Area	151,885	6%	-	151,885	6%
			Totals	**2,478,856**	**-**

* Existing Red Tree Vole Sites and Predicted Red Tree Vole Sites means those sites of the North Oregon Coast Distinct Population Segment of the red tree vole north of Highway 20.

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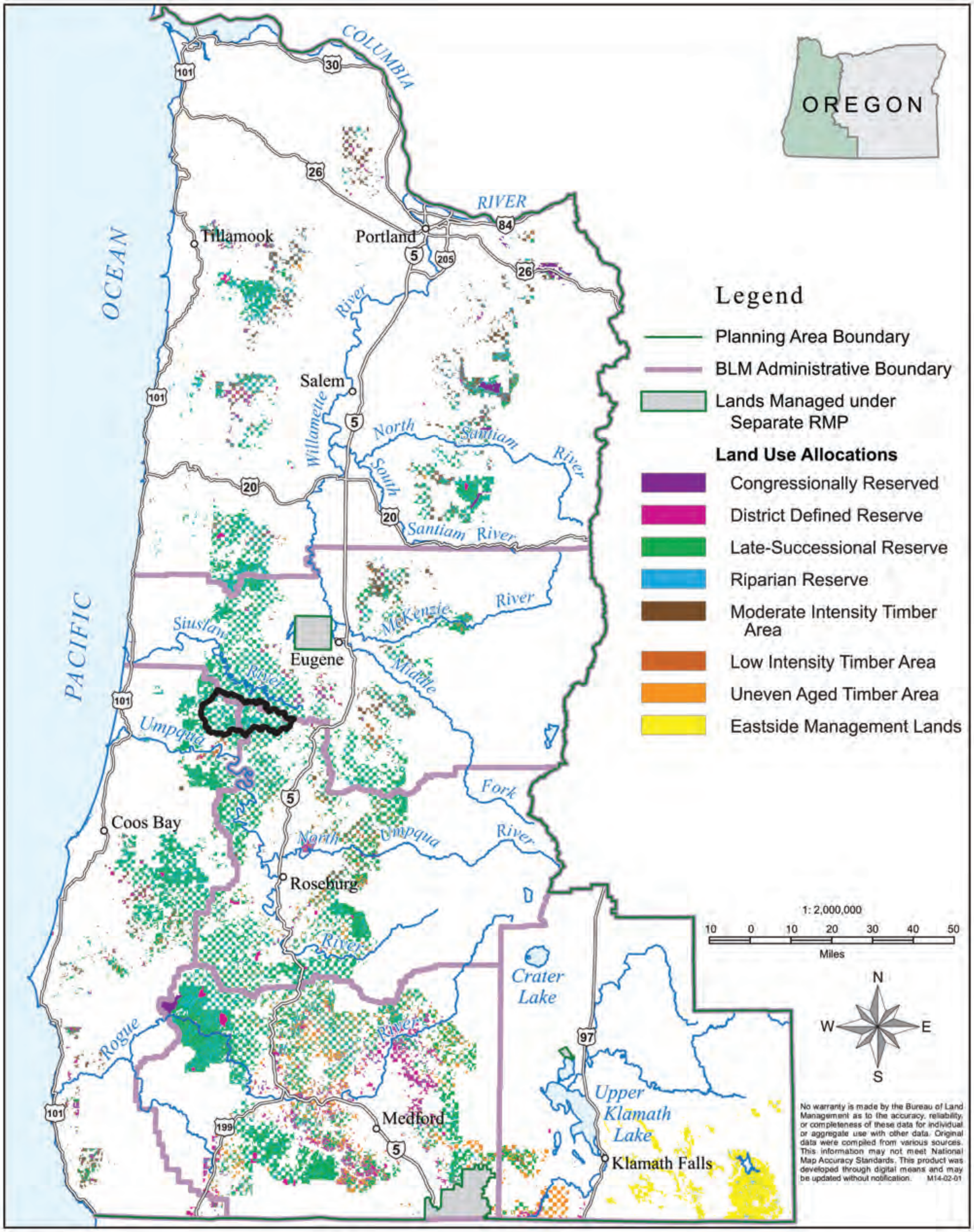
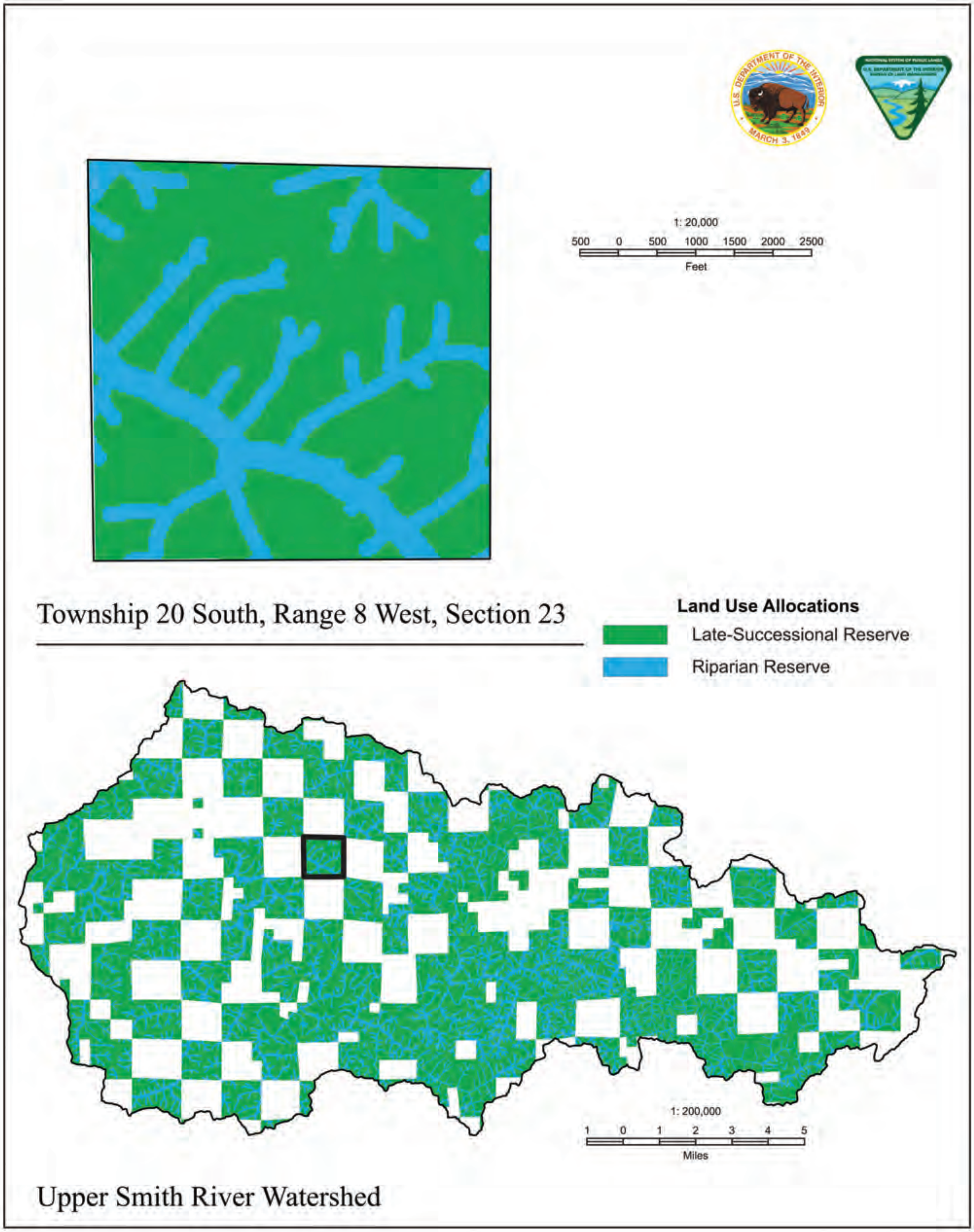


Map 2-4: Sub-Alternative B Land Use Allocations


1: 20,000
500 0 500 1000 1500 2000 2500
Feet
Township 20 South, Range 8 West, Section 23
Land Use Allocations
Late-Successional Reserve
Riparian Reserve
1: 200,000
1 0 1 2 3 4 5
Miles
Upper Smith River Watershed

Alternative C

Alternative C has the largest Harvest Land Base of any of the action alternatives (**Figure 2-7**, **Table 2-7**, and **Map 2-5**). The Harvest Land Base is comprised of the Uneven-aged Timber Area and the High Intensity Timber Area. The High Intensity Timber Area includes regeneration harvest with no retention (i.e., clearcuts). Alternative C has the smallest acreage in the Riparian Reserve of the action alternatives.

A sub-alternative of Alternative C (hereafter Sub-alternative C) includes reserving all forests 80-years old and older, based on the current age of stands in the BLM Forest Operations Inventory. All other features of Sub-alternative C are the same as Alternative C. The description of Sub-alternative C, including the acreage of each land use allocation and a map, follows the description of Alternative C.

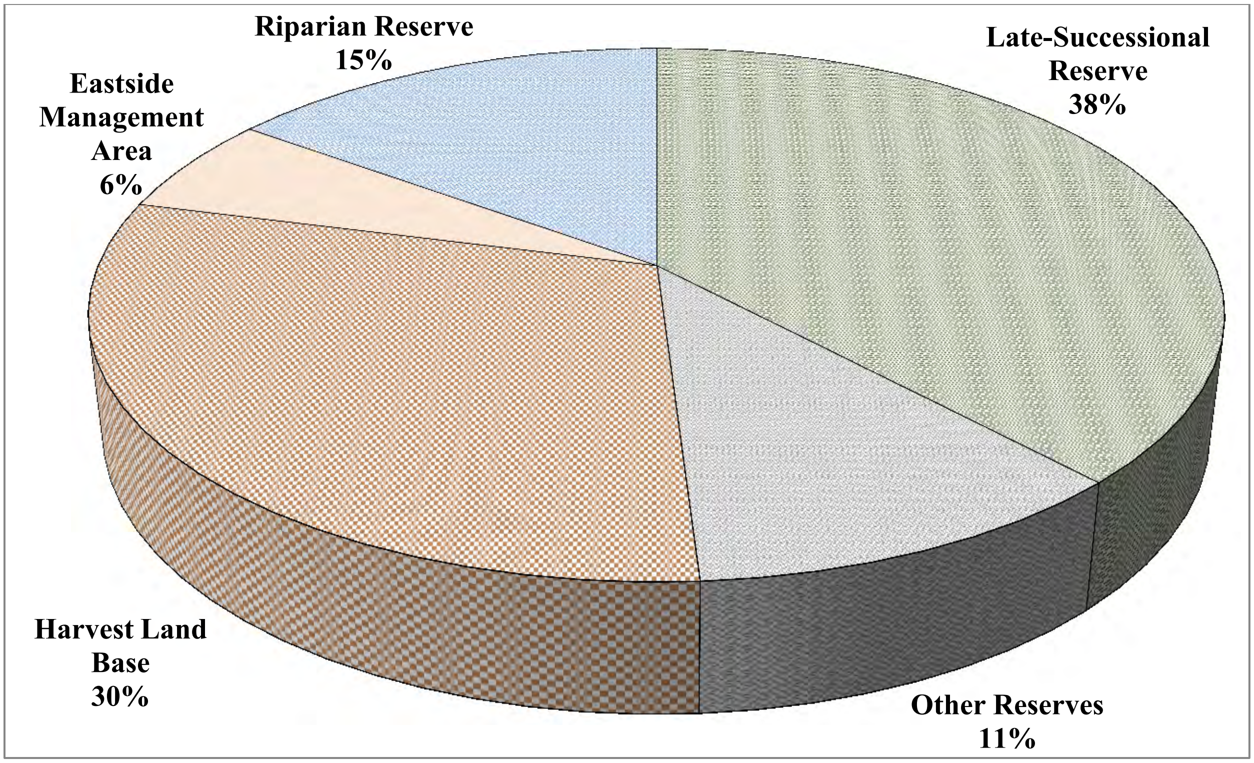
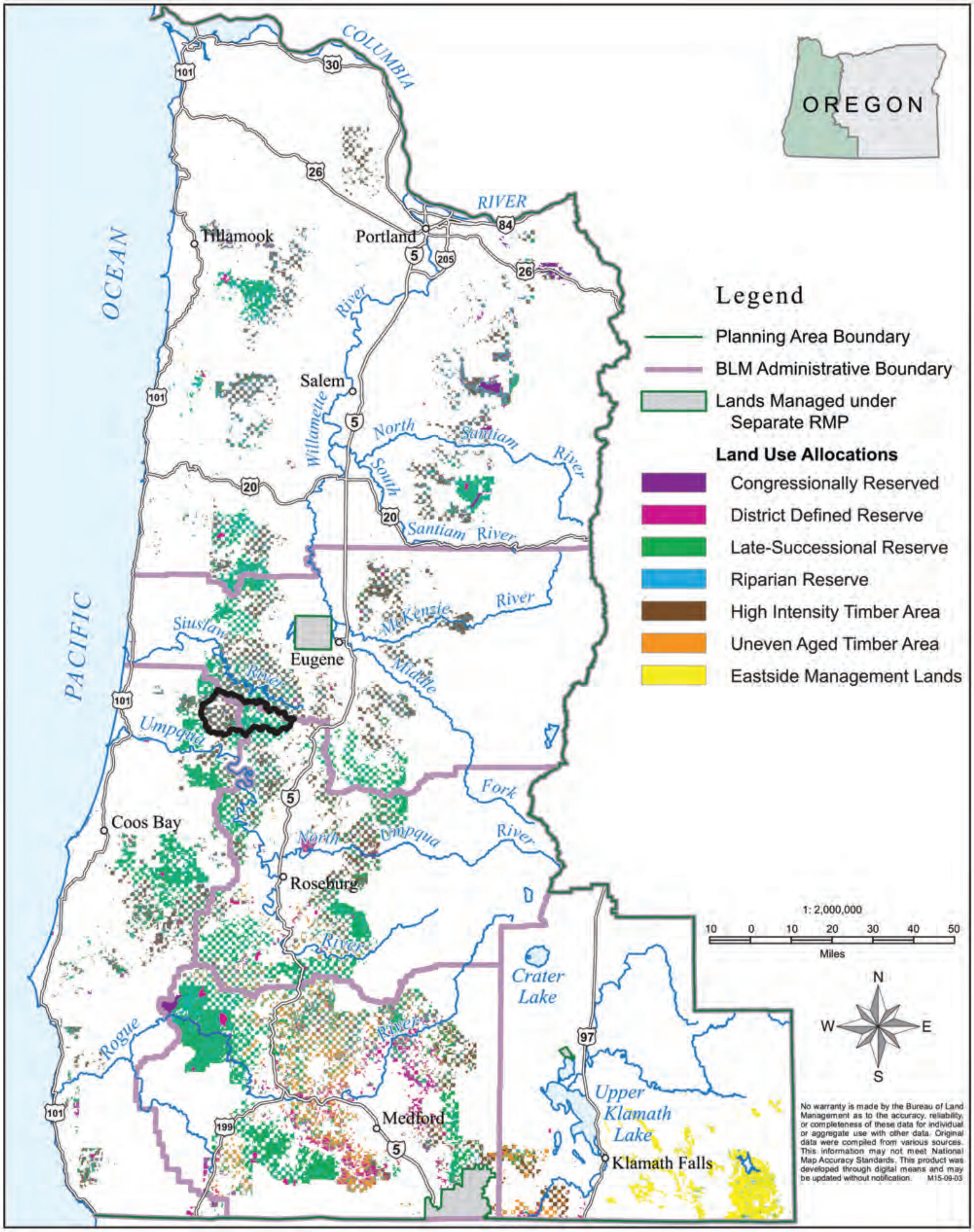


Figure 2-7. Alternative C land use allocations

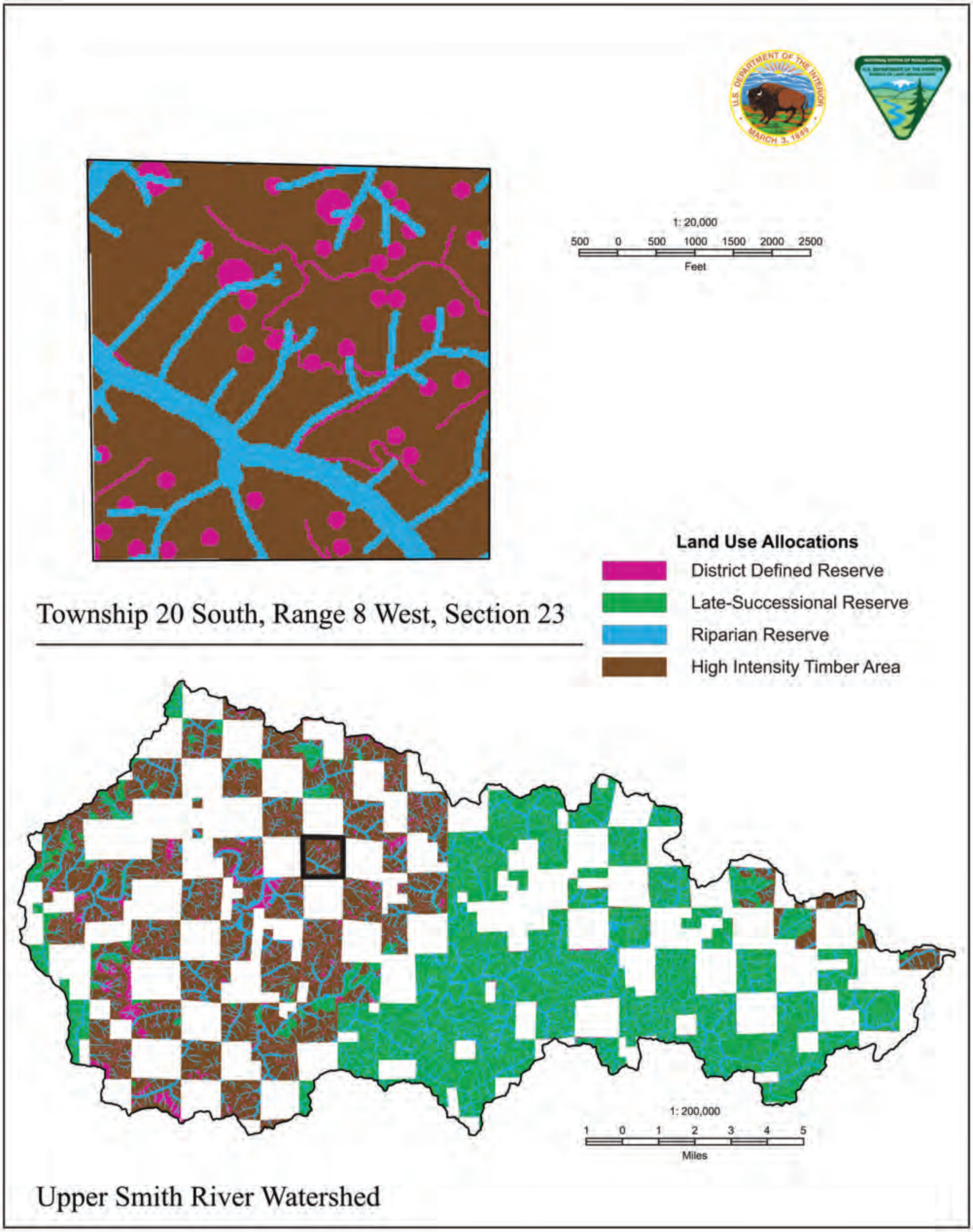
Table 2-7. Alternative C land use allocations

Land Use Allocation	Acres	Total Acres (Percent)	Sub-allocation	Acres	Total Acres (Percent)
Late-Successional Reserve	949,279	38%	Structurally-complex Forest	428,522	17%
			Late-Successional Reserve – Moist	331,224	13%
			Late-Successional Reserve – Dry	148,776	6%
			Existing Occupied Marbled Murrelet Sites	40,468	2%
			Predicted Marbled Murrelet Sites	2,761	<1%
			Existing Red Tree Vole Sites*	287	<1%
Riparian Reserve	372,739	15%	Riparian Reserve – Moist	244,694	10%
			Riparian Reserve – Dry	128,045	5%
Other Reserves	267,678	11%	Congressionally Reserved	40,537	2%
			District-Designated Reserves	227,141	9%
Harvest Land Base	741,332	30%	High Intensity Timber Area	553,857	22%
			Uneven-aged Timber Area	184,715	7%
Eastside Management Area	147,828	6%	-	147,828	6%
			Totals	**2,478,856**	**-**

* Existing Red Tree Vole Sites means those sites of the North Oregon Coast Distinct Population Segment of the red tree vole north of Highway 20.



Map 2-5: Alternative C Land Use Allocations


1: 20,000
500 0 500 1000 1500 2000 2500
Feet
Land Use Allocations
District Defined Reserve
Late-Successional Reserve
Riparian Reserve
High Intensity Timber Area
Township 20 South, Range 8 West, Section 23
1: 200,000
1 0 1 2 3 4 5
Miles
Upper Smith River Watershed

Late-Successional Reserve
The Late-Successional Reserve includes, primarily, Structurally-complex Forest, Large Block Forest Reserves (Late-Successional Reserve – Moist and Late-Successional Reserve – Dry), and much smaller acreages from existing occupied marbled murrelet sites and existing sites of the North Oregon Coast Distinct Population Segment of the red tree vole. In addition, Alternative C includes requirements for surveys for the marbled murrelet and the North Oregon Coast Distinct Population Segment of the red tree vole, as described below, and newly discovered sites would be included in the Late-Successional Reserve. Thus, this description of the Late-Successional Reserve includes predictions of the acreage of newly discovered marbled murrelet and red tree vole sites. Within the Late-Successional Reserve, the BLM would conduct timber salvage after disturbance to recover economic value, to protect public health and safety, or to keep roads and other infrastructure clear of debris.

Structurally-complex Forest
Alternative C includes within the Late-Successional Reserve all stands 160-years old and older, based on the current age of stands in the BLM forest operations inventory.

Large Block Forest Reserves: Late-Successional Reserve – Moist and Late-Successional Reserve – Dry[18]
Alternative C includes within the Late-Successional Reserve blocks of functional and potential northern spotted owl habitat, sufficient to meet block size and spacing requirements (Thomas *et al.* 1990, pp. 24, 28) in all provinces. In moist forests, the BLM would conduct thinning to promote the development of structurally-complex forest, which may include commercial removal of cut trees. In dry forests, the BLM would conduct activities including thinning and prescribed burning to promote the development of structurally-complex forest and to improve resilience to disturbance, which may include commercial removal of cut trees.

Riparian Reserve
In Alternative C, the Riparian Reserve encompass lands within—
- 150 feet on either side of fish-bearing and perennial streams; and
- 50 feet on either side of non-fish-bearing, intermittent streams.

The Riparian Reserve includes an inner zone in which thinning is not permitted. Inner zone widths are—
- 60 feet on either side of fish-bearing and perennial streams; and
- 50 feet on either side of non-fish-bearing, intermittent streams.

Outside of the inner zone, the BLM would conduct thinning, which may include commercial removal, as needed to develop diverse and structurally-complex riparian stands.

Harvest Land Base
The Harvest Land Base is comprised of the High Intensity Timber Area and the Uneven-aged Timber Area. The allocation of the Uneven-aged Timber Area in Alternative C is based on very dry forest types identified by potential vegetation. Timber management in the High Intensity Timber Area includes thinning and regeneration harvest with no retention (i.e., clearcuts). The High Intensity Timber Area has no snag or down woody debris retention requirements.

[18] For the purpose of Late-Successional Reserve and Riparian Reserve management in Alternative C, dry forests are defined by very dry forest types identified by potential vegetation types.

Wildlife
Within the Harvest Land Base, Alternative C includes—

- No specific protections for northern spotted owl known or historic sites;
- A requirement for surveys for the marbled murrelet prior to management actions in stands 120-years and older and protection of habitat within 300 feet around newly discovered occupied sites;
- No specific management requirements for trees capable of providing marbled murrelet nesting structures in younger stands; and
- No requirement for surveys for North Oregon Coast Distinct Population Segment of the red tree vole prior to management actions.

Rare Plants and Fungi
The BLM would create new populations and augment existing populations of ESA-listed and other special status plants and fungi to meet recovery plan or conservation strategy objectives.

Invasive Species
Alternative C includes treatment at all sudden oak death infection sites.

Livestock Grazing
The BLM would manage allotments in compliance with Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington (USDI BLM 1997). The BLM would adjust grazing levels and management practices when needed to meet or make progress toward meeting the standards for rangeland health. The BLM would make unavailable to grazing those allotments that have been generally been vacant or inactive for 5 years or more and currently have no Section 3 or Section 15 grazing preference.

Minerals
Under Alternative C, the BLM would recommend for withdrawal from locatable mineral entry 171,584 acres (in addition to the 98,400 acres previously withdrawn) and would close 215,053 acres to salable mineral material disposal.

Areas of Critical Environmental Concern
Under Alternative C, the BLM would designate 101 Areas of Critical Environmental Concern.

Recreation Management Areas
Alternative C includes designation of Special Recreation Management Areas at currently developed recreation facilities, and on lands where designation does not conflict with sustained-yield timber harvest. Alternative C includes designation of Extensive Recreation Management Areas where the BLM has developed and currently manages recreation activities outside of developed facilities, primarily where the BLM has authorized motorized and non-motorized trails, and where the BLM currently manages dispersed recreation activities. In addition, the BLM would designate Special Recreation Management Areas and Extensive Recreation Management Areas to address specific recreation demand and scarcity. In the rest of the decision area, the BLM would not manage specifically for recreation.

Lands with Wilderness Characteristics
Alternative C includes management for wilderness characteristics of identified lands with wilderness characteristics that are not within the Harvest Land Base, and where they are within compatible existing and potential Recreation Management Areas.

Wild and Scenic Rivers
Under Alternative C, the BLM would recommend for inclusion in the National Wild and Scenic River System six eligible river segments that the BLM found suitable during the BLM's suitability study (as outlined in BLM Manual 6400, USDI BLM 2012b).

Visual Resource Management
Under Alternative C, the BLM would manage Congressionally Reserved lands where decisions have been made to preserve a natural landscape (e.g., designated Wilderness Areas and Wild sections of Wild and Scenic Rivers) as Visual Resource Management Class I. The BLM would manage the following as VRM Class II: designated and recommended suitable Wild and Scenic Rivers classified as Scenic; National Trail management corridors; District-Designated Reserve – Lands Managed for their Wilderness Characteristics; and Special Recreation Management Areas that fall within the Primitive and Backcountry setting. The BLM would manage the following as VRM Class III: designated and recommended suitable Wild and Scenic Rivers classified as Recreational, and Special and Extensive Recreation Management Areas that fall within the Middle Country setting. The BLM would manage ACECs as a VRM class commensurate to the assigned Visual Resource Inventory class (e.g., VRI Class III as VRM Class III). The BLM would manage all other lands as Visual Resource Management Class IV.

Sub-alternative C
Sub-alternative C is identical to Alternative C, except that the Late-Successional Reserve includes all stands 80 years old and older, based on the current age of stands in the BLM forest operations inventory. This single change in design increases the Late-Successional Reserve to 55 percent of the decision area and reduces the Harvest Land Base to 20 percent of the decision area (**Figure 2-8**, **Table 2-8**, and **Map 2-6**).

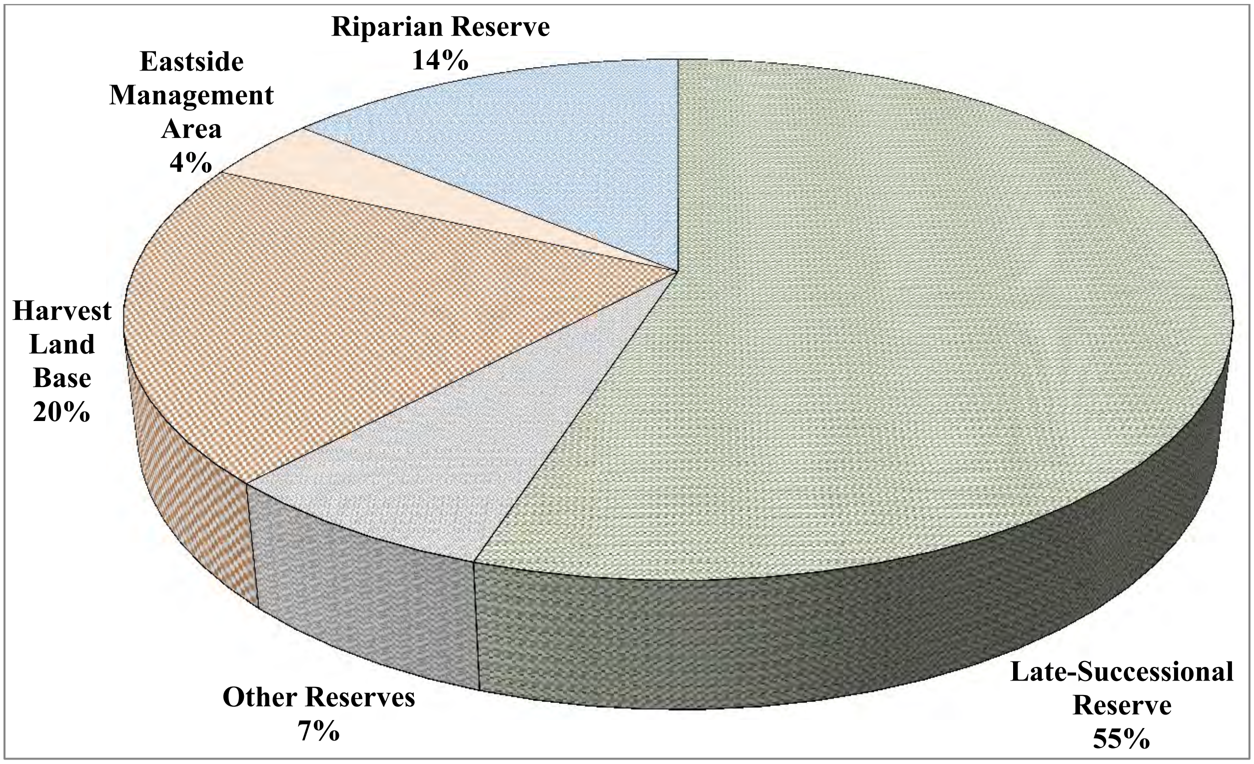
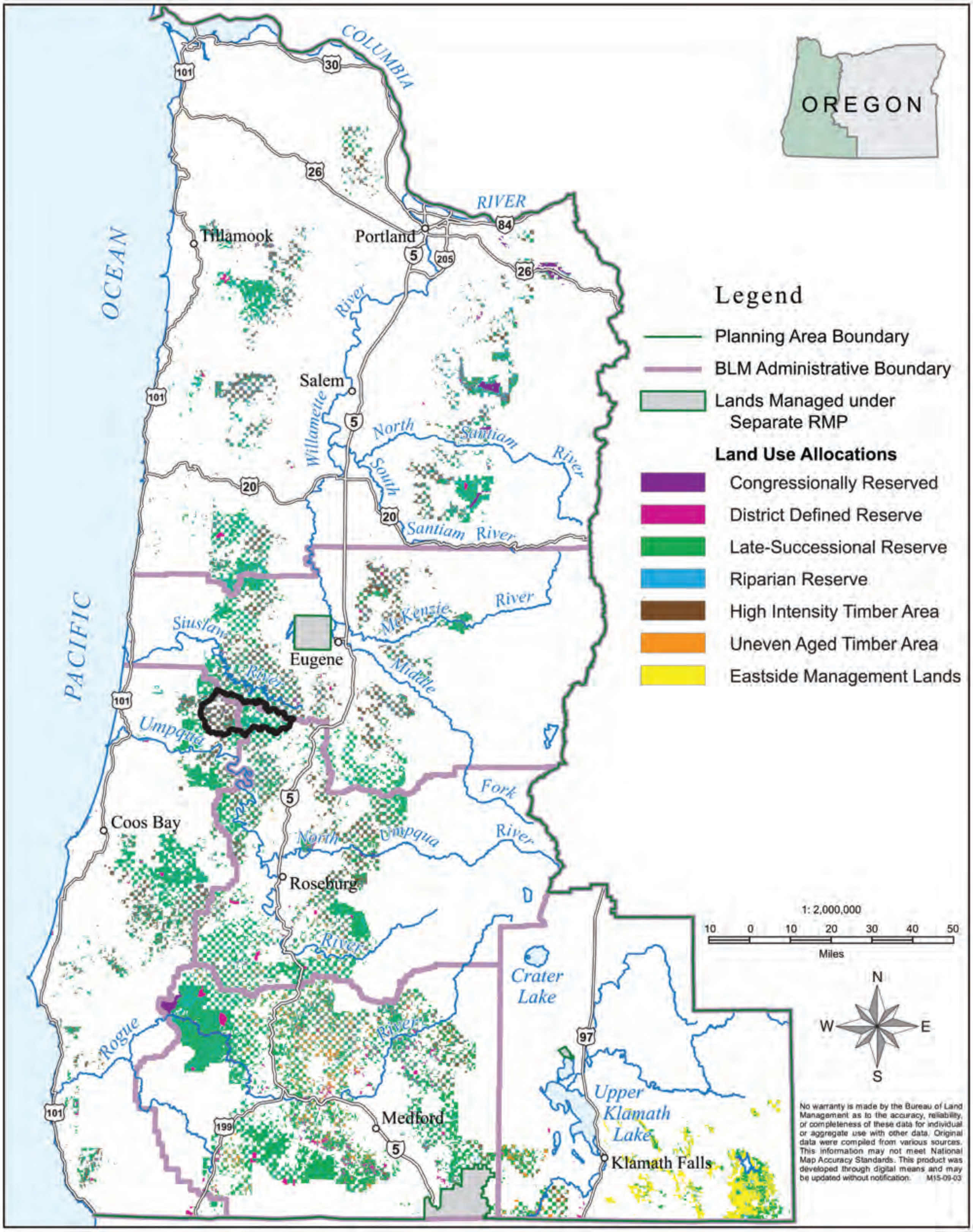


Figure 2-8. Sub-alternative C land use allocations

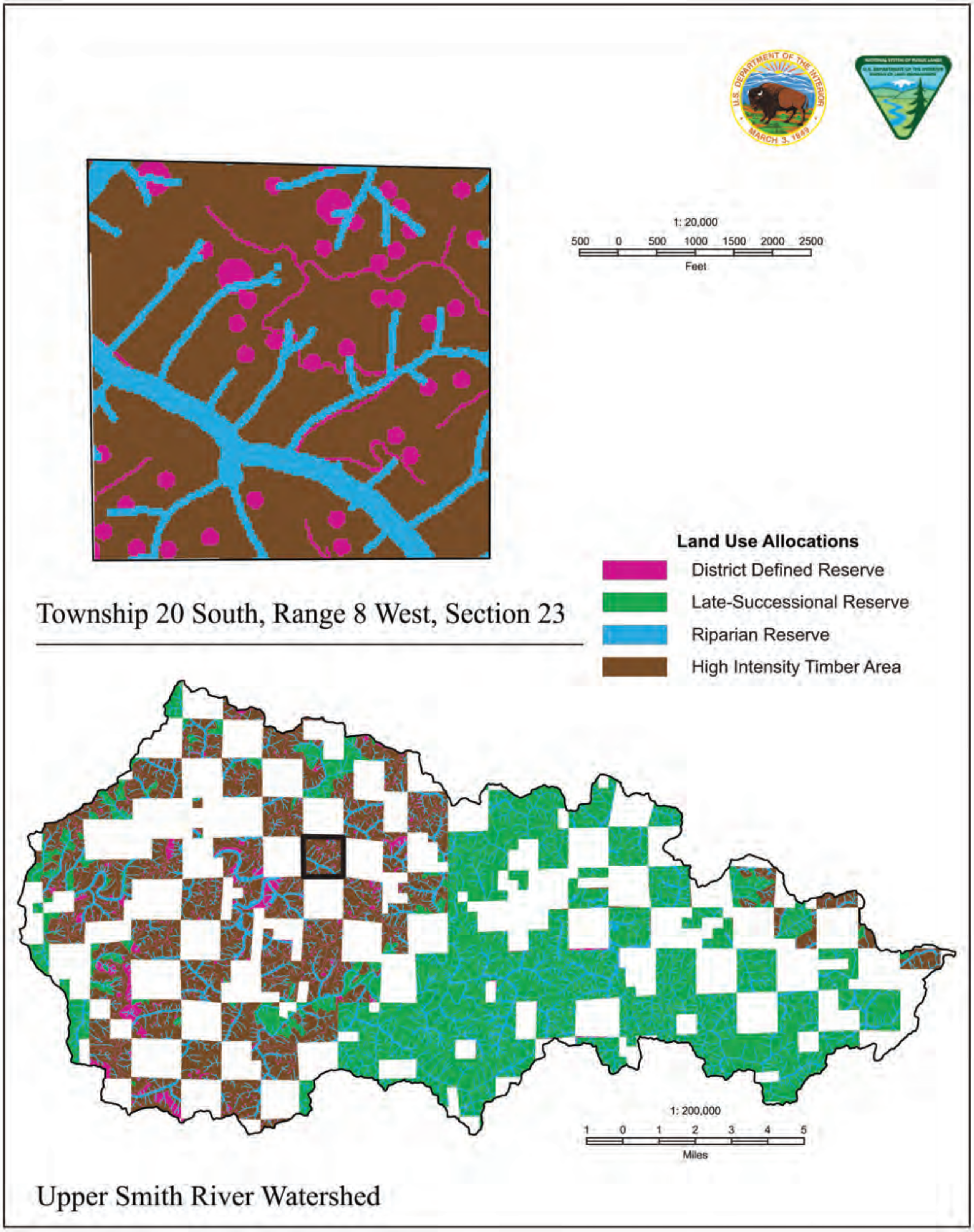
Table 2-8. Sub-alternative C land use allocations

Land Use Allocation	Acres	Total Acres (Percent)	Sub-allocation	Acres	Total Acres (Percent)
Late-Successional Reserve	1,373,206	55%	Structurally-complex Forest	1,036,218	42%
			Late-Successional Reserve – Moist	233,967	9%
			Late-Successional Reserve – Dry	61,525	2%
			Existing Occupied Marbled Murrelet Sites	40,468	2%
			Predicted Marbled Murrelet Sites	740	<1%
			Existing Red Tree Vole Sites*	287	<1%
Riparian Reserve	337,701	14%	Riparian Reserve – Moist	253,674	10%
			Riparian Reserve – Dry	84,026	3%
Other Reserves	172,232	7%	Congressionally Reserved	40,537	2%
			District-Designated Reserves	131,694	5%
Harvest Land Base	495,507	20%	High Intensity Timber Area	402,665	16%
			Uneven-aged Timber Area	92,842	4%
Eastside Management Area	100,210	4%	-	100,210	4%
			Totals	**2,478,856**	**-**

* Existing Red Tree Vole Sites means those sites of the North Oregon Coast Distinct Population Segment of the red tree vole north of Highway 20.



Map 2-6: Sub-Alternative C Land Use Allocations


1: 20,000
500 0 500 1000 1500 2000 2500
Feet
Land Use Allocations
District Defined Reserve
Late-Successional Reserve
Riparian Reserve
High Intensity Timber Area
Township 20 South, Range 8 West, Section 23
1: 200,000
1 0 1 2 3 4 5
Miles
Upper Smith River Watershed

Alternative D

Alternative D has the smallest Late-Successional Reserve of the action alternatives (**Figure 2-9**, **Table 2-9**, and **Map 2-7**). The Harvest Land Base is comprised of the Uneven-aged Timber Area, Owl Habitat Timber Area, and Moderate Intensity Timber Area. The Owl Habitat Timber Area includes timber harvest applied in a manner that would maintain northern spotted owl habitat. The Moderate Intensity Timber Area includes regeneration harvest with retention. Alternative D has the largest acreage in the Riparian Reserve of the action alternatives.

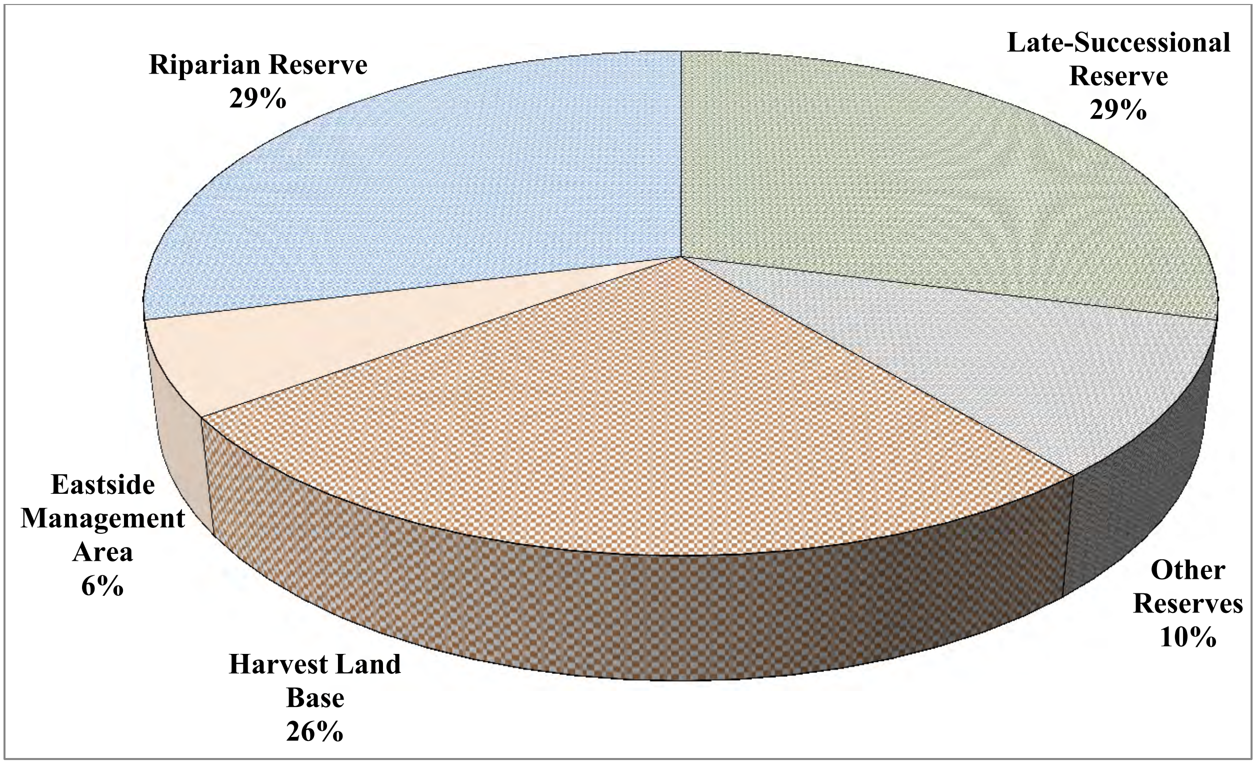
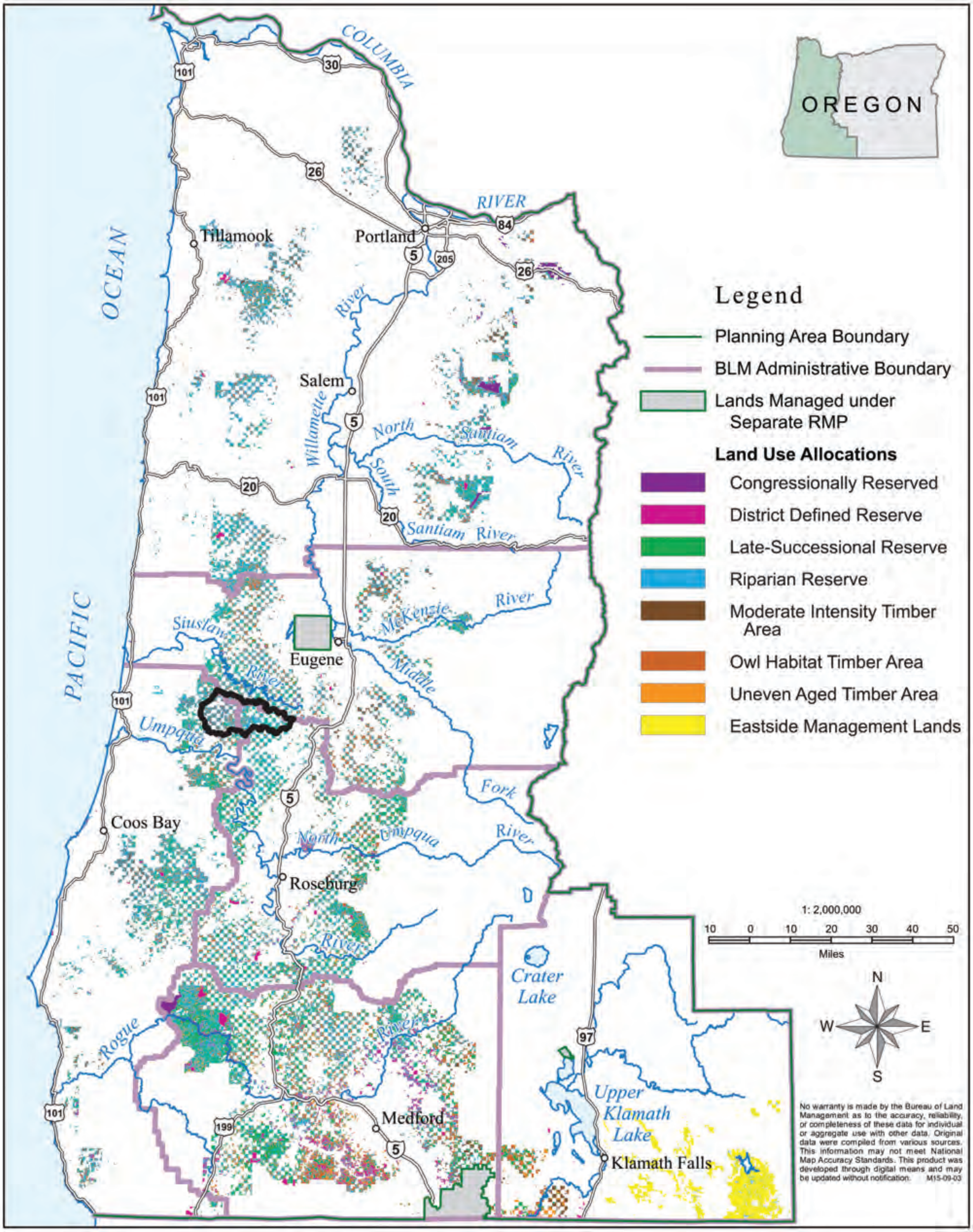


Figure 2-9. Alternative D land use allocations

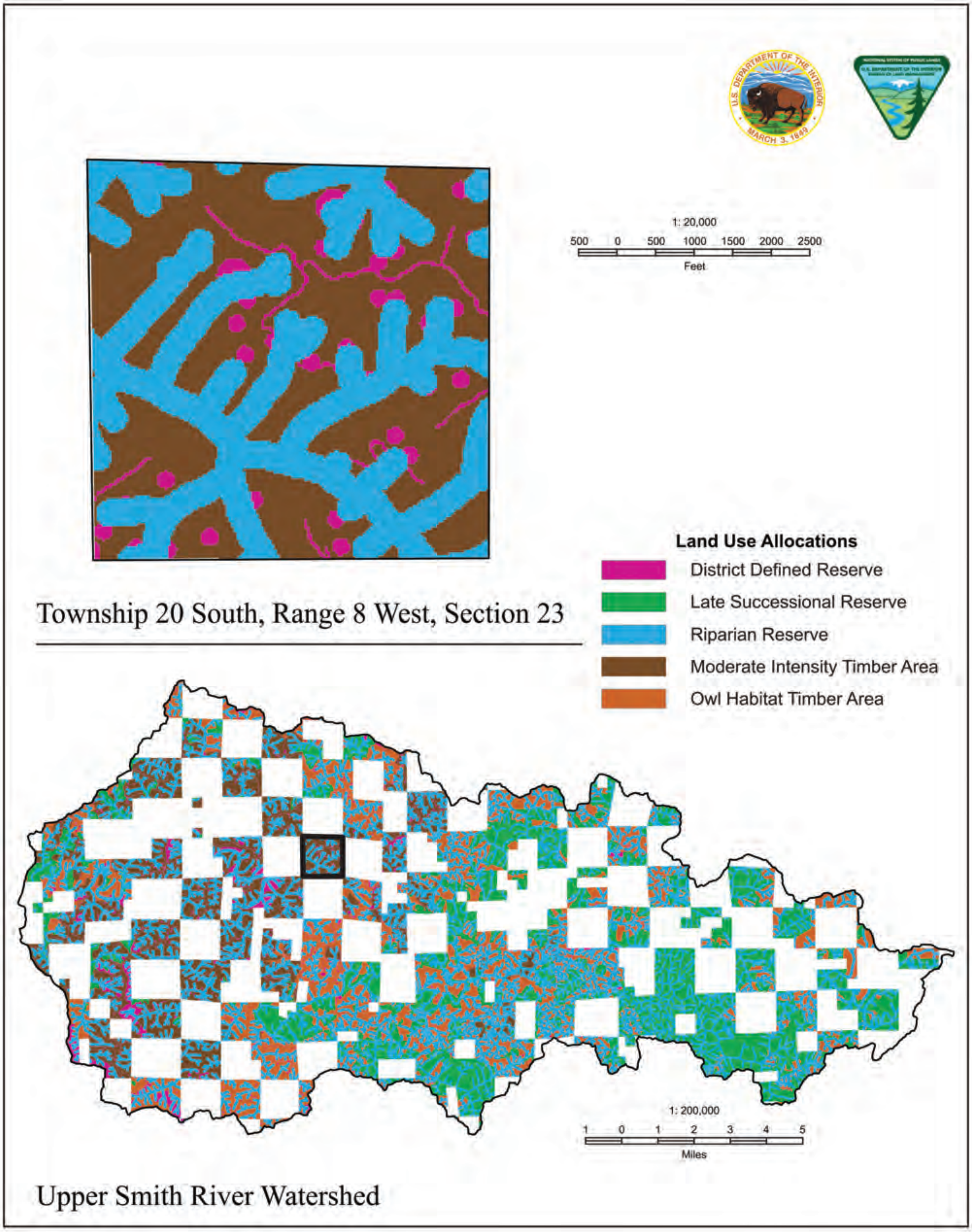
Table 2-9. Alternative D land use allocations

Land Use Allocation	Acres	Total Acres (Percent)	Sub-allocation	Acres	Total Acres (Percent)
Late-Successional Reserve	714,292	29%	Structurally-complex Forest	482,920	19%
			Northern Spotted Owl Sites	96,666	4%
			Existing Occupied Marbled Murrelet Sites	33,037	1%
			Predicted Marbled Murrelet Sites	91,816	4%
			Existing Red Tree Vole Sites*	245	<1%
			Predicted Red Tree Vole Sites*	9,608	<1%
Riparian Reserve	714,629	29%	Riparian Reserve – Moist	459,145	19%
			Riparian Reserve – Dry	255,484	10%
Other Reserves	250,523	10%	Congressionally Reserved	40,537	2%
			District-Designated Reserves	209,986	8%
Harvest Land Base	650,382	26%	Moderate Intensity Timber Area	160,575	6%
			Owl Habitat Timber Area	427,556	17%
			Uneven-aged Timber Area	62,251	3%
Eastside Management Area	149,030	6%	-	149,030	6%
			Totals	**2,478,856**	**-**

* Existing Red Tree Vole Sites and Predicted Red Tree Vole Sites means those sites of the North Oregon Coast Distinct Population Segment of the red tree vole north of Highway 20.



Map 2-7: Alternative D Land Use Allocations


1: 20,000
500 0 500 1000 1500 2000 2500
Feet
Township 20 South, Range 8 West, Section 23
Land Use Allocations
District Defined Reserve
Late Successional Reserve
Riparian Reserve
Moderate Intensity Timber Area
Owl Habitat Timber Area
1: 200,000
1 0 1 2 3 4 5
Miles
Upper Smith River Watershed

Late-Successional Reserve
The Late-Successional Reserve includes, primarily, Structurally-complex Forest/Large Block Forest Reserves, and much smaller acreages from nest patches of known and historic northern spotted owl sites, existing occupied marbled murrelet sites, and existing sites of the North Oregon Coast Distinct Population Segment of the red tree vole. In addition, Alternative D includes requirements for surveys for the marbled murrelet and the North Oregon Coast Distinct Population Segment of the red tree vole, as described below, and newly discovered sites would be included in the Late-Successional Reserve. Thus, this description of the Late-Successional Reserve includes predictions of the acreage of newly discovered marbled murrelet and red tree vole sites. Within the Late-Successional Reserve, the BLM would conduct no timber salvage after disturbance, except when necessary to protect public health and safety, or to keep roads and other infrastructure clear of debris.

Structurally-complex Forest/Large Block Forest Reserves
Alternative D includes within the Late-Successional Reserve all stands 120 years old and older on high productivity sites, 140 years old and older on moderate productivity sites, and 160 years old and older on low productivity sites, based on the current age of stands in the BLM forest operations inventory. This Structurally-complex Forest also constitutes the Large Block Forest Reserves under Alternative D.

Riparian Reserve[19]
In Alternative D, the Riparian Reserve encompasses lands within one site-potential tree height on either side of all streams. The Riparian Reserve includes a no-thin inner zone of 120 feet on either side of all streams. Outside of the inner zone, the BLM would conduct thinning, which may include commercial removal, as needed to ensure that stands are able to provide stable wood to the stream.

Harvest Land Base
The Harvest Land Base is comprised of the Owl Habitat Timber Area, Uneven-aged Timber Area, and Moderate Intensity Timber Area. Alternative D includes the Owl Habitat Timber Area in all designated northern spotted owl critical habitat and within the home ranges of known and historic owl sites within the Harvest Land Base, (though the nest patches themselves are included in the Late-Successional Reserve). Timber harvest in the Owl Habitat Timber Area includes thinning and uneven-aged timber harvest applied in a manner that would maintain northern spotted owl habitat. The portion of the Harvest Land Base outside of designated northern spotted owl critical habitat is divided between the Uneven-aged Timber Area and the Moderate Intensity Timber Area. The allocation of the Uneven-aged Timber Area in Alternative D is based on very dry forest types identified by potential vegetation. The remainder of the Harvest Land Base in Alternative D is in the Moderate Intensity Timber Area. Timber harvest in the Moderate Intensity Timber Area includes thinning and regeneration harvest with retention of 5–15 percent of the stand.

Wildlife
Within the Harvest Land Base, Alternative D includes—
- Specific protections to maintain habitat within the home ranges of all northern spotted owl known and historic sites;
- A requirement for surveys for the marbled murrelet prior to management actions in marbled murrelet Zones 1 and 2 and protection of habitat within 0.5 mile around newly discovered occupied sites;
- Protection of trees capable of providing marbled murrelet nesting structures in younger stands in marbled murrelet Zones 1 and 2; and

[19] For the purpose of Riparian Reserve management in Alternative D, dry forests are defined by very dry forest types identified by potential vegetation types.

- A requirement for surveys for North Oregon Coast Distinct Population Segment of the red tree vole prior to management actions and protection of habitat areas around newly discovered nest sites.

Rare Plants and Fungi
Under Alternative D, the BLM would protect known Bureau Sensitive species sites from adverse impacts where protection does not conflict with sustained-yield forest management in the Harvest Land Base.

Invasive Species
Alternative D includes treatment at all sudden oak death infection sites.

Livestock Grazing
Under Alternative D, the BLM would eliminate livestock grazing by terminating existing livestock grazing authorizations and making the allotments unavailable for livestock grazing.

Minerals
Under Alternative D, the BLM would recommend for withdrawal from locatable mineral entry 208,478 acres (in addition to the 98,400 acres previously withdrawn) and would close 207,655 acres to salable mineral material disposal.

Areas of Critical Environmental Concern
Under Alternative D, the BLM would designate 107 Areas of Critical Environmental Concern.

Recreation Management Areas
Alternative D includes designation of Special Recreation Management Areas at currently developed recreation facilities, and on lands where designation does not conflict with sustained-yield timber harvest. Alternative D would include designation of Extensive Recreation Management Areas on all lands within the decision area where existing recreation use is occurring and the BLM has legal public access. In addition, the BLM would designate Special and Extensive Recreation Management Areas where known historic recreation use has occurred, and where the BLM is seeking to address activity-specific demands. The BLM would designate these to the maximum extent possible without precluding sustained-yield timber harvest.

Lands with Wilderness Characteristics
Alternative D would not include management for wilderness characteristics of any identified lands with wilderness characteristics.

Wild and Scenic Rivers
Under Alternative D, the BLM would recommend all 51 eligible river segments for inclusion in the National Wild and Scenic River System.

Visual Resource Management
Under Alternative D, the BLM would manage Congressionally Reserved lands where decisions have been made to preserve a natural landscape (e.g., designated Wilderness Areas and the Wild sections of Wild and Scenic Rivers) as Visual Resource Management Class I. The BLM would manage the following as VRM Class II: designated and recommended suitable Wild and Scenic Rivers classified as Scenic; National Trail management corridors, and Special Recreation Management Areas that fall within the Primitive and Backcountry setting. The BLM would manage the following as VRM Class III: designated and recommended suitable Wild and Scenic Rivers classified as Recreational, and Special and Extensive Recreation Management Areas that fall within the Middle Country setting. The BLM would manage ACECs as a VRM class commensurate to the assigned Visual Resource Inventory class (e.g., VRI Class

III as VRM Class III). The BLM would manage all other lands as a VRM class commensurate to their assigned Visual Inventory Class (e.g., VRI Class III as VRM Class III), except that in the Harvest Land Base, lands inventoried as Visual Resource Inventory Class II would be managed as Visual Resource Management Class III.

Proposed RMP

The BLM has developed the Proposed RMP as a variation on Alternative B, which the BLM identified in the Draft RMP/EIS as the preferred alternative. The Proposed RMP has a Late-Successional Reserve that is a refinement of the Late-Successional Reserve design in Alternative B (see **Figure 2-10**, **Table 2-10**, and **Map 2-8**). The Harvest Land Base is comprised of the Uneven-aged Timber Area, Low Intensity Timber Area, and Moderate Intensity Timber Area, as in Alternative B. The geographic extent of the portion of the Harvest Land Base in Uneven-aged Timber Area in the Proposed RMP is intermediate between Alternative B and Alternative C. As in Alternative B, the Low Intensity Timber Area and Moderate Intensity Timber Area include regeneration harvest with varying levels of retention.

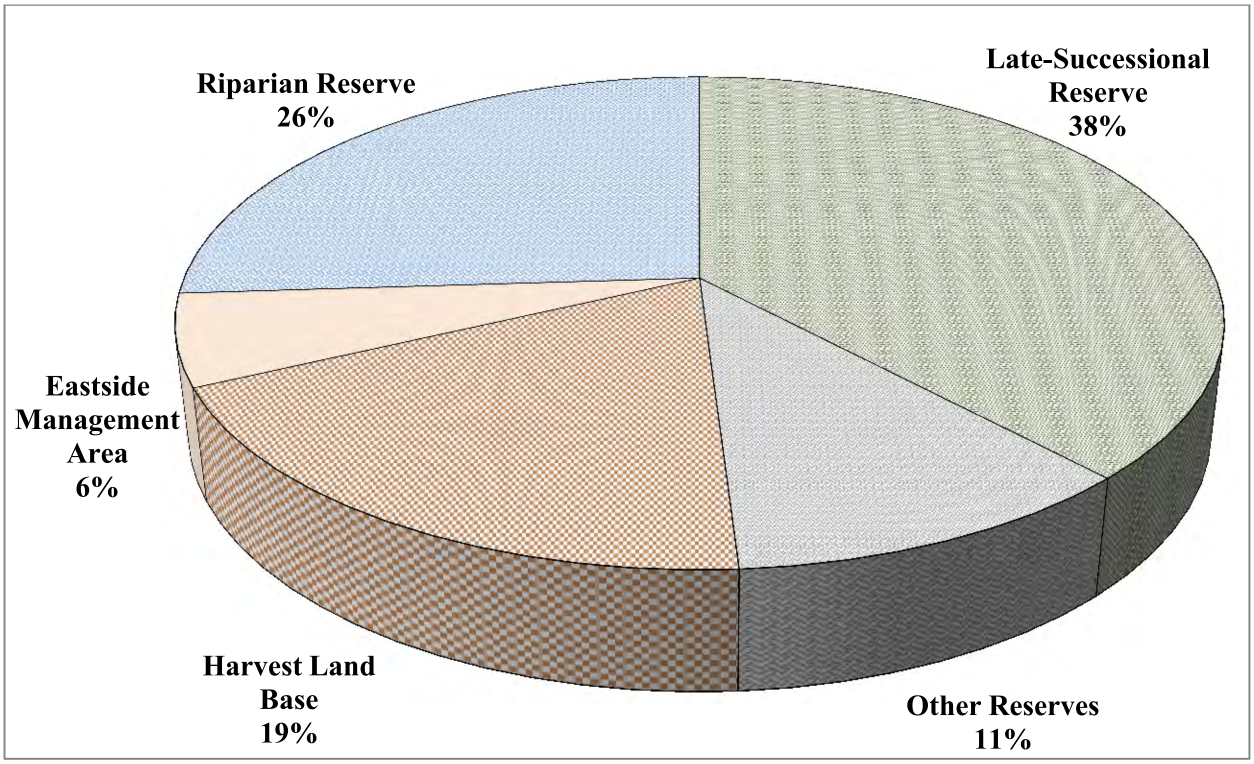


Figure 2-10. Proposed RMP land use allocations

Table 2-10. Proposed RMP land use allocations and suballocations

Land Use Allocation	Acres	Total Acres (Percent)	Sub-allocation	Acres	Total Acres (Percent)
Late-Successional Reserve*	948,466	38%	Structurally-complex Forest	427,881	17%
			Large Block Forest Reserve – Moist	250,546	10%
			Large Block Forest Reserve – Dry	186,949	8%
			Existing Occupied Marbled Murrelet Sites	42,174	2%
			Predicted Marbled Murrelet Sites[†]	31,242	1%
			Existing Red Tree Vole Sites[#]	128	<1%
			Predicted Red Tree Vole Sites[#]	9,546	<1%
Riparian Reserve[‡]	635,717	26%	Riparian Reserve (Class I Subwatersheds)	497,331	20%
			Riparian Reserve (Class II Subwatersheds)	107,453	4%
			Riparian Reserve (Class III Subwatersheds)	30,933	1%
Other Reserves	263,647	11%	Congressionally Reserved Lands	40,505	2%
			District-Designated Reserves[§]	223,142	9%
Harvest Land Base[**]	469,215	19%	Moderate Intensity Timber Area	180,549	7%
			Low Intensity Timber Area	89,126	4%
			Uneven-aged Timber Area	199,541	8%
Eastside Management Area[‖]	161,810	7%	Eastside Management Area	149,971	6%
			Eastside Management Area – Riparian Reserve	11,838	<1%
			Totals	**2,478,856**	**-**

* The acreage of the different components of the Late-Successional Reserve in this table is presented for comparison to the information for the action alternatives. The different components describe areas that are included in the Late-Successional Reserve for different reasons, including analytical projections of areas that the BLM would identify in the future as part of the Late-Successional Reserve. These different components are not sub-allocations, in that they do not have differing management objectives or management direction. The only sub-allocations of the Late-Successional Reserve, as detailed in **Appendix B**, are Late-Successional Reserve – Dry and Late-Successional Reserve – Moist.

† For the Proposed RMP, the BLM used updated detection rates to calculate acres of predicted marbled murrelet sites, which increased the acreage of predicted marbled murrelet sites compared to the alternatives (see the Forest Management and Wildlife sections of Chapter 3).

‡ The design of the Riparian Reserve (west of Highway 97) varies among three classes of subwatersheds. In addition, the Riparian Reserve (west of Highway 97) includes sub-allocations of Riparian Reserve – Moist and Riparian Reserve – Dry, which overlap the three classes of subwatershed. This table only presents the Riparian Reserve (west of Highway 97) by subwatershed class for simplicity of presentation.

§ District-Designated Reserves include several sub-allocations, as detailed in **Appendix B**, which are grouped together in this table.

‖ The acreage for the Eastside Management Area in this table includes both forested and non-forested lands and Eastside Management Area – Riparian Reserve.

Existing Red Tree Vole Sites and Predicted Red Tree Vole Sites means those sites of the North Oregon Coast Distinct Population Segment of the red tree vole north of Highway 20.

** Acres mapped to the Harvest Land Base would be greater than shown here due to acres of Harvest Land Base that the BLM would shift to Late-Successional Reserve in the future based on surveys and discovery of sites for marbled murrelets and red tree voles during implementation of the Proposed RMP (shown as “predicted marbled murrelet sites” and “predicted red tree vole sites” in the Late-Successional Reserve).

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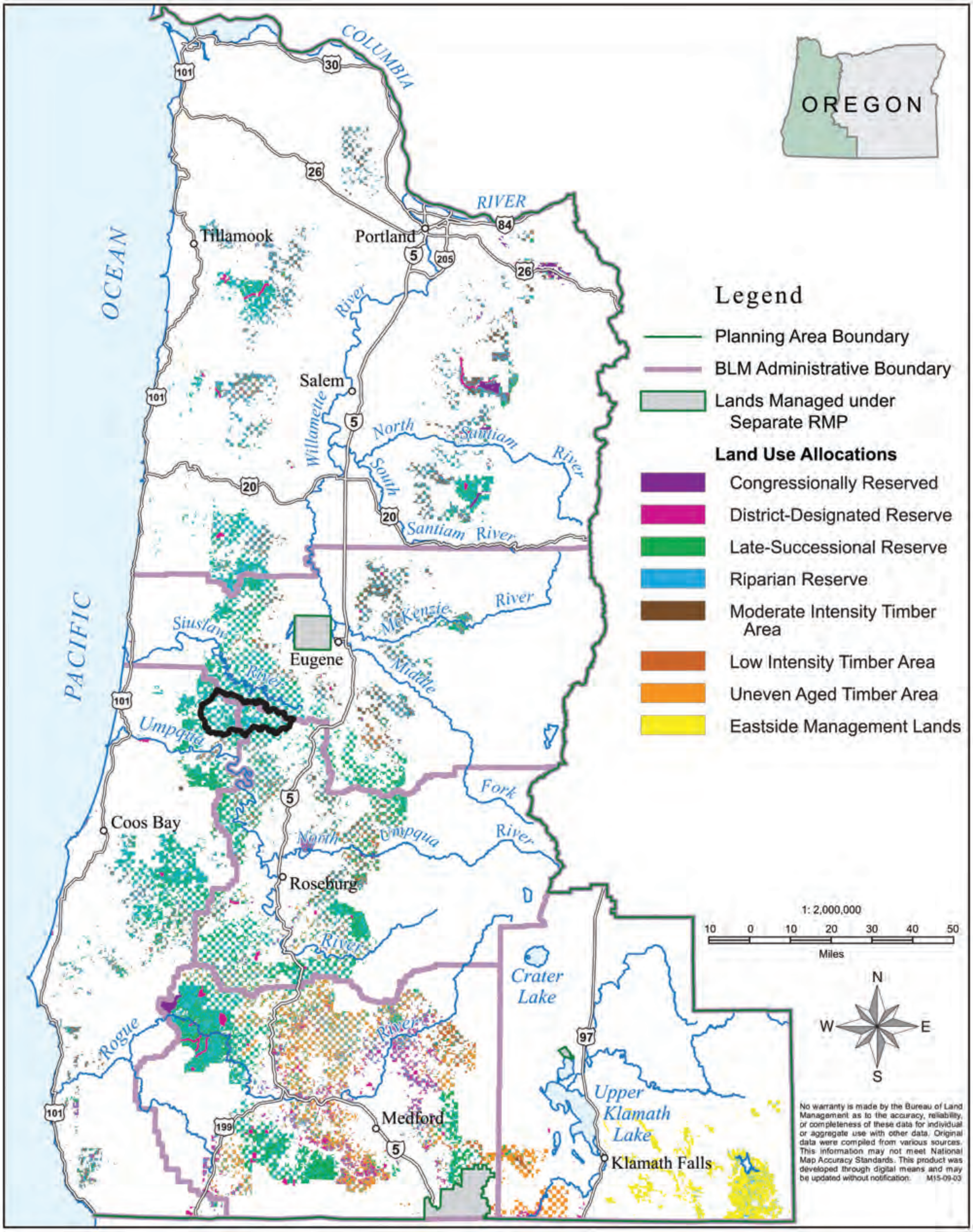
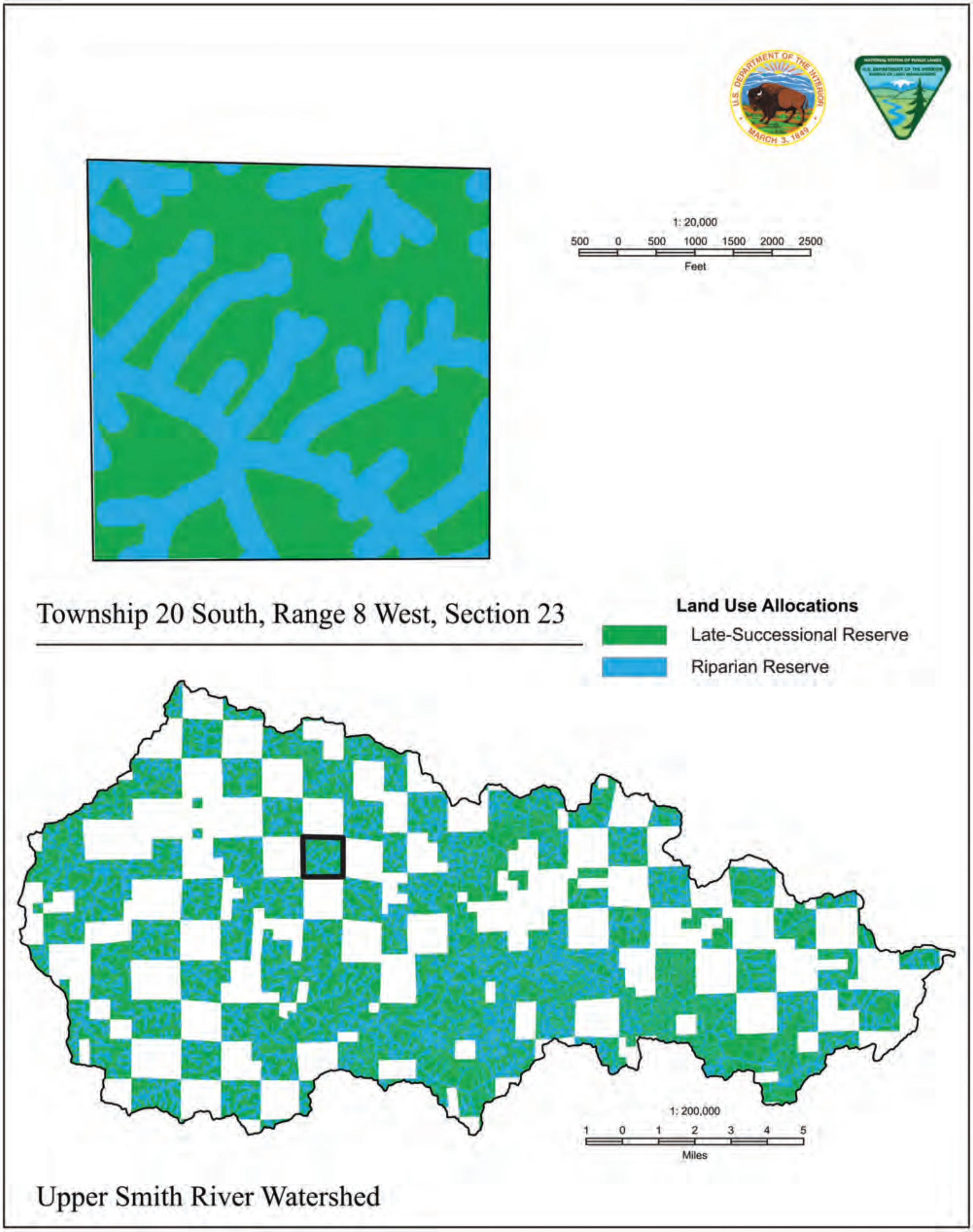


Map 2-8: Proposed RMP Land Use Allocations


1: 20,000
500 0 500 1000 1500 2000 2500
Feet
Township 20 South, Range 8 West, Section 23
Land Use Allocations
Late-Successional Reserve
Riparian Reserve
1: 200,000
1 0 1 2 3 4 5
Miles
Upper Smith River Watershed

The BLM identified Alternative B as the preferred alternative in the Draft RMP/EIS because of the outcomes associated with most resources. However, Alternative B does not provide the best possible response to the purpose and need for action and the guidance for the formulation of alternatives concerning the management of every resource. Recognizing this, the Draft RMP/EIS explained that the BLM would seek to develop a Proposed RMP that would, in comparison to Alternative B—

- Reduce the risk of adverse effects to ESA-listed fish and water quality;
- Increase protection of unique recreation settings and increase recreation use;
- Increase protection of identified lands with wilderness characteristics; and
- Minimize the spread of sudden oak death.

Based on the analysis in the Draft RMP/EIS and comments the BLM received on the Draft RMP/EIS, the BLM has modified the management approach of Alternative B for riparian management, recreation management, protection of identified lands with wilderness characteristics, and treatment of sudden oak death in the development of the Proposed RMP, as summarized below.

To reduce the risk of adverse effects to ESA-listed fish and water quality compared to Alternative B, the Proposed RMP includes a Riparian Reserve design that is intermediate among the alternatives and incorporates elements of each of the alternatives. The Proposed RMP carries forward the concept of key watersheds from the No Action alternative, in that it varies riparian management based on the importance of the subwatershed to the conservation and recovery of ESA-listed fish. For fish-bearing streams and perennial streams in all subwatersheds, the Riparian Reserve design is similar to Alternative D. For non-fish-bearing intermittent streams, the Riparian Reserve design in Class I and II subwatersheds is a slight modification of Alternative A, and the Riparian Reserve design in Class III subwatersheds is similar to Alternative C (see more detailed description below under Riparian Reserve).

To increase protection of unique recreation settings and increase recreation use compared to Alternative B, the Proposed RMP includes an approach to the management of recreation resources modified from Alternative C.

To increase protection of identified lands with wilderness characteristics compared to Alternative B, the Proposed RMP includes an approach to the management of identified lands with wilderness characteristics from Alternative A.

To minimize the spread of sudden oak death compared to Alternative B, the Proposed RMP includes the sudden oak death treatment approach of the No Action alternative, Alternative C, and Alternative D.

In designing the Proposed RMP to best meet all of the purposes for the RMP revision, the BLM considered the effects disclosed in the Draft RMP/EIS as well as the comments received from the public and cooperating agencies. The BLM made many of the modifications to Alternative B to mitigate further the adverse effects to resources through the land use allocations and the management direction. Specifically, the BLM modified the Riparian Reserve design and management direction of Alternative B for the Proposed RMP to reduce the risk of adverse effects to ESA-listed fish and water quality. The BLM increased the protection of identified lands with wilderness characteristics under the Proposed RMP compared to Alternative B to reduce the loss of wilderness characteristics. The BLM adopted the most aggressive sudden oak death treatment approach among the alternatives for the Proposed RMP to minimize the spread of sudden oak death. Additionally, the Proposed RMP included specific management direction intended to reduce or avoid adverse effects. For example, as described below, and in **Appendix B** and **Appendix X**, the Proposed RMP would prohibit the incidental take of northern spotted owls from timber harvest until implementation of a barred owl management program has begun, and would participate in, cooperate with, and provide support for an interagency program for barred owl management when the U.S. Fish and Wildlife Service determines the best manner in which barred owl management can contribute to the recovery of the northern spotted owl.

The Proposed RMP would prohibit the incidental take[20] of northern spotted owls from timber harvest until implementation of a barred owl management program has begun (**Appendix B** and **Appendix X**). This design feature of the Proposed RMP is a refined and focused version of the management approaches for northern spotted owl sites in Alternative D and Sub-alternative B. Alternative D allocated the home ranges of all known and historic northern spotted owl sites in the Harvest Land Base to the Owl Habitat Timber Area (see above; also USDI BLM 2015, pp. 74, 938–939). Sub-alternative B allocated the home ranges of all known and historic northern spotted owl sites to the Late-Successional Reserve (see above; also USDI BLM 2015, pp. 53, 938–939). In both the Owl Habitat Timber Area in Alternative D and the Late-Successional Reserve in Sub-alternative B, management direction would prohibit timber harvest that would not maintain northern spotted owl nesting-roosting habitat. This management direction in Alternative D and Sub-alternative B would effectively prohibit incidental take of northern spotted owls from timber harvest by prohibiting timber harvest that would remove nesting-roosting habitat in occupied northern spotted owl sites. Beyond this, and in contrast to the management direction in the Proposed RMP, this management direction in Alternative D and Sub-alternative B would also prohibit timber harvest that would not cause incidental take of northern spotted owls (such as removal of nesting-roosting habitat in unoccupied northern spotted owl sites). Finally, this management direction in Alternative D and Sub-alternative B would be permanent, in contrast to the management direction in the Proposed RMP, which would prohibit the incidental take of northern spotted owls from timber harvest until implementation of a barred owl management program has begun. Thus, the management approach for northern spotted owl sites in the Proposed RMP is a temporary and more limited refinement of the approaches in Alternative D and Sub-alternative B, which were described and analyzed in the Draft RMP/EIS.

The design of the Proposed RMP included all reasonable measures to avoid and minimize adverse effects to natural resources while meeting the statutory requirements under the O&C Act for a sustained yield of timber and the other purposes of the action. The Proposed RMP would not eliminate all adverse effects. Some level of residual adverse effects would be necessary to accomplish all of the purposes for the action. For example, the application of management direction and best management practices for road construction would reduce, but not eliminate, the potential for sediment delivery to streams. Some amount of road construction and consequent potential sediment delivery would be necessary to accomplish the purpose of providing for a sustained yield of timber and management objectives such as providing access to BLM-administered lands and facilities to support resource management programs. The management direction in the Proposed RMP intended to reduce or avoid adverse effects are too numerous to catalog here, but the effectiveness of such management direction in mitigating adverse effects and residual adverse effects are addressed by the issues and analysis contained in Chapter 3.

This section contains bulleted lists of the management objectives for the land use allocations and resource programs for the Proposed RMP. For some allocations and programs, this section also contains brief descriptions of the allocation and abbreviated descriptions of the management direction. **Appendix B** contains the management objectives and management direction in their entirety for all land use allocations, sub-allocations, and resource programs of the Proposed RMP.

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[20] The ESA defines 'take' as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." 16 U.S.C. 1532(19). The definition of harm is "an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering." 50 CFR 17.3; *Babbitt v. Sweet Home Chapter of Cmtys. for a Greater Or.*, 515 U.S. 687, 696-700 (1995).

Congressionally Reserved Lands and National Landscape Conservation System

- Conserve, protect, and restore the identified outstanding cultural, ecological, and scientific values of the National Landscape Conservation System and other congressionally designated lands.
- Preserve the wilderness character of designated Wilderness Areas.
- Preserve wilderness characteristics in Wilderness Study Areas in accordance with non-impairment standards as defined under the management policy for Wilderness Study Areas (BLM Manual 6330 – Management of BLM Wilderness Study Areas; USDI BLM 2012), until Congress either designates these lands as Wilderness or releases them for other purposes.
- Protect and enhance the free-flowing condition, water quality, and outstandingly remarkable values of eligible, suitable, and designated Wild and Scenic River corridors.[21]
- Provide protection to Wild and Scenic River corridors that are suitable for inclusion as components of the National Wild and Scenic Rivers system until Congress makes a decision on designation.
- Provide protection to Wild and Scenic River corridors that are eligible but have not yet been studied for suitability as components of the National Wild and Scenic Rivers system pending suitability evaluations.

Under the Proposed RMP, the BLM would recommend for inclusion in the National Wild and Scenic River System the six eligible Wild and Scenic River segments that the BLM found suitable during its administrative process (as outlined in BLM Manual 6400 – Wild and Scenic Rivers – Policy and Program Direction for Identification, Evaluation, Planning and Management, USDI BLM 2012b).

District-Designated Reserves

- Maintain the values and resources for which the BLM has reserved these areas from sustained-yield timber production.

The Proposed RMP includes management for wilderness characteristics of all identified lands with wilderness characteristics that are outside of the Harvest Land Base.

Eastside Management Area – Forested Lands

- Manage forested lands on a sustainable basis for multiple uses including wildlife habitat, recreational needs, riparian habitat, cultural resources, community stability, and commodity production, including commercial timber and other forest products.
- Promote development of fire-resilient forests.
- Offer for sale the probable sale quantity of 350 Mbf of timber per year.

Eastside Management Area – Non-forested Lands

- Manage non-forested lands with the intent of maintaining or improving wildlife habitat and rangeland conditions based on ecological site parameters. Where conditions are currently late-seral or potential natural community, maintain these conditions. Where conditions are early or mid-seral, improve conditions towards late-seral or potential natural community.
- Manage non-forested lands for multiple uses in addition to those listed above including: recreational needs, community stability, and commodity production. Commodities include firewood, logs, biomass, chips, and other products and byproducts from juniper woodlands and rangelands.

[21] Wild and Scenic River corridors include all of the river classifications – Wild, Scenic, and Recreational.

- Promote development of fire-resilient woodlands and rangelands.
- Provide for the conservation of Bureau Special Status Species.

Eastside Management Area – Riparian Reserve

- Provide for conservation of Bureau Special Status fish and other Bureau Special Status riparian-associated species.
- Provide for the riparian and aquatic conditions that supply stream channels with shade, sediment filtering, leaf litter and large wood sources, and stream bank stability.
- Maintain and restore water quality and hydrologic functions.
- Maintain and restore access to stream channels for all life stages of aquatic species.
- Maintain and restore the proper functioning condition and ecological site potential of riparian and wetland areas.

Harvest Land Base

- Manage forests to achieve continual timber production that can be sustained through a balance of growth and harvest.
- Offer for sale the declared Allowable Sale Quantity of timber.
- Recover economic value from timber following disturbances, such as fires, windstorms, disease, or insect infestations.
- In harvested or disturbed areas, ensure the establishment and survival of desirable trees appropriate to the site and enhance their growth.
- Enhance the economic value of timber in forest stands.

In the Proposed RMP, the Harvest Land Base is comprised of the Uneven-aged Timber Area, Low Intensity Timber Area, and Moderate Intensity Timber Area.

The Uneven-aged Timber Area is located in—

- Dry and very dry forest types identified by potential vegetation types in the Klamath Falls Field Office;
- Dry forest types within northern spotted owl critical habitat designated in the 2012 final rule (77 FR 71908) and very dry forest types in the Medford District; and
- Very dry forest types in the South River Field Office of the Roseburg District.

The Low Intensity Timber Area is located in areas within the Harvest Land Base outside of the Uneven-aged Timber Area, in which the BLM identified that higher level of retention within regeneration harvest units would better integrate the management of multiple resources. Timber harvest in the Low Intensity Timber Area includes thinning and regeneration harvest with retention of 15–30 percent of the stand. In delineating these areas, the BLM included—

- Northern spotted owl critical habitat designated in the 2012 final rule (77 FR 71908) in the Harvest Land Base outside of the Uneven-aged Timber Area;
- Dry forest types outside of designated northern spotted owl critical habitat in the Harvest Land Base in the Medford District; and
- Special Recreation Management Areas that overlap the Harvest Land Base outside of the Uneven-aged Timber Area where increased tree retention in regeneration harvests would facilitate recreation management.

The Moderate Intensity Timber Area is located in the remaining portions of the Harvest Land Base. Timber harvest in the Moderate Intensity Timber Area includes thinning and regeneration harvest with retention of 5–15 percent of the stand.

In contrast to Alternative B, the Proposed RMP includes either natural tree regeneration or replanting after timber harvest in both the Low Intensity Timber Area and Moderate Intensity Timber Area.

Late-Successional Reserve

- Maintain nesting-roosting habitat for the northern spotted owl and nesting habitat for the marbled murrelet.
- Promote the development of nesting-roosting habitat for the northern spotted owl in stands that do not currently support northern spotted owl nesting and roosting.
- Promote the development of nesting habitat for the marbled murrelet in stands that do not currently meet nesting habitat criteria.
- Promote the development and maintenance of foraging habitat for the northern spotted owl, including creating and maintaining habitat to increase diversity and abundance of prey for the northern spotted owl.

In the Proposed RMP, the Late-Successional Reserve includes, primarily, Structurally-complex Forest, Large Block Forest Reserves (Late-Successional Reserve – Moist and Late-Successional Reserve – Dry), and much smaller acreages from existing occupied marbled murrelet sites and existing sites of the North Oregon Coast Distinct Population Segment of the red tree vole north of Highway 20. In addition, the Proposed RMP includes requirements for surveys for the marbled murrelet and the North Oregon Coast Distinct Population Segment of the red tree vole, as described below; newly discovered sites would be included in the Late-Successional Reserve. Thus, this description of the Late-Successional Reserve includes predictions of the acreage of newly discovered marbled murrelet and red tree vole sites. Within the Late-Successional Reserve, the BLM would not conduct timber salvage after disturbance, except when necessary to protect public safety, or to keep roads and other infrastructure clear of debris.

Structurally-complex Forest
The Proposed RMP includes within the Late-Successional Reserve all stands identified by existing, district-specific information on Structurally-complex Forests.[22]

Large Block Forest Reserves: Late-Successional Reserve – Moist and Late-Successional Reserve – Dry[23]
The Proposed RMP includes within the Late-Successional Reserve blocks of functional and potential northern spotted owl habitat, sufficient to meet block size and spacing requirements (Thomas *et al*. 1990, pp. 24, 28) in all provinces except the Coast Range province, where reserves include blocks of habitat without limitations for size and spacing. In comparison to Alternative B, the Proposed RMP includes additional areas of Late-Successional Reserve in the Eugene and Roseburg Districts to facilitate east/west northern spotted owl movement and survival between the Coast Range and Cascade Mountains. In moist forests, the BLM would conduct thinning to promote the development of structurally-complex forest, which may include commercial removal

[22] The BLM has updated this information since the preparation of Alternative B in the Draft RMP/EIS, which used the district-specific information on structurally-complex forests available at that time.
[23] The Late-Successional Reserve – Dry and Riparian Reserve – Dry sub-allocations in the Proposed RMP are delineated as those portions of the Late-Successional Reserve and Riparian Reserve, respectively, which are in dry and very dry forest types identified by potential vegetation types within the Klamath Falls Field Office, the Medford District, and the South River Field Office of the Roseburg District.

of cut trees. In dry forests, the BLM would conduct activities including thinning and prescribed burning to promote the development of structurally-complex forest and to improve resilience to disturbance, which may include commercial removal of cut trees.

Riparian Reserve (west of Highway 97)

- Contribute to the conservation and recovery of ESA-listed fish species and their habitats and provide for conservation of Bureau Special Status fish and other Bureau Special Status riparian-associated species.
- Maintain and restore natural channel dynamics and processes, and the proper functioning condition of riparian areas, stream channels, and wetlands by providing forest shade, sediment filtering, wood recruitment, stability of stream banks and channels, water storage and release, vegetation diversity, nutrient cycling, and cool and moist microclimates.
- Maintain water quality and streamflows within the range of natural variability, to protect aquatic biodiversity, provide quality water for contact recreation and drinking water sources.
- Meet ODEQ water quality criteria.
- Maintain high quality water and contribute to the restoration of degraded water quality for 303(d)-listed streams.
- Maintain high quality waters within ODEQ designated Source Water Protection watersheds.

In the Proposed RMP, the Riparian Reserve encompasses lands along streams and other waterbodies. The design of the Riparian Reserve (west of Highway 97) varies among three classes of subwatersheds,[24] based on the importance of the subwatershed to the conservation and recovery of ESA-listed fish (see **Figure 2-11**). The BLM evaluated the importance of subwatersheds to the conservation and recovery of ESA-listed fish primarily based on designated critical habitat[25] and the presence of streams with a high-intrinsic potential for salmon. Class I subwatersheds are those that include both designated critical habitat and high-intrinsic potential streams.[26] Class II subwatersheds are those that include designated critical habitat or high-intrinsic potential streams. Class III subwatersheds are those that include neither designated critical habitat nor high-intrinsic potential streams. In identifying subwatershed classes, the BLM considered primarily the information in critical habitat designations and data on high intrinsic potential streams to indicate the importance of subwatersheds to the conservation and recovery of ESA-listed fish. However, future changes in designated critical habitat or data on high intrinsic potential streams would not alter the identification of subwatershed classes for the purpose of Riparian Reserve design and management direction (**Appendix X**).

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[24] The BLM defined the three classes for Riparian Reserve design in the Proposed RMP based on '6th field watersheds' (Hydrologic Unit Code 12). Hydrologic Unit Codes (HUC) are a U.S Geological Survey classification based on a hierarchy of nested watersheds. HUC 12 subwatersheds are typically 10,000–40,000 acres in size.

[25] For subwatersheds on the east side of the Willamette River, the BLM included core-genetic and core-legacy populations in addition to designated critical habitat.

[26] The 'intrinsic potential' is the set of habitat features that most influence whether that habitat is likely to be used or selected (or not) by an individual fish species. 'High intrinsic potential' streams are those streams with the habitat features that are known to be highly productive for an individual fish species (BLM 2015b, pp. 2–3).

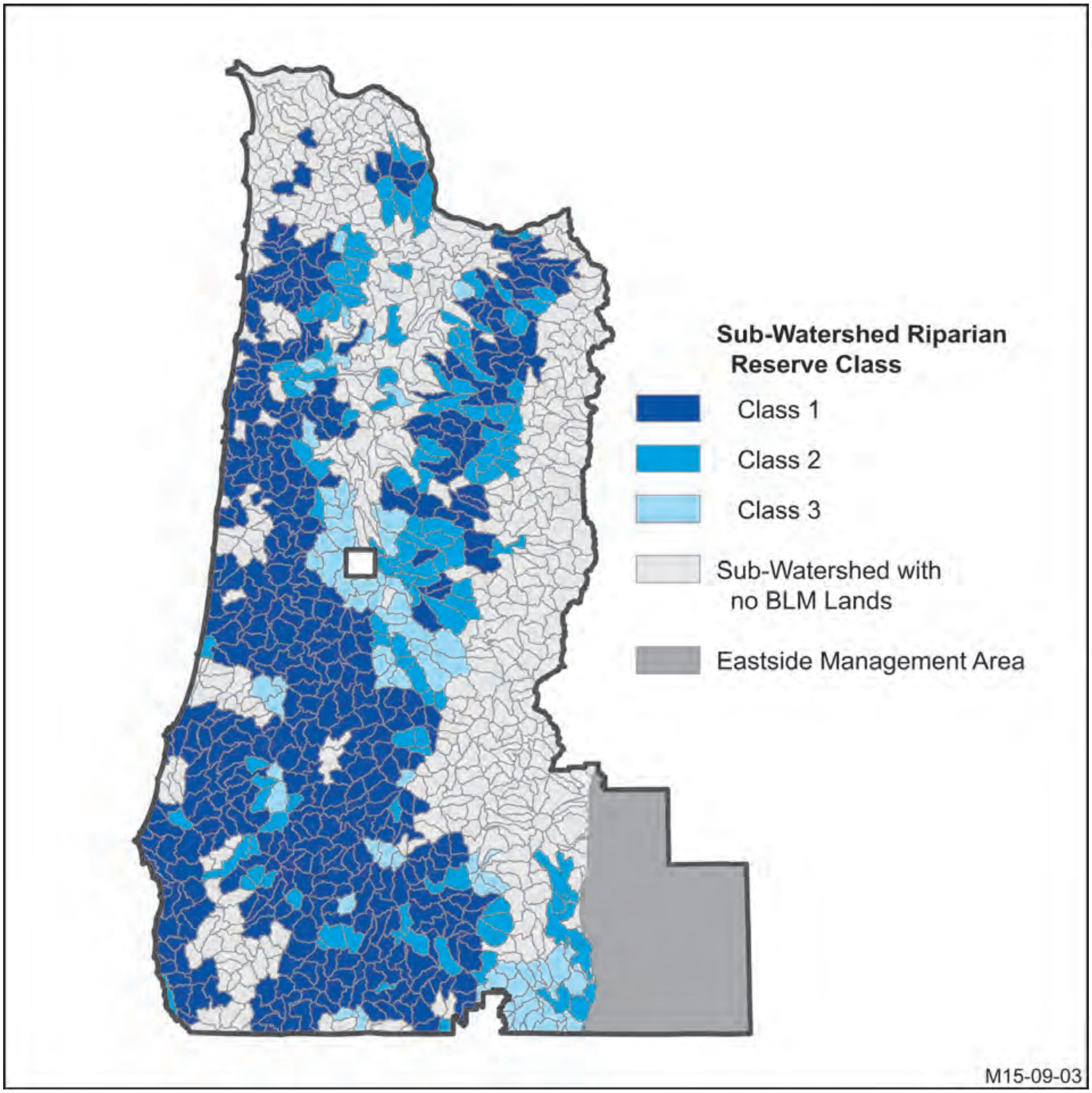

Figure 2-11. Proposed RMP subwatershed classes

Class I Subwatersheds
The Riparian Reserve encompasses lands within one site-potential tree height on either side of all streams.

The Riparian Reserve includes an inner zone in which thinning is generally not permitted. Inner zone widths are—

- 120 feet on either side of perennial streams and fish-bearing intermittent streams, and
- 50 feet on either side of non-fish-bearing, intermittent streams.

The Riparian Reserve includes a middle zone from 50 to 120 feet on either side of non-fish-bearing, intermittent streams. No middle zone is delineated on perennial streams and fish-bearing intermittent streams. In the middle zone, the BLM would conduct thinning as needed to ensure that stands are able to provide trees to form stable instream structures. In the middle zone in moist forests, the BLM would conduct thinning without commercial removal of timber (i.e., down woody debris and snag creation only). In the middle zone in the Riparian Reserve – Dry, activities would include prescribed burning and thinning that would include removal of cut trees, including commercial removal, as needed to reduce the risk of stand-replacing, crown fires.

The outer zone of the Riparian Reserve would be from 120 feet to one site-potential tree height on either side of all streams. In the outer zone, the BLM would conduct thinning, which may include commercial removal, as needed to ensure that stands are able to provide stable wood to the stream.

Class II Subwatersheds
The Riparian Reserve encompasses lands within one site-potential tree height on either side of all streams.

The Riparian Reserve includes an inner zone in which thinning is generally not permitted. Inner zone widths are—

- 120 feet on either side of perennial streams and fish-bearing intermittent streams, and
- 50 feet on either side of non-fish-bearing, intermittent streams.

In the outer zone, the BLM would conduct thinning, which may include commercial removal, as needed to develop diverse and structurally-complex riparian stands.

Class III Subwatersheds
The Riparian Reserve encompasses lands within—

- One site-potential tree height on either side of perennial streams and fish-bearing intermittent streams, and
- 50 feet on either side of non-fish-bearing, intermittent streams.

The Riparian Reserve includes an inner zone in which thinning is generally not permitted. Inner zone widths are—

- 120 feet on either side of perennial and fish-bearing intermittent streams, and
- 50 feet on either side of non-fish-bearing, intermittent streams.

In the outer zone, the BLM would conduct thinning, which may include commercial removal, as needed to develop diverse and structurally-complex riparian stands.

Administrative Actions

- Provide for the orderly and efficient management of resources.

Air Quality

- Protect air quality-related values in Federal mandatory Class I areas.
- Prevent exceedances of national, State, or local ambient air quality standards.

Areas of Critical Environmental Concern

- Maintain or restore relevant and important values in Areas of Critical Environmental Concern, including Research Natural Areas and Outstanding Natural Areas.

Under the Proposed RMP, the BLM would designate 108 Areas of Critical Environmental Concern.

Cultural Resources

- Preserve and protect significant cultural resources and ensure that they are available for appropriate uses by present and future generations.
- Reduce imminent threats and resolve potential conflicts from natural or human-caused deterioration or potential conflict with other resources by ensuring that all authorizations for land and resource use will comply with Section 106 of the National Historic Preservation Act.

Fire, Fuels, and Wildfire Response

- Respond to wildfires in a manner that provides for public and firefighter safety while meeting land management objectives by utilizing the full range of fire management options.
- Fire management strategies would be risk-based decisions that consider firefighter and public safety, values at risk, management objectives, and costs that are commensurate with the identified risk.
- Actively manage the land to restore and maintain resilience of ecosystems to wildfire and decrease the risk of uncharacteristic, large, high-intensity/high-severity wildfires.
- Manage fuels to reduce wildfire hazard, risk, and negative impacts to communities and infrastructure, landscapes, ecosystems, and highly valued resources.
- Manage fire, fuels, and wildfire response consistent with the National Cohesive Wildland Fire Management Strategy.
- Participate with communities bordering Federal lands in partnership with local, State, and Federal stakeholders to reduce the risks and threats from wildland fire.

Fisheries

- Improve the distribution and quantity of high-quality fish habitat across the landscape for all life stages of ESA-listed, Bureau Special Status Species, and other fish species.
- Maintain and restore access to stream channels for all life stages of aquatic species.

Forest Management

- Enhance the health, stability, growth, and vigor of forest stands.
- In harvested or disturbed areas, ensure the establishment and survival of desirable vegetation appropriate to the site.

- Facilitate safe and efficient forestry operations for the BLM, reciprocal right-of-way agreement holders, and permittees.

Hydrology

- Maintain water quality within the range of natural variability that meets ODEQ water quality standards for drinking water, contact recreation, and aquatic biodiversity.

Invasive Species

- Prevent the introduction of invasive species and the spread of existing invasive species infestations.
- Prevent the introduction and the spread of sudden oak death (*Phytophthora ramorum*) infections.

The Proposed RMP includes treatment at all sudden oak death infection sites.

Lands, Realty, and Roads

- Make land tenure adjustments to facilitate the management of resources and enhance public resource values.
- Provide legal access to BLM-administered lands and facilities to support resource management programs.
- Provide needed rights-of-way, permits, leases, and easements over BLM-administered lands in a manner that is consistent with Federal and State laws.
- 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.
- Provide a road transportation system that serves resource management needs (administrative/commercial) and casual use needs (recreational/domestic) for both BLM-administered lands and adjacent privately owned lands.

Livestock Grazing

- Provide for livestock grazing consistent with other resource objectives while maintaining or improving the health of the public rangelands.
- Prevent livestock from causing trampling disturbance to fish spawning beds where ESA-listed and Bureau Sensitive species occur.

Under the Proposed RMP, the BLM would manage allotments in compliance with Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington (USDI BLM 1997). The BLM would adjust grazing levels and management practices when needed to meet or make progress toward meeting the standards for rangeland health. The BLM would make unavailable to grazing those allotments, as listed in **Appendix B**, that have been generally been vacant or inactive for 5 years or more and currently have no Section 3 or Section 15 grazing preference.

Minerals

- Manage the development of leasable (including conventional and non-conventional hydrocarbon resources) minerals, locatable mineral entry, and salable mineral material disposal in an orderly and efficient manner.

- Maintain availability of mineral material sites needed for development and maintenance of access roads for forest management, timber harvest, local communities, rights-of-way for energy production and transmission, and other uses.

Under the Proposed RMP, the BLM would recommend for withdrawal from locatable mineral entry 208,912 acres (in addition to the 98,400 acres previously withdrawn) and would close 217,711 acres to salable mineral material disposal.

Paleontological Resources

- Protect and preserve significant localities from natural or human-caused deterioration or potential conflict with other resources.
- Provide appropriate scientific, educational, and recreational use, such as research and interpretive opportunities for paleontological resources.

Rare Plants and Fungi

- Provide for conservation and contribute toward the recovery of plant species that are ESA-listed or candidates.
- Support the persistence and resilience of natural communities, including those associated with forests, oak woodlands, shrublands, grasslands, cliffs, rock outcrops, talus slopes, meadows, and wetlands. Support ecological processes and disturbance mechanisms to allow for a range of seral conditions.
- Provide for the conservation of Bureau Special Status plant and fungi species.
- Support the persistence and resilience of oak species within oak woodlands and within mixed hardwood/conifer communities.

Under the Proposed RMP, the BLM would manage mixed hardwood/conifer communities to maintain and enhance oak persistence and structure and manage mixed conifer communities to maintain and enhance pine persistence and structure.

Recreation and Visitor Services

- Provide a diversity of quality recreational opportunities.
- Meet legal requirements for visitor health and safety and mitigate resource user conflicts.
- Mitigate recreational impacts on natural and cultural resources. In land use allocations where management of other resources is dominant, provide recreational opportunities where they can be managed consistent with the management of these other resources.
- Develop new recreation opportunities to address recreation activity demand created by growing communities, activity groups, or recreation-tourism if—
    - Recreation development is consistent with interdisciplinary land use plan objectives; and
    - The BLM has secured commitments from partners (e.g., a cooperative management agreement, adopt-a-trail agreement, and memorandum of understanding).

The Proposed RMP includes designation of Special Recreation Management Areas at currently developed recreation facilities, and on lands where designation does not conflict with sustained-yield timber harvest. The Proposed RMP includes designation of Extensive Recreation Management Areas where the BLM has developed and currently manages recreation activities outside of developed facilities, primarily where the BLM has authorized motorized and non-motorized trails, and where the BLM currently manages dispersed recreation activities. In addition, the BLM would designate Special Recreation Management Areas and Extensive Recreation Management Areas to address specific recreation demands and scarcity, or address where unique opportunities for activity-specific demands exist. In the rest of the decision area, the BLM would not manage specifically for recreation, but recreation could occur to the extent that the BLM has legal public access and recreation is not in conflict with the primary uses of these lands. The Proposed RMP would designate 241 RMAs (see **Appendix O**). The BLM would manage RMAs to achieve the management objectives and management direction described for Recreation and Visitor Services in Appendix B, and in accordance with their RMA Frameworks.[27]

Soil Resources

- Maintain or enhance the inherent soil functions (e.g., ability of soil to take in water, store water, regulate outputs for vegetative growth and stream flow, and resist erosion or compaction) of managed ecosystems.
- Provide landscapes that stay within natural soil stability failure rates during and after management activities.

Sustainable Energy

- Develop sustainable energy resources to the maximum extent possible without precluding other land uses.

Trails and Travel Management

- Maintain a comprehensive travel network that best meets the full range of public use, resource management, and administrative access needs.
- Protect fragile and unique resource values from damage by public motorized vehicle use.
- Provide public motorized vehicle use opportunities where appropriate.

Tribal Interests

Under the Proposed RMP, the BLM would consult with affected Tribes early in project planning in order consider effects to, and appropriately avoid or mitigate impacts to all cultural resources of concern, including both archaeological and natural resources. The BLM would identify opportunities to partner with Tribes on restoration projects and other land management activities that include resources and areas of interest to the Tribes. The BLM would accommodate access to and ceremonial use of sacred sites and places of traditional cultural importance to Tribes as well as avoid adversely affecting their physical integrity to the extent practicable, permitted by law, and not clearly inconsistent with other agency functions.

Visual Resource Management

- Protect scenic values on public lands where visual resources are an issue or where high-value visual resources exist.
- Prohibit activities that would disrupt the existing character of the landscape in Visual Resource Management Class I areas.
- Retain the existing character of the landscape in Visual Resource Management Class II areas.
- Partially retain the existing character of the landscape in Visual Resource Management Class III areas.

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[27] Recreation Management Frameworks for the Proposed RMP are located at http://www.blm.gov/or/plans/rmpswesternoregon/feis.php.

- Allow for major modification of the existing character of the landscape in Visual Resource Management Class IV areas.

Under the Proposed RMP, the BLM would manage Congressionally Reserved lands where decisions have been made to preserve a natural landscape (e.g., designated Wilderness Areas and the Wild segments of Wild and Scenic Rivers) as Visual Resource Management Class I. The BLM would manage the following as VRM Class II: designated and recommended suitable Wild and Scenic Rivers classified as Scenic; National Trail management corridors; District-Designated Reserve – Lands Managed for their Wilderness Characteristics; and Special Recreation Management Areas that fall within the Primitive and Backcountry setting. The BLM would manage the following as VRM Class III: designated and recommended suitable Wild and Scenic Rivers classified as Recreational, and Special and Extensive Recreation Management Areas that fall within the Middle Country setting. The BLM would manage ACECs as a VRM Class commensurate to the assigned Visual Resource Inventory class (e.g., VRI Class III as VRM Class III), except that the BLM would manage ACECs within the Harvest Land Base that are VRI Class II as VRM Class III. The BLM would manage all other lands as Visual Resource Management Class IV.

Wildlife

- Conserve and recover species that are ESA-listed, proposed, or candidate, and the ecosystems on which they depend.
- Implement conservation measures that reduce or eliminate threats to Bureau Sensitive species to minimize the likelihood of and need for the ESA-listing of these species.
- Conserve or create habitat for species addressed by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act and the ecosystems on which they depend.

Under the Proposed RMP, the BLM would implement the mitigation measure described in the Draft RMP/EIS for BLM participation in barred owl management (see **Appendix X**). As described in the Draft RMP/EIS, the BLM would cooperate with the U.S. Fish and Wildlife Service and provide financial support for their experimental removal of barred owls. Further, when the U.S. Fish and Wildlife Service determines the best manner in which barred owl management can contribute to the recovery of the northern spotted owl, the BLM would participate in, cooperate with, and provide support for an interagency program for barred owl management to implement Recovery Action 30. Barred owl management actions on BLM-administered lands within the range of the northern spotted owl could include BLM participation in scheduling, funding, and implementing such actions.

The Proposed RMP includes a requirement to avoid the incidental take of northern spotted owls from timber harvest until implementation of a barred owl management program has begun. As part of the process to determine whether a planned timber harvest would result in take of northern spotted owls, the BLM would establish whether the northern spotted owl is actually present in the area that would be affected by the timber harvest using the best available science at that time, such as through pre-project northern spotted owl surveys.

Management for the marbled murrelet under the Proposed RMP includes—

- A requirement for survey of nesting habitat in all land use allocations in marbled murrelet Zone 1 and in reserve land use allocations in marbled murrelet Zone 2;
- A requirement for protection of habitat within 300 feet around newly discovered occupied marbled murrelet sites; and
- The protection of trees capable of providing marbled murrelet nesting structures in younger stands within the Harvest Land Base in marbled murrelet Zone 1.

The Proposed RMP also includes a requirement for surveys for North Oregon Coast Distinct Population Segment of the red tree vole prior to management actions north of Highway 20 and protection of habitat areas around known sites and newly discovered nest sites north of Highway 20, and protection of known sites in the Late-Successional Reserve and Riparian Reserve south of Highway 20.

Wild Horses

- Manage and maintain a healthy population of wild and free-roaming horses in the Pokegama Herd Management Area of the Klamath Falls Field Office.

Mitigation

The Council on Environmental Quality regulations state that mitigation includes avoiding, minimizing, rectifying, reducing, eliminating, or compensating for adverse environmental impacts (40 CFR 1508.20). The BLM NEPA Handbook explains that measures or practices should only be termed mitigation measures if they have not been incorporated into the proposed action or alternatives. If they are incorporated into the proposed action or alternatives, they are called design features, not mitigation measures (BLM Handbook 1790-1 – National Environmental Policy Act, USDI BLM 2008, p. 61). Most of the measures that would avoid, rectify, or reduce environmental impacts are integral to the design of the alternatives and the Proposed RMP, such as the size, location, and extent of the Late-Succession Reserve, and therefore these design features cannot be addressed as discrete mitigation measures. Throughout Chapter 3, this Proposed RMP/Final EIS describes the varying effects of these different design features and their effectiveness at avoiding, minimizing, rectifying, reducing, eliminating, or compensating for adverse environmental impacts. These different design features and their effects are too numerous and too thoroughly integrated into the analysis in Chapter 3 to enumerate here.

Best Management Practices (BMPs) are practices that have been determined to be the most effective and practicable in preventing or reducing the amount of pollution generated by diffuse sources to a level compatible with water quality goals (40 CFR 130.2 [m]). The BMPs are measures or practices that would avoid, rectify, or reduce environmental impacts, and are included in the approved RMP. **Appendix J** lists the BMPs and provides a detailed discussion of the role and application of BMPs. Under all alternatives and the Proposed RMP, project-level planning and analysis would identify the appropriate and applicable BMPs needed to achieve management objectives.

The Draft RMP/EIS identified one potential mitigation measure common to all action alternatives: BLM participation in barred owl management. This measure has been incorporated into the Proposed RMP, as described above and in **Appendix X**.

Alternatives Considered but not Analyzed in Detail

An EIS must rigorously explore and objectively evaluate all reasonable alternatives. The BLM may eliminate from detailed analysis alternatives that are not reasonable. As explained in the BLM NEPA Handbook (USDI BLM 2008, p. 52), an alternative need not be analyzed in detail if–

- It does not meet the purpose and need (see Chapter 1 for the purpose and need);
- It is technically or economically infeasible;
- It is inconsistent with the basic policy objectives for the management of the area (see Chapter 1 for the guidance for the formulation of alternatives);
- Its implementation is remote or speculative;
- It is substantially similar to an alternative being considered in detail; or
- It would have substantially similar effects to an alternative being considered in detail.

The BLM considered the following alternatives but eliminated them from detailed analysis, as explained below.

No Timber Harvest

This alternative would prohibit all timber harvesting on BLM-administered lands. The BLM eliminated this alternative from detailed analysis because it would not meet the purpose and need, which includes providing a sustained yield of timber in accordance with the O&C Act.

This Proposed RMP/Final EIS does make use of a reference analysis of no timber harvest on BLM-administered lands. This reference analysis is not a reasonable alternative. Instead, this Proposed RMP/Final EIS includes discussion of this reference analysis to provide context and a point of comparison as needed to analyze and interpret the effects of the alternatives.

Continuation of the Current Practices

This management approach would seek to continue the varying current practices that the BLM has been implementing since the adoption of the 1995 RMPs. The BLM cannot analyze continuation of the current practices as the No Action alternative. Additionally, the BLM has eliminated from detailed analysis the continuation of the current practices as an action alternative.

As discussed earlier in this chapter, the No Action alternative in this Proposed RMP/Final EIS is implementation of the 1995 RMPs as written (in contrast to using one of the variable years representing how the BLM has been implementing the 1995 RMPs). It is not possible to analyze continuation of the current practices within the decision area as the No Action alternative for two reasons. First, implementation of the timber management program has departed substantially from the outcomes predicted in the 1995 RMPs, and the manner and intensity of this departure has varied substantially over time and among districts (USDI BLM 2012, pp. 6–12). There is no apparent basis on which the BLM might select and project into the future the continuation of practices from a specific year (or set of years) since 1995. Second, continuing to harvest timber at the current declared annual productive capacity level for multiple decades into the future would not be possible using the current practices of predominately thinning harvests (USDI BLM 2012, pp. 6–12). The No Action alternative provides a benchmark to compare outputs and effects, even though this alternative does not meet the purpose and need of the project. Because of the inherent unsustainability and variability of current practices, the BLM cannot project their implementation into the future; thus, analyzing continuation of the current practices would not serve the essential function of the No Action alternative of providing a baseline for comparison of outputs and effects. In contrast, it is possible for the BLM to project the implementation of the 1995 RMPs as written for multiple decades into the future and provide a baseline for comparison to the action alternatives.

The BLM will not present the implementation of the 1995 RMPs as written and continuation of the current practices as two separate No Action alternatives. The BLM developed two separate No Action alternatives in a previous planning effort to amend the 1995 RMPs, and the District Court for the Western District of Washington determined this approach was inconsistent with NEPA. The District Court for the Western District of Washington stated that agencies are "…obligated to provide a single, comprehensive no-action alternative that accurately represented the status quo…" *Conservation NW.* v. *Rey*, 674 F. Supp. 2d 1232, 1251 (W.D. Wash. 2009). The status quo at this time is that the BLM must implement actions in conformance with the 1995 RMPs, consistent with 43 CFR 1610.5–3. Therefore, implementation of the 1995 RMPs as written, amended, and modified by court orders, represents the single No Action alternative for this RMP revision.

The BLM also eliminated continuation of the current practices from detailed analysis as an action alternative, because it would not be a reasonable alternative, in that it would not meet the purpose and need for this planning effort. The purpose and need includes providing a sustained yield of timber, which requires that the management of the forest provide a continuous volume of timber at the current intensity of management without decline. The current implementation practices in the timber program are not sustainable (USDI BLM 2012, pp. 6–12).

Timber harvest practices have varied since the adoption of the 1995 RMPs. Nevertheless, in recent years, all districts have implemented a timber harvest program that has been predominately thinning. The level of regeneration harvest has been substantially less than assumed in the 1995 RMPs for all districts, ranging from 4 percent to 16 percent of the assumed levels during the period from 2004 to 2010 (USDI BLM 2012, p. 7, Appendices 3–8). Thus, a management approach that would limit timber harvest to thinning would approximate the continuation of the practices of the past decade.

The 2008 FEIS analyzed a sub-alternative of Alternative 1 that would limit timber harvest to thinning, which provides an approximation of the effects of continuation of the current practices. That analysis evaluated how long thinning alone could provide at least 90 percent of the annual productive capacity for Alternative 1. That analysis concluded that none of the sustained-yield units could maintain that harvest level for a decade. As concluded in that analysis, "This sub-alternative demonstrates that high levels of thinning cannot be maintained for extended periods to sustain an allowable sale quantity"[28] (USDI BLM 2007, p. 561). That analysis is incorporated here by reference (USDI BLM 2007, pp. 560–561). The timber harvest level of Alternative 1 would have been higher than the timber volume being produced under current practices. Thus, at the slower pace of harvesting under the current practices, compared to the harvest rates assumed under Alternative 1 in the 2008 FEIS, it could be inferred that thinning might be able to support the current harvest volume for approximately one to two decades. However, during the years since the BLM conducted that analysis, the BLM has continued to harvest predominately with thinning, exhausting much of the thinning opportunities considered in that analysis. As a result, the overall analytical conclusion from the 2008 FEIS that high levels of thinning can only be sustained for less than a decade is still applicable.

This analytical conclusion is consistent with the plan evaluations that the BLM conducted in 2012, which determined that the current timber harvest practices are "not sustainable at the declared ASQ level" due to reliance on predominately thinning (USDI BLM 2012, pp. 10–11).

In summary, the BLM cannot analyze continuation of the current practices as the No Action alternative, because the current practices have been variable and are not sustainable, preventing the projection of the current practices into the future. The BLM has eliminated from detailed analysis the continuation of the current practices as an action alternative, because it would not be a reasonable alternative, in that it would not provide for a sustained yield of timber over the long term. The analysis of a thinning only sub-alternative in the 2008 FEIS provides an approximation of the effects of this management approach, concluding that thinning levels can only be sustained for less than a decade.

[28] As noted in Chapter 1, the terms 'annual productive capacity,' 'annual sustained yield capacity,' and 'allowable sale quantity' are synonymous.

Implement the 1995 RMPs at the Sustained-yield Timber Harvest Levels Declared in the 1995 RMPs

This alternative would implement the 1995 RMPs as written with the annual productive capacity for sustained-yield timber fixed at the level declared in the 1995 RMPs. The BLM eliminated this alternative from detailed analysis because—

- It is reasonably foreseeable that the BLM would adjust the annual productive capacity based on new information and analysis;
- Ignoring new information and analysis on annual productive capacity would produce a flawed and incomplete analysis of environmental effects;
- The 1994 RMP/EISs already analyzed a management approach with an annual productive capacity at the currently declared levels; and
- A management approach with an annual productive capacity at the currently declared levels does not represent a benchmark among the range of alternatives in this Proposed RMP/Final EIS.

As discussed earlier in this chapter, the No Action alternative in this Proposed RMP/Final EIS is implementation of the 1995 RMPs as written. The 1995 RMPs determined and declared the annual productive capacity to be 211 MMbf, based on information and analysis available at that time. In response to new information described in plan evaluations, the BLM adjusted the annual productive capacity in 1999 in some sustained-yield units through plan maintenance, resulting in a total annual productive capacity of 203 MMbf. As part of the analysis of the No Action alternative in this RMP/EIS, the BLM has calculated the annual productive capacity under the management described in the 1995 RMPs (i.e., the land use allocations and management direction), in light of the most current information available to the BLM on the condition of forests within the decision area. That analysis demonstrates that the annual productive capacity under the management described in the 1995 RMPs, based on current conditions and current information, would be 277 MMbf. The discussion in Chapter 3 in the Forest Management section explains the reasons for this increase in the determination of the annual productive capacity. This conclusion is consistent with the conclusion in the 2008 FEIS, which calculated the annual productive capacity for the No Action alternative to be 268 MMbf at that time. If the BLM were to adopt the No Action alternative at the conclusion of this planning process, it is reasonably foreseeable that the BLM would adjust the declaration of the annual productive capacity through plan maintenance based on this new information, as the BLM did in 1999 following plan evaluations. Even if the BLM were to eschew any amendment or revision of the 1995 RMPs, the regulations at 43 CFR 1610.5–4 would still compel the BLM to maintain the 1995 RMPs and refine the previously approved decision based on a change in data. Therefore, it is not reasonably foreseeable that, under the No Action alternative, the BLM would continue in the future to determine the annual productive capacity to be 203 MMbf (or the originally declared 211 MMbf).

For the purpose of RMP analysis, the determination of the amount of sustained-yield timber harvest that the BLM could produce under an alternative is indirectly determinative of a host of environmental effects, as documented throughout Chapter 3 of this Proposed RMP/Final EIS. To ignore new information and inaccurately analyze the amount of sustained-yield timber harvest under an alternative, (i.e., to fix the annual productive capacity for the No Action alternative at either 203 or 211 MMbf) would provide a flawed and incomplete analysis of environmental effects.

The BLM presented analysis of the 1995 RMP with an annual productive capacity of 211 MMbf in the RMP/EISs for the 1995 RMPs (USDI BLM 1994 a, b, c, d, e, f). For many effects, that analysis remains a reasonably accurate depiction of the effects of an alternative with that level of sustained-yield timber harvest. The plan maintenance prepared by the BLM for the adjustments of the annual productive capacity to 203 MMbf documented that the adjustment was simply a refinement of the previously approved decision and did not require additional NEPA analysis (e.g., USDI BLM 2003a, p. 108).

Finally, omitting detailed analysis of an alternative with an annual productive capacity of 203 MMbf (or the originally declared 211 MMbf) from this RMP/EIS does not deprive the BLM of a benchmark in its analysis. The alternatives and sub-alternatives in the Proposed RMP/Final EIS would result in an annual productive capacity that ranges from 119 to 486 MMbf. Both Sub-alternative B and Alternative D would result in an annual productive capacity lower than 203 MMbf. Thus, an alternative with an annual productive capacity of 203 MMbf (or the originally declared 211 MMbf) represents an intermediate level of resource development and an intermediate outcome. Regardless of whether the BLM analyzes the continued implementation of the 1995 RMPs with an annual productive capacity calculated based on the current information or fixed at the previous declared level, the range of alternatives analyzed in the Proposed RMP/Final EIS spans "the full spectrum of alternatives," and the action alternatives include management approaches with "greater and lesser levels of resource development," consistent with guidance from the Council on Environmental Quality ("Forty Most Asked Questions..." 46 FR 18027).

'Natural Selection Alternative' – Harvest Only 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. The BLM eliminated this alternative from detailed analysis because it would not meet the purpose and need and the basic policy objectives described in the guidance for development of all action alternatives, in that it would not make a substantial and meaningful contribution to providing a sustained yield of timber. As explained in the Purpose and Need for Action in Chapter 1, O&C Act states that "[t]he annual productive capacity for such lands shall be determined and declared…" and that volume of timber "…shall be sold annually." To limit the harvest of timber to trees that die or are dying would not reflect the annual productive capacity for such lands. Furthermore, the timber volume in dead and dying trees from year to year would be inherently unpredictable and variable, and thus would not support sustained-yield timber production because the annual volume for sale would fluctuate unpredictably based on annual conditions. Therefore, limiting the harvest of timber to trees that die or are dying would not be consistent with the requirements of the O&C Act and would not respond to the purpose for the action.

Harvest Only Small-diameter Trees with a One-time Entry

This alternative would limit timber harvest to small diameter trees cut for restoration treatments. Timber harvest would be conducted only as a one-time entry into stands for timber volume. The BLM eliminated this alternative from detailed analysis because it would not meet the purpose and need and the basic policy objectives described in the guidance for development of all action alternatives, in that it would not make a substantial and meaningful contribution to providing a sustained yield of timber. An alternative designed for "one-time entry" with restoration as the primary objective would not provide sustained yield of timber. Limiting timber harvest to "one-time entry" and establishing restoration of some resource condition as the primary objective would preclude producing a given volume of timber in perpetuity at a given intensity of management, as required by the O&C Act and specifically described in the purpose for the action. Therefore, such an alternative would not be a reasonable alternative.

Maximize Carbon Storage

This alternative would maximize the storage of carbon on BLM-administered lands. The Draft RMP/EIS analyzed the effects of the alternatives on carbon storage. The BLM considered those effects on carbon storage, as well as the effects on other resources, in the development of the Proposed RMP. However, the BLM has no specific legal or regulatory mandate or policy direction to manage BLM-administered lands for carbon storage, and carbon storage is not part of the purpose and need for action. Therefore, the BLM has not developed alternatives specifically and explicitly intended to maximize carbon storage.

The BLM has various climate-related policies, including the following:

- Executive Order 13514, which directs agencies to measure, manage, and reduce greenhouse gas emissions toward agency-defined targets for agency actions such as vehicle fleet and building management
- Executive Order 13653, which directs agencies to assess climate change related impacts on and risks to the agency's ability to accomplish its missions, operations, and programs and consider the need to improve climate adaptation and resilience
- Secretarial Order 3289, which establishes a Department of the Interior approach for applying scientific tools to increase understanding of climate change and to coordinate an effective response to its impacts
- Departmental Manual 523 DM 1, which directs the Department of the Interior agencies to integrate climate change adaptation strategies into programs, plans, and operations

These policies address topics related to greenhouse gas emissions and climate change, but none directs the BLM to manage BLM-administered lands specifically for carbon storage. This Proposed RMP/Final EIS is consistent with these policies to the extent they address topics within the scope of this planning effort.

Protect All Nesting, Roosting, and Foraging Habitat for the Northern Spotted Owl

The BLM eliminated this alternative from detailed analysis because it would be substantially similar in design and effects to Sub-alternative C, which would reserve all forests 80 years of age and older. Although an age threshold of 80 years old does not function as a *de facto* definition of nesting, roosting, and foraging habitat, the majority of forests over 80 years of age provide nesting, roosting, and foraging habitat for the northern spotted owl, and the majority of forests less than 80 years of age do not provide nesting, roosting, and foraging habitat. At the scale of analysis of the decision area, an alternative that would reserve all nesting, roosting, and foraging habitat for the northern spotted owl would not be sufficiently different from Sub-alternative C to warrant separate analysis.

Reserve All Forests 200 Years of Age and Older

The BLM eliminated this alternative from detailed analysis because it would not meet the purpose and need and the basic policy objectives described in the guidance for development of all action alternatives, in that it would not make a substantial and meaningful contribution to maintaining older, more structurally-complex multi-layered conifer forest. Forests 200 years of age and older only constitutes about two-thirds of the structurally-complex forest, according to the structural stage descriptions used in this Proposed RMP/Final EIS. This alternative would leave too much older, more structurally-complex multi-layered conifer forest available for timber harvest to constitute a substantial and meaningful contribution to maintaining older, more structurally-complex multi-layered conifer forest.

Maintain the 50 Percent of the Landscape with the Highest Structural Complexity

This alternative, which was suggested in public comments on the Draft RMP/EIS, would identify the 50 percent of the moist forest landscape with the highest structural complexity and manage those stands to promote and enhance their structural complexity. The remainder of the landscape would be available for variable retention regeneration harvest. This alternative would include monitoring the development of structural complexity and re-designating the most valuable 50 percent every 10 years.

The proponent of this alternative does not provide enough detail or explanation for the BLM to develop this proposal into an alternative. Specifically, the proponent does not specify if the retention of 50 percent of the landscape in a reserve system would *include* reserves for other objectives, such as Riparian Reserve, District-Designated Reserves, and Congressionally Reserved lands, or if the 50 percent of the landscape that would be managed for structural complexity would be *in addition to* these reserves for other objectives.

If the proponent intends that the 50 percent of the landscape that would be managed for structural complexity *includes* reserves for other objectives, such as Riparian Reserve, District-Designated Reserves, and Congressionally Reserved lands, then the resultant reserve network as a whole would include approximately 11–24 percent of the decision area managed for structural complexity, depending upon the approach for these other reserves. For comparison, the action alternatives would allocate a Late-Successional Reserve network of 29–46 percent of the decision area. The BLM eliminated this alternative from detailed analysis because such a small reserve network would be insufficient to meet the purpose of contributing to the conservation and recovery of threatened and endangered species.

If the proponent intends that the 50 percent of the landscape that would be managed for structural complexity *in addition to* reserves for other objectives, such as Riparian Reserve, District-Designated Reserves, and Congressionally Reserved lands, then the resultant Harvest Land Base would be approximately 5–18 percent of the decision area, depending upon the approach for these other reserves. In comparison, the Harvest Land Base ranges from 14 percent to 40 percent of the decision area for the alternatives. However, the approach for formulation of the other reserves would be critical in evaluating an alternative that proposes 50 percent of the landscape to be managed for structural complexity in addition to reserves for other objectives, both in the alternative's ability to meet the purpose and need and the effects of the alternatives. Without further information on the approach for the other reserves, especially the Riparian Reserve, the BLM cannot fully formulate such an alternative.

In addition to more detail being necessary in order to consider for detailed analysis, the proponent's alternative at face value would not meet the purpose and need, which includes contributing to the conservation and recovery of threatened and endangered species. As the purpose and need explains, contributing to the conservation and recovery of the spotted owl necessarily includes maintaining a network of large blocks of forest to be managed for late-successional forests. Retaining 50 percent of the moist forest landscape with the highest structural complexity does not provide for the maintenance of large blocks of forest to be managed for late-successional forest and therefore is not a reasonable alternative. It would instead reserve forest based on its current structural condition. Setting a simple landscape target for forest structural conditions would not provide an effective conservation strategy for threatened and endangered species. The BLM eliminated this alternative from detailed analysis because it would not meet the purpose and need.

Do Not Reserve Older, More Structurally-complex Forest

The BLM eliminated this alternative from detailed analysis because it would not meet the purpose and need, which includes contributing to the conservation and recovery of ESA-listed species. As the purpose and need explains, contributing to the conservation and recovery of the spotted owl necessarily includes maintaining older and more structurally-complex multi-layered conifer forests. As such, any alternative that does not maintain older, more structurally-complex forest is not a reasonable alternative.

Increase Riparian Reserve Widths

This alternative would include a Riparian Reserve that would be wider than the Riparian Reserve in the No Action alternative (i.e., more than two site-potential tree heights on fish-bearing streams and more than one site-potential tree height on non-fish-bearing streams). Such an alternative would be substantially similar to the Riparian Reserve in the No Action alternative, because of its effect on the conservation and recovery of ESA-listed fish and the protection of clean water. Based on the results in the interagency Aquatic and Riparian Effectiveness Monitoring Program, which evaluated watershed condition and trend in the Northwest Forest Plan area, the protections provided, in part, by the Riparian Reserve, are improving watershed conditions (Miller *et al.* 2015, Lanigan *et al*. 2012). Additional width of the Riparian Reserve would not provide additional protections for fish habitat or water quality. Furthermore, the Riparian Reserve in the No Action alternative was designed to meet an array of objectives, including broad ecological objectives and riparian and terrestrial species habitat. In contrast, the Riparian Reserve in the action alternatives is designed to meet narrower objectives: conservation and recovery of ESA-listed fish and protection of clean water, consistent with the purpose and need for action. Because of these narrower objectives, the action alternatives considered in detail do not include widening the Riparian Reserve widths. The action alternatives address the broad ecological objectives and terrestrial species habitat objectives from the Aquatic Conservation Strategy of the No Action alternative through a variety of approaches, such as larger Late-Successional Reserve, maintaining older, more structurally-complex forest, and specific management direction for protection of habitat components in the Harvest Land Base. Because the action alternatives include a range of such approaches, it would be unwarranted to add these broad ecological objectives and terrestrial species habitat objectives to the Riparian Reserve in the action alternatives.

2008 BLM RMPs (Western Oregon Plan Revisions)

This alternative would manage BLM-administered lands consistent with the 2008 Records of Decision/RMPs. The U.S. District Court, District of Oregon (*Pacific Rivers Council et al.* v. *Shepard*, 03:11-CV-442-HU, 2012 WL 950032 (D. Or. March 20, 2012)) vacated the 2008 Records of Decision/RMPs on May 16, 2012. The BLM eliminated this alternative from detailed analysis because it would not meet the purpose and need and therefore is not a reasonable alternative. As the purpose and need explains, contributing to the conservation and recovery of the spotted owl necessarily includes maintaining older and more structurally-complex multi-layered conifer forests. As such, any alternative that does not maintain older, more structurally-complex forest is not a reasonable alternative. Specifically, the 2008 RMPs would not maintain older and more structurally-complex multi-layered conifer forests, because they would only defer the harvest of older forests for 15 years, after which such stands would be available for timber harvest. On the face of it, an alternative that would plan the harvest of these older, more structurally-complex forests after 15 years would not be consistent with maintaining these forests, as the purpose for the action specifically requires. Therefore, an alternative that would manage BLM-administered lands consistent with the 2008 Records of Decision/RMPs would not meet the purpose of the action to contribute to the conservation and recovery of ESA-listed species.

Oregon Forest Practices Act

This alternative would manage BLM-administered lands with only those protections required by the Oregon Forest Practices Act, such as riparian protections and retention requirements during timber harvest. The BLM eliminated this alternative from detailed analysis because it would not meet the purpose and need for action and therefore is not a reasonable alternative.

In the 2008 FEIS, the BLM used a reference analysis of managing most commercial forest lands for timber production, which considered the effects of managing "…in a manner similar to private industrial lands" and that analysis is incorporated here by reference (USDI BLM 2008b, p. 484). The 2008 FEIS used this reference analysis to provide context and a point of comparison where needed to analyze the effects of the alternatives, rather than as a reasonable alternative itself. Nevertheless, the information in the 2008 FEIS on the effects of this reference analysis is sufficient to demonstrate that this management approach would not meet the purpose and need for action, in that it would not provide a substantial and meaningful contribution to the conservation and recovery of ESA-listed species, including the northern spotted owl, marbled murrelet, and numerous fish species. It would not meet the purpose and need for action because it would not provide a network of large blocks of forest to be managed for late-successional forests and maintain older and more structurally-complex multi-layered conifer forests and would not maintain marbled murrelet habitat (USDI BLM 2008b, p. 532). It would not meet the purpose and need for action because this management approach or similar management approaches would result in stream temperature increases after timber harvest, increased risk of sediment delivery to streams, and increased susceptibility to peak flows and subsequent adverse effects to fish habitat (USDI BLM 2008b, pp. 755–759, 762–764, 765).

Provide "Not Less than One-half Billion Feet Board Measure" of Timber

This alternative would include providing an annual productive capacity of at least 500 million board feet of timber. Several commenters have asserted during the planning process that the O&C Act makes this requirement of the BLM. The O&C Act directs, "The annual productive capacity for such lands shall be determined and declared as promptly as possible after August 28, 1937, but until such determination and declaration are made the average annual cut therefrom shall not exceed one-half billion feet board measure: Provided, that timber from said lands in an amount not less than one-half billion feet board measure, or not less than the annual sustained yield capacity when the same has been determined and declared, shall be sold annually, or so much thereof as can be sold at reasonable prices on a normal market."

The purpose and need for action includes providing a sustained yield of timber but does not specify a target volume of timber. The basic policy objectives described in the guidance for development of all action alternatives stipulate that the alternatives must make a substantial and meaningful contribution to each of the purposes for action to be considered reasonable. The BLM has not specified a quantitative threshold for the amount of timber harvest that would constitute a substantial and meaningful contribution to sustained-yield timber production, and does not accept that "one-half billion feet board measure" (that is, 500 million board feet) is a relevant or appropriate threshold.

Moreover, the BLM does not accept that the O&C Act requires that this RMP provide an annual productive capacity of "not less than one-half billion feet board measure" of timber. The O&C Act requires that the BLM offer for sale annually "…not less than one-half billion feet board measure, <u>or</u> not less than the annual sustained yield capacity when the same has been determined and declared…"(emphasis added). Previous BLM planning efforts, including the 1995 RMPs, determined and declared the annual sustained yield capacity, rendering obsolete the requirement to offer for sale "…not less than one-half billion feet board measure." This RMP revision will likewise determine and declare the annual sustained yield capacity based on the eventual RMP selected, again rendering obsolete the requirement to offer for sale "…not less than one-half billion feet board measure."

Change the O&C Act

This alternative would change or repeal the O&C Act, changing or removing the mandate for the BLM to manage the O&C lands "for permanent forest production, and the timber thereon shall be sold, cut, and removed in conformity with the principle 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." Changes to existing laws or repeal of existing laws are not within the authority of the BLM and would be beyond the scope of this action, which is to revise the current RMPs with management objectives, land use allocations, and management direction that best meet the purpose and need. The purpose and need specifically includes providing a sustained yield of timber as required by the O&C Act.

Bills have recently been introduced to Congress that would change or repeal the O&C Act, including H.R. 1526 (O&C Trust, Conservation, and Jobs Act, passed House September 20, 2013) and S. 1784 (Oregon and California Land Grant Act of 2013, introduced December 9, 2013). Neither of these bills has yet become law. If Congress passes and the President signs into law any legislation that would change or repeal the O&C Act, the BLM would reconsider the purpose and need for action in this RMP revision, as appropriate. However, any such changes to the O&C Act or the purpose and need at this time would be speculative.

Comparison of Alternatives and the Proposed RMP

Table 2-11 summarizes key features of the alternatives and the Proposed RMP. This table is not comprehensive and focuses on design features that vary substantially among the alternatives and the Proposed RMP and are easily quantified and summarized. **Appendix B** of the Proposed RMP/Final EIS provides detailed descriptions of the management objectives and management direction for the Proposed RMP. Appendix B of the Draft RMP/EIS provides detailed descriptions of the management objectives and management direction for each action alternative.

Table 2-11. Key features of the alternatives and the Proposed RMP

Alternative/ Proposed RMP	Total Late-Successional Reserve (Acres)	Protection of Structurally-complex Forest	Riparian Reserve Total Width	Riparian Reserve Inner Zone Width	Marbled Murrelet Survey and Protection
No Action	478,860	None specified	2 SPTH* on fish-bearing streams; 1 SPTH* on non-fish-bearing streams	None specified	Survey in Zones 1 and 2; protect contiguous recruitment and existing habitat within 1/2 mile of sites
Alt. A	1,147,527	≥ 120 years	1 SPTH* on all streams	120' on perennial and fish-bearing streams; 50' on non-fish-bearing intermittent streams	None
Alt. B	1,127,320	District-defined map based on existing, district-specific information	1 SPTH* on perennial and fish-bearing streams; 100' on debris-flow-prone non-fish-bearing intermittent streams; 50' on other non-fish-bearing intermittent streams	60' on perennial and fish-bearing streams; 50' on non-fish-bearing intermittent streams	Survey in Zone 1; protect contiguous habitat within 300' of sites
Sub. B	1,422,933				
Alt. C	949,279	≥ 160 years	150' on perennial and fish-bearing streams; 50' on non-fish-bearing streams	60' on perennial and fish-bearing streams; 50' on non-fish-bearing intermittent streams	Survey stands >120 years; protect contiguous habitat within 300' of sites
Sub. C	1,373,206	≥ 80 years			None
Alt. D	714,292	≥ 120/140/160 years on high/moderate/low productivity sites	1 SPTH* on all streams	120' on all streams	Survey in Zones 1 and 2; protect habitat within 1/2 mile of sites
PRMP	948,466	District-defined map based on existing, district-specific information (updated from Alternative B)	Class I and II subwatersheds: 1 SPTH* on all streams	Class I subwatersheds: 120' on perennial and fish-bearing streams; 50' on non-fish-bearing intermittent streams; Middle zone from 50' to 120' on non-fish-bearing intermittent streams	Survey nesting habitat in all land use allocations in Zone 1, survey nesting habitat in reserve land use allocations in Zone 2; protect contiguous habitat within 300' of sites
			Class III subwatersheds: 1 SPTH* on perennial and fish-bearing streams; 50' on non-fish-bearing intermittent streams	Class II and III subwatersheds: 120' on perennial and fish-bearing streams; 50' on non-fish-bearing intermittent streams	

* Site-potential tree height

Alternative/ Proposed RMP	Total Harvest Land Base (Acres)	Green Tree Retention	Areas of Critical Environmental Concern (Number Designated)	Recreation Management Areas		District-Designated Reserve–Lands Managed for their Wilderness Characteristics (Acres)	Wild and Scenic Rivers Recommended for National System Inclusion (Number of River Segments)
				Special Recreation Management Area (Acres)	Extensive Recreation Management Area (Acres)		
No Action	691,998	GFMA†: 6–8 TPA‡ Connectivity/Diversity: 12–18 TPA‡ Southern GFMA†: 16–25 TPA	86 *(and 55 potential)*	168,968	2,397,460	-	- *(all 51 eligible would continue receiving interim protections)*
Alt. A	343,900	No retention	107	20,065	-	79,709	-
Alt. B	556,335	Low Intensity Timber Area: 15–30% retention Moderate Intensity Timber Area: 5–15% retention	105	24,972	139,320	76,525	6
Sub. B	298,121						
Alt. C	741,332	No retention	101	59,046	357,771	66,190	6
Sub. C	495,507						
Alt. D	650,382	Owl Habitat Timber Area: maintain owl habitat Moderate Intensity Timber Area: 5–15% retention	107	86,693	580,458	-	51
PRMP	469,215	Low Intensity Timber Area: 15-30% retention Moderate Intensity Timber Area: 5–15% retention	108	70,730	420,311	79,107	6

† GFMA = General Forest Management Area
‡ TPA = Trees per acre

Table 2-12 summarizes key effects of the alternatives and the Proposed RMP. This table is not comprehensive and focuses on effects that vary substantially among the alternatives and the Proposed RMP and are easily quantified and summarized. Inclusion or omission of effects from this table does not indicate the importance of the effects to the decision-making process. For example, the table does not include summarization of effects to northern spotted owls, because differences among the effects of alternatives and the Proposed RMP cannot be summarized briefly or quantitatively. Nevertheless, the effects on northern spotted owls are directly related to the purpose for the action, and these effects will be relevant in the decision-making process. Chapter 3 provides detailed analysis of the environmental consequences of the alternatives and the Proposed RMP.

Table 2-12. Key effects of the alternatives and the Proposed RMP

Current Conditions	Payments to Counties	Jobs	Allowable Sale Quantity of Timber (MMbf/Year)	Total Timber Volume (MMbf/Year)	Carbon Storage (Teragrams)	Greenhouse Gas Emissions (Megagrams of CO_2e/Year)
Current (2012)	$11.7 million*	7,403	203	205†	367	123,032
Alternative/ Proposed RMP	**Payments to Counties, Mid-Point of First Decade (2012 dollars/Year)**	**Jobs, Mid-Point of First Decade**	**Allowable Sale Quantity of Timber (MMbf/Year)**	**Total Timber Volume, Average of First Decade (MMbf/Year)**	**Carbon Storage in 50 years (Teragrams)**	**Greenhouse Gas Emissions in 10 Years (Megagrams of CO_2e/Year)**
No Action	$46.5 million	10,152	277	400	467	277,667
Alt. A	$28.1 million	7,909	234	249	484	260,126
Alt. B	$36.4 million	9,127	234	332	478	300,719
Alt. C	$67.4 million	12,245	486	555	440	383,957
Alt. D	$18.7 million	7,083	176	180	501	223,824
PRMP	$25.6 million	8,549	205	278	482	230,759
Current Conditions	**High Fire Hazard in Interior/South (Acres)**	**Marbled Murrelet High-quality Nesting Habitat (Acres)**	**Existing Roads (Miles)**	**Existing Sediment Delivery to Streams (Tons/Year)**	**Potential Wood Supply to Streams (TPA > 20” DBH)**	**Existing Detrimental Soil Disturbance (Acres)**
Current (2012)	194,690	233,219	14,330	60,265	19.0	139,299
Alternative/ Proposed RMP	**High Fire Hazard in Interior/South in 50 Years (Acres)**	**Marbled Murrelet High-quality Nesting Habitat in 50 Years (Acres)**	**New Road Construction in 10 Years (Miles)**	**Additional Sediment Delivery to Streams, Average of First Decade (Tons/Year)**	**Potential Wood Supply to Streams in 100 Years (TPA > 20” DBH)**	**Additional Detrimental Soil Disturbance in 10 Years (Acres)**
No Action	150,618	294,666	637	369	36.3	32,986
Alt. A	117,870	305,620	299	116	39.2	18,433
Alt. B	108,698	308,023	531	201	34.0	34,171
Alt. C	129,124	276,789	699	269	31.5	40,961
Alt. D	107,717	310,055	240	93	39.4	27,407
PRMP	116,172	308,863	437	165	37.0	31,563

* Payments counties would have received in 2012 if payments had been based on timber receipts instead of Secure Rural Schools payments
† Total timber volume offered for sale in 2012
DBH = Diameter at breast height
TPA = Trees per acre
MMbf = Million board feet

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Chapter 3 – Affected Environment and Environmental Consequences

Introduction

This chapter describes the environment that the RMPs are likely to affect and the environmental consequences of the alternatives. Many EISs present the affected environment and environmental consequences in separate chapters. The BLM has combined these two topics into this single chapter to provide all of the relevant information on a resource in a single discussion.

This chapter includes sections on each resource that the RMPs are likely to affect. Each resource section begins with a summary of the methods used to analyze the effects of the alternatives and the Proposed RMP on this resource. Each section includes one or more subsections that address a particular question about how the alternatives would affect the resource (the BLM refers to these questions as ‘Issues’). Under each Issue, the BLM describes the status and trends of the pertinent resource and then answers the question by describing the environmental consequences to the resource of the Proposed RMP and all alternatives analyzed in detail, including the No Action alternative.

Summary of Notable Changes from the Draft RMP/EIS

Chapter 3 of this Proposed RMP/Final EIS—

- Updated information on other broad-scale analyses currently underway that the BLM considers as reasonably foreseeable actions for analyzing cumulative effects;
- Revised the discussion of ‘Analytical Assumptions about RMP Implementation’ to address the Proposed RMP;
- Updated baseline forest age and structural conditions resulting from 2013/2014 wildfires; and
- Added analysis of the effects of the Proposed RMP for each of the issues.

The Proposed RMP/Final EIS identifies changes to specific sections of this chapter in those sections.

The Planning Area

The planning area includes approximately 2.5 million acres of Federal surface ownership and an additional 68,600 acres of Federal minerals with private surface ownership in western Oregon managed by the BLM’s Coos Bay, Eugene, Medford, Roseburg, and Salem Districts, and the Klamath Falls Field Office of the Lakeview District (**Map 1-1**). The entire planning area includes approximately 22 million acres, but only 2.5 million acres, or 11 percent, are Federal lands administered by the BLM.[29] Private landowners own and manage the majority of lands within the planning area (**Figure 3-1).**

[29] As noted in Chapter 1, the BLM uses the term ‘planning area’ to refer to all lands within the geographic boundary of this planning effort regardless of jurisdiction and uses the term ‘decision area’ to refer to the lands within the planning area for which the BLM has authority to make land use and management decisions. Within the western Oregon districts, three BLM-administered areas are not included in the decision area: the Cascade Siskiyou National Monument (Medford District), the Upper Klamath Basin and Wood River Wetland (Klamath Falls Field Office), and the West Eugene Wetlands (Eugene District).

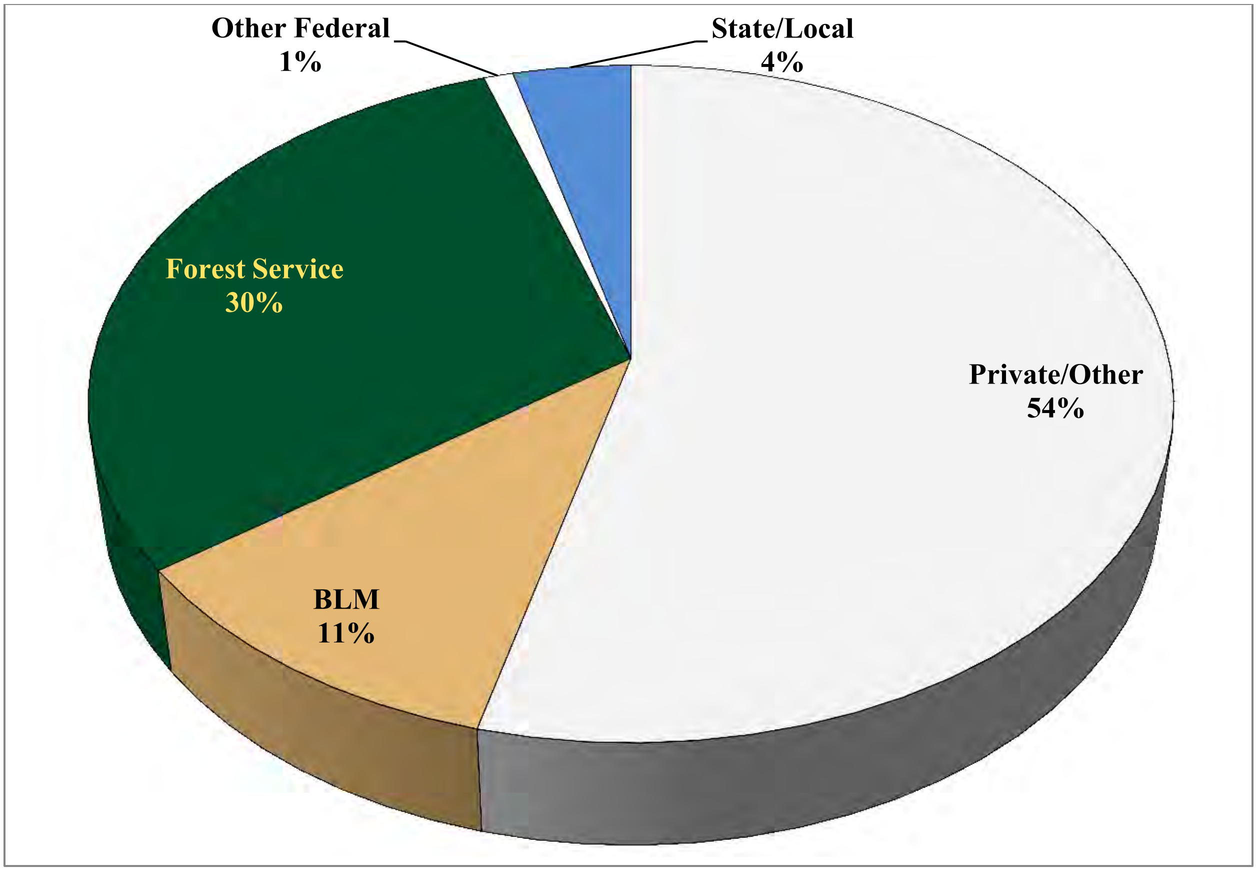

Figure 3-1. Major ownerships within the planning area

There are five physiographic provinces within the planning area: Coast Range, Willamette Valley, West Cascades, Klamath, and East Cascades (**Figure 3-2**). The physiographic provinces vary in vegetation, hydrology, geology, and other processes (e.g., fire-return intervals) (FEMAT 1993).

Figure 3-2. Physiographic provinces within the planning area as described in the FEMAT report (1993)

The decision area includes O&C lands, Coos Bay Wagon Road lands, public domain lands, and acquired lands (**Map 1-2**, **Table 3-1**). The section 'Major Authorizing Laws and Regulations' in Chapter 1 provides a description of the differing legal mandates that apply to these lands. The O&C lands are mostly scattered and intermingled with private, industrial forestlands. The O&C land pattern has a checkerboard character that results from the grid of the Public Land Survey System. The O&C lands are generally located in the odd-numbered sections, and the intermingled private lands are in the even-numbered sections. A section in the checkerboard is typically one mile on a side and encloses approximately 640 acres. About half of the public domain lands are scattered and intermingled with O&C lands, and the other half exist as larger blocks in the Salem, Coos Bay, and Lakeview BLM Districts (with the majority being concentrated in the Klamath Falls Field Office of the Lakeview District).

Table 3-1. Land status of the decision area

Land Status	Acres	Decision Area (Percent)
O&C Lands	2,025,826	81.2%
Coos Bay Wagon Road Lands	74,598	3.0%
Public Domain Lands	384,273	15.4%
Acquired Lands	8,958	0.4%
Totals	**2,493,655**	**100%**

Analytical Methodologies and Assumptions

This section describes the overall scope and analytical approach for this Proposed RMP/Final EIS, as well as key analytical assumptions that are common to all analyses. The individual resource sections of this chapter and accompanying appendices include assumptions that are specific to that resource or program. In addition, Section C of the 2013 Planning Criteria for the RMPs for Western Oregon (hereinafter Planning Criteria), which is incorporated here by reference, includes detailed descriptions of the assumptions that are specific to individual resources or programs (USDI BLM 2013, pp. 27–204). The individual resource sections in this chapter describe any notable changes that the BLM has made to the methods and assumptions in the Planning Criteria since its publication.

Scope of the Analysis

The Council on Environmental Quality's regulations for implementing NEPA direct that "NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail" (40 CFR 1500.1[b]). Issues are "truly significant to the action in question" if they are necessary to make a reasoned choice between alternatives (i.e., the issue relates to how the alternatives respond to the purpose and need). Issues are also "truly significant to the action in question" if they relate to significant direct, indirect, or cumulative impacts caused by the alternatives. For this analysis, each resource section identifies the issues that are "significant to the action in question" and focuses the analysis on those issues.

The Council on Environmental Quality's regulations for implementing NEPA requires that an EIS disclose both the direct and indirect effects on the quality of the human environment of a proposed action or alternative.

Direct effects are those effects that are caused by the action and occur at the same time and place (40 CFR 1508.8(a)). For the most part, RMPs in and of themselves have minimal direct effects. This is because an RMP is typically implemented only through the approval of future proposed projects and activities consistent with the management direction of the RMP, and because there are numerous steps that must occur before any on-the-ground activities can actually occur. There are exceptions to this, in which an RMP could have direct effects on resources. For example, an RMP may designate an area as *open* for public motorized access, and thus the BLM would have no further decision-making before on-the-ground activities and effects on resources could occur. Additionally, an RMP may sometimes include implementation decisions within the RMP Record of Decision.

Indirect effects are those effects that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8(b)). With few exceptions as described above, the effects of an RMP represent indirect effects. That is, an RMP is designed to guide and control future management actions (43 CFR 1601.0–2), but those actions and their effects are later in time than the RMP Record of Decision. Although the specific timing, size, location, and design of future actions that would occur under each alternative and the Proposed RMP are not certain, the BLM can project a reasonable forecast of future actions consistent with the management direction of the alternatives and the Proposed RMP for the analysis in this Proposed RMP/Final EIS. The section below on Vegetation Modeling includes a more detailed description of this projection of future actions.

Cumulative effects result from the incremental impact of an action when added to past actions, other present actions, and reasonably foreseeable actions (40 CFR 1508.7). Due to the nature of the analysis in this large-scale and long-term planning effort, all environmental effects described in this Proposed RMP/Final EIS would have incremental impacts that would have a cumulative effect together with past actions, other present actions, and reasonably foreseeable actions. Therefore, there is not a discrete and separate section labeled as cumulative effects. The discussion of effects on each resource incorporates the effects of past actions, and describes other present actions and reasonably foreseeable actions to provide context in which the incremental effects are examined, thus revealing the cumulative effects of the alternatives and the Proposed RMP.

As the Council on Environmental Quality points out, in guidance issued on June 24, 2005, the "environmental analysis required under NEPA is forward-looking," a review of past actions is required only "to the extent that this review informs agency decision making regarding the proposed action." Use of information on the effects of past actions may be valuable in two ways according to the Council on Environmental Quality guidance: for consideration of the proposed action's cumulative effects and as a basis for identifying the proposed action's direct and indirect effects.

The Council on Environmental Quality stated in this guidance that "[g]enerally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." This is because a description of the current state of the environment inherently includes the effects of past actions. The Council on Environmental Quality guidance specifies that the "[Council on Environmental Quality] regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions." The existing baseline information used in this analysis is a result of the aggregation of all past actions. The information on the current conditions is more comprehensive and more accurate for establishing a useful starting point for a cumulative effects analysis than attempting to establish such a starting point by adding up the described effects of individual past actions to some environmental baseline condition in the past, which unlike current conditions can no longer be verified by direct examination.

The second area in which the Council on Environmental Quality guidance states that information on past actions may be useful is in "illuminating or predicting the direct and indirect effects of a proposed action." The basis for predicting the direct and indirect effects of this proposed action and its alternatives is published empirical research, the general accumulated experience of the resource professionals in the agency with similar actions, and using models based on current scientific knowledge regarding relationships of the proposed management directions and effects that are generally accepted by the scientific community in the various specialized fields.

Scoping for this project did not identify any need to list individual past actions nor to analyze, compare, or describe environmental effects of individual past actions in order to complete an analysis that would be useful for illuminating or predicting the effects of the proposed action.

In this Proposed RMP/Final EIS, the BLM incorporated the effects of present actions into the description of the current condition, consistent with Council on Environmental Quality guidance and Department of Interior NEPA regulations at 43 CFR 46.115. For the purpose of this analysis, the BLM assumed that projects implementing the 1995 RMPs for which the BLM had made a decision prior to October 2012 have been implemented. For example, a timber sale sold prior to that date has been displayed and analyzed as harvested, whether or not that harvest has yet been completed. This assumption may overestimate the actual acreage harvested from sold sales, because some sales have not yet been harvested. This analytical assumption does not constitute a decision in principle about the disposition of these sales. The BLM integrated the effects of present actions on other ownerships into the broader analysis of current condition and assumptions about continued management consistent with existing plans or current trends.

For BLM-administered lands, reasonably foreseeable future actions are those actions that would occur as described under the various alternatives and the Proposed RMP. For other ownerships within the planning area, reasonably foreseeable actions are those actions that would occur with the continuation of present management, also from a broad-scale perspective. It would be speculative for the BLM to presume knowledge of site-specific actions that would occur in the future on lands managed by others over the time period analyzed in the Proposed RMP/Final EIS. The BLM based these assumptions about future management on other ownerships on existing plans or current trends, and these assumptions are broad and general in nature. However, the broad assumptions are sufficient to provide context for evaluating the incremental effect of the alternatives.

There are other broad-scale analyses currently underway that the BLM considers as reasonably foreseeable actions for analyzing cumulative effects, including the U.S. Forest Service revision of the Okanagan-Wenatchee Forest Plans and the Oregon, Mormon Pioneer, California, and Pony Express National Historic Trails Feasibility Study Revision. The Jordan Cove Energy and Pacific Connector Pipeline Project, which the BLM had identified in the Draft RMP/EIS as a reasonably foreseeable future action, is no longer reasonably foreseeable, as discussed below.

Revision of the Okanogan-Wenatchee Forest Plans

The U.S. Forest Service is revising the land and resource management plans for the Okanogan-Wenatchee National Forests. The U.S. Forest Service released their Forest Plan Revision proposed actions on June 30, 2011, followed by a 90-day comment period that closed on September 28, 2011. The Proposed Action is the first formal step to developing the revised plans. The U.S. Forest Service has not yet released a draft EIS or published an expected timeline for release of a draft EIS. At the time of preparation of this Proposed RMP/Final EIS, the U.S. Forest Service states that the Okanogan-Wenatchee Forest Plan Revision is on hold. The revisions of these plans are reasonably foreseeable future actions, in that there are formal proposals for these plan revisions. However, it would be speculative of the BLM to project any specific effects related to these plan revisions, given the early stage of the planning process and the undefined timetable for completion of the plan revisions.

The Oregon, Mormon Pioneer, California, and Pony Express National Historic Trails Feasibility Study Revision

The National Park Service is revising the original feasibility studies of the Oregon, Mormon Pioneer, California, and Pony Express National Historic Trails. The trail routes under consideration in this feasibility study include the Applegate Trail, which lies within the planning area and includes lands within the decision area. The National Park Service conducted external scoping in 2011. The National Park Service is currently collecting route data and will then prepare a combination feasibility study and environmental assessment. The feasibility study will evaluate the eligibility of the study routes for all four trails. Upon completion of the study, the National Park Service will submit the final documents with a recommendation to Congress. Congress could set them aside or pass legislation to add all, some, or none of the study routes to the Oregon, California, Mormon Pioneer, and Pony Express National Historic

Trails. Although the National Park Service has begun the revision of the feasibility study, it is uncertain what recommendation the National Park Service will make regarding the Applegate Trail, or how Congress will act on the National Park Service recommendation. If Congress passes legislation to add the Applegate Trail to the National Historic Trails, the BLM may need to change the land use allocation or management direction along the trail segments in the decision area. However, at this early stage in the feasibility study, such an outcome is speculative.

Jordan Cove Energy and Pacific Connector Pipeline Project

The Federal Energy Regulatory Commission released the Jordan Cove Energy and Pacific Connector Pipeline Project Draft EIS in November 2014 (FERC 2014) and the Final EIS in September 2015 (FERC 2015). The BLM was a cooperating agency in the preparation of that Final EIS. Jordan Cove Energy Project, L.P. proposes to construct and operate a liquefied natural gas export terminal at Coos Bay, Oregon. Pacific Connector proposes to construct and operate an approximately 232-mile-long, 36-inch diameter underground welded-steel pipeline between interconnections with the existing interstate natural gas systems of Ruby Pipeline LLC and Gas Transmission Northwest LLC near Malin, Oregon, and the Jordan Cove terminal. Implementation of the Pacific Connector pipeline would require a right-of-way grant from the BLM to cross BLM-administered lands. The FERC-prepared Final EIS considered RMP amendments to the Coos Bay, Medford, and Roseburg Districts and the Klamath Falls Field Office 1995 RMPs where the proposed action does not conform to those RMPs. The Draft RMP/EIS for this RMP revision identified that if the BLM were to make decisions on the proposed plan amendments and the Pacific Connector Pipeline right-of-way subsequent to the adoption of this RMP revision, the BLM would make additional determinations regarding plan conformance for the Pacific Connector Pipeline Project.

The proposed pipeline would cross portions of Klamath, Jackson, Douglas, and Coos Counties, Oregon, including approximately 40 miles of BLM-administered lands. The construction of the pipeline would affect vegetation and habitat on approximately 803 acres of BLM-administered lands: 669 acres of forest, 60 acres of rangeland, 54 acres of transportation-utility lands, less than 0.1 acre of agricultural land, 0.8 acre of wetlands, 1 acre of water, and about 2 acres of barren lands/quarries. The construction of the pipeline would require the temporary clearing of vegetation within a 75-foot to 95-foot-wide construction right-of-way. During operation of the pipeline, a 30-foot-wide corridor centered on the pipeline would be kept in an herbaceous state, resulting in a permanent loss of forest. Across all ownerships, the construction of the pipeline would result in the clearing of 2,055 acres of forest and the permanent loss of 528 acres of forest. The potential effects of this proposed action on vegetation and habitat are described in more detail in the Jordan Cove Energy and Pacific Connector Pipeline Project Final EIS, which is incorporated here by reference (FERC 2015, pp. 4-12 – 4-731).

No Federal lands would be utilized for the Jordan Cove liquefied natural gas terminal. Construction of the liquefied natural gas terminal and associated facilities would affect a total of approximately 397 acres, of which 178 acres are currently industrial land, 111 acres forest land, 76 acres open land (including shrubs and grasslands), and 32 acres of open water. Permanent operation of the facilities would affect approximately 251 acres, of which 68 acres are open land, 76 acres industrial, 76 acres forest, and 32 acres open water. The potential effects of the construction and operation of the Jordan Cove liquefied natural gas terminal are described in more detail in the Jordan Cove Energy and Pacific Connector Pipeline Project Final EIS, which is incorporated here by reference (FERC 2015, pp. 4-2 – 4-11).

The Draft RMP/EIS for this RMP revision identified the Jordan Cove Energy and Pacific Connector Pipeline Project as a reasonably foreseeable future action, in that there was a formal proposal for the project at that time. The Draft RMP/EIS addressed the cumulative effects of the Jordan Cove Energy and Pacific Connector Pipeline Project together with the effects of the alternatives in those specific resource sections for which analysis at the scale of the Draft RMP/EIS would provide meaningful information.

However, the BLM did not explicitly incorporate potential future effects of the project, such as removal of vegetation and habitat along the proposed pipeline route, into the modeling for the Draft RMP/EIS analysis, because the modeling would not be able to detect or parse out any cumulative or synergistic effect due to the small acreage and localized effects of the proposed pipeline project. The vegetation clearing for the proposed pipeline would affect less than 0.1 percent of the BLM-administered lands in the planning area, which represents an exceedingly small portion of the decision area as a whole. Furthermore, the area that the pipeline would affect would be spread out across the Klamath Falls Field Office, Medford, Roseburg, and Coos Bay Districts, further attenuating the potential effects on vegetation and habitat that could be detected at this scale of analysis. Finally, the vegetation clearing for the proposed pipeline would occur as a narrow feature on the landscape, cutting across forest stands, rather than removing forest stands. Such a small overall acreage, spread out over multiple administrative units, as a narrow feature on the landscape would not reflect any meaningful differences in the vegetation modeling at the scale of analysis for the Draft RMP/EIS and would not have the potential to alter any of the analytical conclusions related to vegetation and habitat in the Draft RMP/EIS analysis. If constructed as described in the proposed action, the Jordan Cove Energy and Pacific Connector Pipeline Project would disturb and remove too little acreage of vegetation and habitat and therefore would not generate any relevant information that could be meaningfully included in the vegetation and habitat modeling of approximately 2.5 million acres on BLM-administered lands in the Draft RMP/EIS.

The FERC-prepared Final EIS has addressed the cumulative effects of the proposed Jordan Cove Energy and Pacific Connector Pipeline Project. The Draft RMP/EIS identified that the BLM would address the cumulative effects of BLM implementation actions under this RMP in future project-level NEPA analysis where the effects of the Jordan Cove Energy and Pacific Connector Pipeline Project would be within the geographic and temporal scope of the effects of those implementation action(s), as appropriate (see generally USDI BLM 2008, pp. 57–61). The Draft RMP/EIS identified that the BLM would be better able to address the cumulative effects of the Jordan Cove Energy and Pacific Connector Pipeline Project together with BLM actions in project-level NEPA analysis than in the Draft RMP/EIS, given the small acreage and localized effects of the Jordan Cove Energy and Pacific Connector Pipeline Project in the context of this RMP revision and the analyses in the Draft RMP/EIS.

At this time, the Jordan Cove Energy and Pacific Connector Pipeline Project is no longer a reasonably foreseeable future action, because the FERC denied the certificate for construction of the Jordan Cove Energy and Pacific Connector Pipeline Project on March 11, 2016 (*Jordan Cove Energy Project, L.P. and Pacific Connector Gas Pipeline, L.P.*, 154 FERC ¶ 61,190 (2016)).

Irreversible and Irretrievable Commitment of Resources

The Council on Environmental Quality's regulations for implementing NEPA require that an EIS discussion of environmental consequences include "any adverse environmental effects which cannot be avoided should the proposal be implemented, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented" (40 CFR 1502.16). Irreversible or irretrievable commitments of resources are those that cannot be reversed or that are lost for a long period. Examples include the extraction of minerals or the commitment of land to permanent roads. Although not specifically labeled, adverse environmental effects, the relationship between short-term uses and long-term productivity, and the irreversible and irretrievable commitment of resources are described, by resource, throughout the discussion of environmental consequences in this chapter.

Spatial and Temporal Scales of Analysis

The spatial and temporal scale of analysis varies by resource and by issue. Consistent with the BLM NEPA Handbook, the spatial and temporal scale of analysis should be bounded by the extent and duration of the direct and indirect effects of the proposed action (USDI BLM 2008, p. 58).

For some issues in this Proposed RMP/Final EIS, the spatial scale is broader than the planning area. For other issues, the spatial scale is highly limited because of the nature of the resource and the potential effects of the proposed action on the resource. The individual resource sections of this chapter and accompanying appendices include descriptions of the spatial scales of analysis that are specific to that resource or program.

Specifying the temporal scale of analysis for an RMP/EIS is more challenging than for a discrete, site-specific action. Analysis of the effects of an RMP includes projecting future implementation actions. Because it is not possible to forecast the duration of the RMP itself, it is not possible to determine the duration of the effects of implementing the RMP. Instead, most analyses in this Proposed RMP/Final EIS set the temporal scale of analysis based on a time frame that illuminates differences in the outcomes under the alternatives and the Proposed RMP. For most analyses, this temporal scope extends beyond any reasonable anticipation of RMP implementation, because analysis of effects of different land management on many resources must be extended for many decades to show any discernable differences. Limiting the temporal scope of analysis to the anticipated duration of the RMP, such as one or two decades, would obscure differences in effects among the alternatives and the Proposed RMP and thus fail to provide a clear basis for choice among alternatives. The individual resource sections of this chapter and accompanying appendices include descriptions of the temporal scales of analysis that are specific to that resource or program.

The temporal scope for the determination of the annual productive capacity for sustained-yield timber production for each alternative and the Proposed RMP is somewhat different that for the other analyses, in light of the BLM's mandate for sustained-yield timber production under the O&C Act, as discussed in Chapter 1. The determination of the annual productive capacity for each alternative and the Proposed RMP extends for 200 years, far beyond any reasonable anticipation of RMP implementation. The temporal scope for this determination extends beyond the other analyses to ensure that the BLM could produce the determined annual productive capacity of timber without any decline, even in future decades.

Data Used in this Analysis

The analyses in this Proposed RMP/Final EIS use multiple data sources. Acreage totals for the planning area and the decision area vary based on how the BLM assembles the data to address the specific issue in question. The precise acreage of the planning area depends on what area the BLM includes within the geographic boundary of this planning effort, such as offshore areas within the official BLM district boundaries or areas within the geographic boundaries of separate BLM RMPs, ranging from 22,096,899 acres to 22,928,632 acres. In addition, the differing data sources for BLM-administered lands and other lands complicate combining acreage totals across ownerships. Similarly, the precise acreage of the decision area depends on the data source for defining BLM-administered lands within the planning area, ranging from 2,478,856 acres to 2,493,655 acres. Because of these varying acreages from various data sources, the acreage totals are not precisely the same in all resource sections of this analysis. The individual resource sections of this chapter and accompanying appendices include descriptions of the data sources that are specific to that resource or program.

The data that the BLM used in this analysis is at a far finer resolution than was available for the Northwest Forest Plan and the 1995 RMPs. The data for most of the analyses in this Proposed RMP/Final

EIS (such as the vegetation modeling described below) is at a resolution of units of 100 square meters in size, which is more than 1,600 times finer in resolution than the data available for the Northwest Forest Plan. As a result, this analysis can more precisely map resource conditions and accurately include fine-scale features, such as streams and roads, which the BLM could not previously consider. The data summaries in the analyses in the Proposed RMP/Final EIS do not always reflect the precision of the underlying data. In many of the analyses, the BLM rounded acreage numbers to ensure that the precision of analytical results does not exceed the accuracy associated with the analytical assumptions. The BLM only requires sufficient precision of the analytical results to illustrate the comparative effects caused by the alternatives to support reasoned decision-making.

Analytical Assumptions about RMP Implementation

For the purpose of this analysis, the BLM assumed full and immediate implementation of each of the alternatives and the Proposed RMP. That is, the BLM has modeled and analyzed implementation of actions at the level directed by each alternative based on vegetation data from January 2013,[30] as discussed further in the following section.

The necessary organization transition from the current implementation of the 1995 RMPs to the Proposed RMP may take time before the BLM will be able to implement the Proposed RMP fully. None of the changes from the 1995 RMPs to the Proposed RMP are sufficiently large to require a lengthy transition period, such as the five-year transition suggested in the Draft RMP/EIS. However, the BLM will need time to restructure resources, budget, and staff, making full implementation of the Proposed RMP unlikely for some programs in some districts during the first few years of RMP implementation. Specific sections of this chapter address where the BLM would require extended periods of time for full implementation of the Proposed RMP or alternatives.

For the purpose of this analysis, the BLM assumed adequate funding and staffing to implement the Proposed RMP and alternatives as described.

Vegetation Modeling

The BLM used the Woodstock model as part of the Remsoft Spatial Planning System 2012.12.0 to simulate the management and development of the forested BLM-administered lands over time. The alternatives and the Proposed RMP outline a range of approaches for managing BLM-administered lands by varying the land allocations and intensity with which the BLM manages these forests. These different approaches would result in a range of outcomes, habitat characteristics, and timber harvest levels. The Woodstock model simulated the application of management practices and forest development assumptions to characterize the forest in 10-year increments into the future. The Planning Criteria includes a description of the vegetation modeling in detail, including an explanation of why the BLM chose the Woodstock model over other types of models to conduct this analysis, and that discussion is incorporated here by reference (USDI BLM 2014, pp. 28–33). In addition, **Appendix C** provides detailed and technical information on the vegetation modeling.

The BLM mapped lands that would be allocated for sustained-yield timber production and lands that would be allocated to reserve land use allocations under each alternative and the Proposed RMP. For each land use allocation, the BLM described treatments to reflect the management direction for each

[30] The vegetation modeling analyzed implementation of alternatives from January 2013, which provided the most current comprehensive vegetation data available for modeling the effects of the alternatives considered in the Draft RMP/EIS. Use of this data facilitated the decade-scale vegetation modeling and provided an approximation of the effects of implementation actions between January 2013 and the eventual adoption of the RMP.

alternative and the Proposed RMP. Within the Woodstock model, these treatments define the forest management activities that could occur for an individual stand. The BLM used the ORGANON growth model, version 9.1 (http://www.cof.orst.edu/cof/fr/research/organon/) to simulate the growth of stands through time.

The Woodstock model used starting conditions of the forest vegetation, treating January 2013 as analysis year zero.[31] The BLM used information on forest conditions in the Woodstock model from three sources. The first is the Forest Operations Inventory, which contains information on forest stand condition for approximately 69,600 stands. The second source of vegetation information is the Current Vegetation Survey, which is a systematic, permanent plot grid inventory that has installed one plot every 1.7 miles on forested BLM-administered lands. The third source is the BLM geographic information system, which contains information describing aspects of the environment that affect where timber harvest could take place. These include the productive capacity of the land, as well as Bureau Special Status plant species locations.

For the Draft RMP/EIS, the BLM used data frozen in 2012 to establish a baseline of forest conditions used to describe the affected environment and from which to model forest development and harvest levels for the No Action alternative and the action alternatives. After the preparation of the Draft RMP/EIS, the BLM recognized that wildfire activity in the decision area in 2013 and 2014 produced measurable changes to these baseline forest age and structural conditions. For the Proposed RMP/Final EIS, the BLM updated baseline forest age and structural conditions resulting from 2013/2014 wildfires, which has resulted in changes to affected environment descriptions throughout this document, when compared to the Draft RMP/EIS. The BLM used the updated baseline forest conditions to feed into the Woodstock model to account for potential changes in environmental effects, and to refine timber harvest estimates for the Proposed RMP. The BLM did not re-run vegetation modeling or analysis completed for the No Action alternative or the action alternatives due to the relatively minor nature of the changes. Therefore, there may be minor discrepancies in acreage values when comparing first decade data from the Proposed RMP to the No Action alternative or the action alternatives.

The BLM incorporated into the Woodstock model a scenario for future wildfires in the planning area. **Appendix D** provides a detailed and technical description of the development of the wildfire scenario. To model the locations of these future wildfires, the BLM used the wildfire suitability model developed as part of the 15-year monitoring report for the Northwest Forest Plan (Davis *et al.* 2011). This model was based on the occurrence of large wildfires from 1970–2002, and represents a probability surface for large wildfire occurrence within the northern spotted owl range.

The BLM modelled this future wildfire scenario consistently for all alternatives and the Proposed RMP. It is possible that management actions such as timber harvest and fuels treatments would alter the likelihood or severity of future wildfires and those management actions would vary by alternative and the Proposed RMP. Nevertheless, it is not possible to model different future wildfire scenarios under different alternatives and the Proposed RMP, given the following:

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[31] The vegetation modeling does not account timber harvest that has occurred between January 2013 and the preparation of this Proposed RMP/Final EIS. The vegetation modeling generally overestimated timber harvest during that period, because the vegetation modeling projected implementation of the alternatives starting in January 2013. For most alternatives, the modeled implementation of the alternatives would have resulted in slightly more timber harvest than the BLM actually implemented during that period. During that period, the BLM has sold and awarded timber sales on approximately 34,000 acres. These timber sales have been predominately thinning. Of the 34,000 acres sold, approximately 29,000 acres were thinning/partial harvest, while 5,000 acres were regeneration harvest, road clearing, and salvage harvest. The difference between the timber harvest that the BLM has implemented and the timber harvest modeled for each alternative during that period is too small to alter the basic analytical results of the vegetation modeling.

- The inherent challenges in predicting the location and timing of future stochastic events
- The inability at this scale of analysis to forecast the site-specific location and conditions of future management actions
- The uncertainty around the site-specific effects of individual management actions on the likelihood of wildfire occurrence and severity

Although it is possible that the alternatives and the Proposed RMP would differentially affect how future wildfires would occur, such differences are not reasonably foreseeable at this scale of analysis. Therefore, it would be speculative to forecast different future wildfire scenarios under different alternatives and the Proposed RMP. **Appendix D** provides more detailed discussion of the role of forest management actions in modeling the future wildfire scenario.

The BLM also modelled this future wildfire scenario based on past wildfire occurrence and did not incorporate projections of the effects of climate change on future wildfire occurrence and severity. As discussed later in this chapter, there is evidence that the fire season is becoming longer, potential fire severity is increasing in the planning area, and that climate change may be contributing to these trends. However, the inherent challenges in predicting future stochastic events coupled with the uncertainties in climate change predictions make it impossible to forecast specifically when and where future wildfires would occur differently than they have occurred in the recent past. **Appendix D** provides more detailed discussion of the role of climate change predictions in modeling the future wildfire scenario.

The BLM did not incorporate projections of future windstorms, disease outbreaks, or insect infestations into the simulation of the growth of stands through time within the Woodstock model. These disturbances will occur in the future under all alternatives and the Proposed RMP, but predicting their location, timing, severity, and extent would be speculative. Unlike the wildfire suitability model reference above, there are no available theoretical approaches for estimating the location, timing, or severity of future windstorms, disease outbreaks, or insect infestations at the scale of the planning area over the time frame of this analysis.

The BLM did not incorporate projections of climate change into the simulation of the growth of stands through time within the Woodstock model. That is, the BLM modelled the management and development of the forested BLM-administered lands over time assuming that forest stands will continue to grow and respond to treatments in the future the same as they do now. There are substantial uncertainties in predicting how and when climate conditions will change at the regional scale, as discussed in detail later in this chapter. In addition to the uncertainty in climate change predictions, the available climate predictions cannot be downscaled to a meaningful level for use in forest stand growth and harvesting models. To translate these broad regional predictions with substantial uncertainties to projections of how and when specific groups of forest stands would change in their patterns of growth and response to treatment over the next several decades would be so speculative as to be arbitrary. Separate from the vegetation modeling with Woodstock, the BLM did review bioclimatic envelope model projections and evaluate the potential effects and associated uncertainty of projected climate changes on a variety of forest management outcomes for the planning area conducted using the Climate extension of the Forest Vegetation Simulator model. The Climate Change section in this chapter includes detailed discussions of these specific analytical efforts.

The BLM used the Woodstock model to simulate forest development within the decision area. On other land ownerships within the planning area, the BLM used an estimation of future forest conditions by applying assumptions to the 2006 version of the gradient nearest neighbor (GNN) imputation and Landsat time-series data (Ohmann *et al.* 2012). The BLM estimated future forest conditions on other land ownerships assuming that other landowners would continue to implement their present management.

The BLM did not use the Woodstock model to model vegetation change on the Eastside Management Area land use allocation (i.e., BLM-administered lands in the Klamath Falls Field Office east of Highway 97), because most of these lands are not in a forested condition. These lands do not include any O&C lands and are outside of the range of the northern spotted owl.

Vegetation Modeling Products

For each alternative and the Proposed RMP, the Woodstock model projected development of the forest for many decades into the future. The model tracked the types of forest management treatments over time (short- and long-term), both numerically and spatially. The modeling utilized both numeric and spatially explicit displays of development of the forest over time.

Within the modeling, the BLM described all land in the decision area as non-forest, woodland, or forested. The non-forested land includes sagebrush, grassland, water and other areas that are not expected to have forests within the time of the analysis. The woodland includes juniper and Oregon white oak plant associations, and other areas that have trees, but the BLM does not expect them to maintain a closed forest canopy.

Forest conditions at the scale of the planning area are discussed in terms of the structural stages of forests. Various interdisciplinary team members in their analysis used this common definition. The structural stage definitions rely heavily on the structural stage definitions that the BLM developed in the 2008 EIS, with one addition. The 2008 analysis divided the forest structure into four classifications (Stand Establishment, Young, Mature, and Structurally-complex). The forest structure definitions used in this analysis include all of the 2008 definitions, as well as the new category of Early Successional (see the Forest Structural Stage Classification section of **Appendix C**).

The BLM defined each of the structural stages for ‘moist’ and ‘dry’ forests. The BLM developed a map that labels all lands in the decision area as either moist or dry. The final groupings have incorporated recommendations from BLM staff, and are similar to, but do not always correspond exactly to mapped plant series, or plant association groupings. In general, the moist forest includes western hemlock, Sitka spruce, Pacific silver fir, Shasta red fir, and tanoak plant associations. The dry forest includes Douglas-fir, Jeffery pine, grand fir, white fir, and ponderosa pine plant associations.

The structural stage definition further differentiates Early Successional, Stand Establishment, and Young structural stages by the presence or absence of structural legacies. For the purpose of this definition, a structural legacy is a tree that is ≥ 20” DBH and is larger and older than other trees in the stand. In addition to **Appendix C**, the 2008 EIS provides detailed information on the Stand Establishment, Young, Mature, and Structurally-complex structural stages and is incorporated here by reference (USDI BLM 2008, pp. 206–211 and Appendix B, pp. 12–15).

The BLM defined the Early Successional category to describe forested land that has low canopy cover and younger, shorter trees than the Stand Establishment stage. The Early Successional structural stage has trees that are less than 50 feet tall and less than 30 percent canopy cover. Some combination of shrubs, grasses, and forbs appear visually dominant and are ecologically dominant at the beginning of this stage. The Stand Establishment structural stage has similar characteristics but has greater than 30 percent canopy cover, such that trees are both visually and ecologically dominant.

The following outline shows the different structural stages that the BLM used in this analysis:

- Non-forest
- Woodland
- Forest

- Early Successional
  - With Structural Legacies
  - Without Structural Legacies
- Stand Establishment
  - With Structural Legacies
  - Without Structural Legacies
- Young High Density
  - With Structural Legacies
  - Without Structural Legacies
- Young Low Density
  - With Structural Legacies
  - Without Structural Legacies
- Mature
  - Single Canopy
  - Multiple Canopy
- Structurally-complex
  - Existing Old Forest
  - Existing Very Old Forest
  - Developed Structurally-complex

The BLM used the modeling output from this five-tiered structural stage definition to help assess changes in the forested landscape over time, including evaluating habitat conditions for most wildlife species other than the northern spotted owl.

The modeling also provided species-specific outputs on habitat conditions for the northern spotted owl. The BLM used these outputs in species-specific modeling as inputs for other models to analyze the effects of the alternatives and the Proposed RMP on northern spotted owl habitat and populations, as discussed in detail later in this chapter.

The modeling also provided outputs related to timber production, including calculation of the annual productive capacity for sustained-yield timber production (the Allowable Sale Quantity (ASQ)) under each alternative and the Proposed RMP (ASQ harvest). The BLM calculated the annual productive capacity for each of the six sustained yield units, which match the five western Oregon BLM district boundaries and the western portion of the Klamath Falls Field Office in the Lakeview District. The BLM constrained the calculation of the annual productive capacity to the volume of timber that could be produced continuously for 200 years with the management practices described in the alternatives and the Proposed RMP from those lands allocated to the Harvest Land Base. Both the management practices and the lands allocated to the Harvest Land Base would vary among the alternatives and the Proposed RMP, and, consequently, the calculated annual productive capacity varies as well.

The modeling also provided outputs related to timber production from the reserve land use allocations under each alternative and the Proposed RMP (non-ASQ harvest). Both the management direction for reserve land use allocations and the lands allocated to the reserve land use allocations would vary among the alternatives and the Proposed RMP, and, consequently, the calculated timber production from the reserve land use allocations varies as well. Unlike the ASQ, this timber production would also vary over time for each alternative, because timber harvest would occur as a by-product of forest management treatments for purposes other than sustained-yield timber production.

The BLM used these modeling outputs related to timber production as inputs for other models to analyze the effects of the alternatives and the Proposed RMP on socioeconomic conditions, including employment and earnings, payments to the counties, and implementation costs to the BLM, as discussed in detail later in this chapter.

Analysis of Sub-alternatives

As explained in Chapter 2, sub-alternatives are variations of an action alternative that modify an individual component of the alternative to explore how the changes would alter certain outcomes. In the Draft RMP/EIS, the BLM developed Sub-alternatives B and C, which are sub-alternatives of Alternative B and Alternative C, respectively. Both of these sub-alternatives vary the design of the Late-Successional Reserve to explore how the changes would modify outcomes for forest management and northern spotted owls. Because these sub-alternatives vary only this component of the alternatives and all other components of the alternative remain unchanged, the analysis of the sub-alternatives in the Draft RMP/EIS only included the effects on forest management and northern spotted owls.

Reference Analysis

A reference analysis of No Timber Harvest is included in this Proposed RMP/Final EIS. The BLM includes this reference analysis to provide additional information for interpreting the effects of one or more of the alternatives. The No Timber Harvest reference analysis is not a reasonable alternative, because it would not meet the purpose and need for action. However, this reference analysis provides information about the biological capabilities of the decision area in the absence of timber harvest and affords a point of comparison in the effects analysis of the alternatives and the Proposed RMP. The discussion of the reference analysis is not comprehensive, as it is not a reasonable alternative. Instead, the BLM described outcomes under the No Timber Harvest reference analysis only for those issues for which it is useful in interpreting the effects of one or more of the alternatives and the Proposed RMP.

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Areas of Critical Environmental Concern

Key Points

- The No Action alternative would provide special management attention or interim special management attention to all 140 existing and potential Areas of Critical Environmental Concern.
- The action alternatives and the Proposed RMP consider the designation of 131 potential (designated, previously nominated, and 14 newly nominated) Areas of Critical Environmental Concern, totaling up to 104,824 acres or about 4 percent of the planning area.
- The Proposed RMP would include the designation of the largest number (108) and Alternative C the least (101) Areas of Critical Environmental Concern.
- All action alternatives and the Proposed RMP would maintain 92–99 percent of the relevant and important values within the potential Areas of Critical Environmental Concern.
- Across the planning area, the potential Areas of Critical Environmental Concern represent a high level of diversity in both the values protected and the number and categories of values within any one Area of Critical Environmental Concern.

Summary of Notable Changes from the Draft RMP/EIS

The BLM has updated acres to account for refined boundaries of Areas of Critical Environmental Concern (ACECs). The BLM conducted boundary refinements to prevent resource management conflicts, and correct where previous boundaries did not accurately capture the landscapes with relevant and important values. The BLM also updated considerations for designation under the alternatives and the Proposed RMP based on management provided for, or directed by, underlying land use allocations and special management areas, considerations of management in favor of other priorities, or because management of the ACEC would not be consistent with other land management activities.

Issue 1

How would the alternatives affect the relevant and important resource values of existing and proposed Areas of Critical Environmental Concern?

Summary of Analytical Methods

The BLM defined special management needed to protect or maintain the relevant and important values of each potential ACEC. The BLM then determined if the management direction for other resources under each alternative and the Proposed RMP protects or maintains the relevant and important resource values associated with each potential ACEC. The BLM also considered whether the application of special management needed to protect relevant and important values would not preclude sustained-yield timber harvest in the Harvest Land Base. The presence or amount of O&C Harvest Land Base within the potential ACECs varies by alternative and the Proposed RMP. The BLM would not designate ACECs under alternatives or the Proposed RMP where the needed special management would preclude O&C Harvest Land Base sustained-yield production.

Appendix F lists all potential ACECs within the decision area. For every alternative and the Proposed RMP, the BLM assigned each potential ACEC to one of following categories:

- **Yes**, the BLM would designate the entire potential ACEC. The area requires special management to maintain relevant and important values and management would not preclude O&C sustained-yield timber harvest at the stand level in the Harvest Land Base, recreation management in Special Recreation Management Areas, or meeting the management objectives of underlying lands with special designations.[32] Special management may condition, but not preclude, O&C sustained-yield timber production and recreation management.

- **Yes_a**, the BLM would designate a portion of the potential ACEC. The BLM removed portions of the potential ACEC where special management would conflict with O&C sustained-yield timber harvest or recreation management in Special Recreation Management Areas. The BLM determined that the remaining area still supports relevant and important values needing special management.
- **No**, the BLM would not designate the potential ACEC because the area does not require special management to maintain the relevant and important values. Other land designations or land use allocations provide management necessary to retain the relevant and important values.
- **No[1]**, the BLM would not designate the potential ACEC because of conflicts with other management priorities.
- **No_a**, BLM would not designate the potential ACEC because the special management required to maintain the relevant and important values would preclude O&C sustained-yield timber harvest in the Harvest Land Base.

The BLM assumed that the relevant and important values associated with an ACEC designated under any particular alternative or the Proposed RMP would be adequately protected by the special management direction.

The Planning Criteria provides detailed information on authorities, guidance for ACEC designation on O&C lands, analytical assumptions, methods and techniques, which the BLM incorporates here by reference (USDI BLM 2014, pp. 35–36).

Background

Areas of Critical Environmental Concern (ACECs), defined in the Federal Land Policy and Management Act (FLPMA), represent areas within the public lands where special management attention is required to protect or to prevent irreparable damage to any of the following categories:

- Important historic, cultural, or scenic values
- Fish and wildlife resources
- Other natural processes or systems
- Safety from natural hazards

The BLM develops special management direction to protect relevant and important values, but does not apply special management when other management mechanisms adequately protect the relevant and important values or where designation is not warranted.

The BLM designs some special management attention to move the relevant and important value onto a trajectory to reach a desired condition. The BLM designs other special management attention to protect the relevant and important values from management actions or other human activities. This may include prohibiting or modifying certain management activities.

[32] Lands with special designations include Wild and Scenic Rivers, National Trails, District Designated Reserve – Lands Managed for their Wilderness Characteristics, Wilderness Areas, and Wilderness Study Areas.

ACEC Characteristics

An area must meet relevance and importance criteria, and require special management attention to qualify for consideration for designation as an ACEC. An area meets the relevance criterion if it contains any of the categories of values listed above.

The value, resource, process or system, or hazard described above must have substantial significance to satisfy the importance criteria. This generally means that any of the following characterize the value, resource, process or system, or hazard:

- It has qualities that give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource, are more than locally significant.
- 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 to satisfy national priority concerns or to carry out the mandates of the FLPMA.
- It has qualities that warrant highlighting to satisfy public or management concerns about safety or public welfare.
- It poses a significant threat to human life or property.

The BLM describes relevant and important values in four categories as shown in **Table 3-2**. These categories are:

- ***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 needed for ESA-listed and Bureau Sensitive species, or habitat 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, areas with potential for high flooding, landslide-prone areas, and areas with unstable soils, seismic activity, or dangerous cliffs. The BLM may consider human caused hazards a natural hazard if the BLM determines through the resource management planning process that it has become part of a natural process.

Table 3-2. Value categories for designated and previously nominated potential ACECs

District/ Field Office	Historic, Cultural, or Scenic	Fish and Wildlife	Natural Process or System	Natural Hazard
Coos Bay	2	14	17	-
Eugene	2	12	20	1
Klamath Falls	3	3	4	-
Medford	5	7	31	-
Roseburg	1	3	11	-
Salem	9	22	36	1
Totals	**22**	**61**	**120**	**2**

Although it is only necessary for an area to meet the relevance and importance criteria for one value to qualify as an ACEC, many potential ACECs meet the criteria for several values. However, the number of values that meet the relevance and importance criteria can vary widely, as can the combination of values that meet these criteria within an ACEC. For example, the Sterling Mine Ditch potential ACEC contains a historical gold mining ditch, where the Table Rocks ACEC contains a combination of unique geologic features, vernal pools, Bureau Special Status plants, ESA-listed fairy shrimp, a developed interpretive educational area, and scenic and cultural values.

Research Natural Areas (RNAs) represent a specific type of ACEC. These areas are established and maintained for the primary purpose of research and education because the area has one or more of the following characteristics:

- Typical representation of a common plant or animal association
- Unusual plant or animal association
- ESA-listed plant or animal species
- Typical representation of common geologic, soil, or water feature
- Outstanding or unusual geologic, soil, or water feature

The Research Natural Area network in the Pacific Northwest represents a wide range of elevation, geology, topography, soils, and vegetation communities throughout the region. The BLM manages these in partnership with the U.S. Forest Service, state natural resource agencies, and key private organizations. This network allows for evaluation of differential responses to environmental change in comparison to forests managed for sustained yield.

Outstanding Natural Areas (ONAs) are also specific types of ACECs. Outstanding Natural Area designations aim to protect unique scenic, scientific, educational, and recreational values of certain areas within the public lands. It is important to note that, when applied by Congress, the term ‘outstanding natural area’ has a different meaning than when the BLM applies it through a planning decision to create a type of ACEC. A congressionally designated ‘outstanding natural area’ provides permanent protection for the values for which Congress designated the area.

ACEC Designation and Analysis

The BLM only designates ACECs through the land use planning process. During planning, the BLM must identify and fully consider for designation and management all designated and nominated areas meeting the relevance and importance criteria. The BLM reviews ACEC nominations for identification of relevant and important values upon receipt. When reviews find areas to meet relevance and importance criteria, the BLM identifies them as ‘potential ACECs’ and evaluates them to determine if they warrant special management attention. If so, the BLM provides interim protective management for the potential ACECs until the BLM can consider them for designation under a land use planning process.

In accordance with regulations, the BLM reconsidered areas within the planning area designated as ACECs in the 1995 RMPs and previously nominated potential ACECs. The previously nominated potential ACECs include nominated areas evaluated late in the development of the 1995 RMPs, nominations received after 1995, and nominations solicited during the 2008 planning effort. The BLM also solicited and received new ACEC nominations in 2012 for this planning process.

The BLM found that 81 of the 86 of the designated ACECs and 34 of the 38 previously nominated potential ACECs meet the relevance and importance criteria and are carried forward for further analysis. The reviews of these designated and previously nominated potential ACECs resulted in refinements to boundaries and determinations of which values met relevance and importance criteria. For example, this reconsideration resulted in a boundary expansion to an existing RNA, Beatty Creek, in the Roseburg District and removal of the ONA status from the following potential ACECs: McGowan Meadow, Table Rocks, and Valley of the Giants. In addition, the Salem District determined the Little Grass Mountain ONA no longer met the ACEC criteria. The BLM analyzed 4 of the 8 designated and potential ONAs and all 32 designated RNAs in this plan revision.

The BLM evaluated 34[33] new ACEC nominations; 16 meet criteria for relevance and importance. Where necessary, the BLM is providing special management attention to these 16 areas while analyzing them as part of this plan revision. Included in these 16 new potential ACECs is the West Fork Illinois River on the Medford District, which the BLM found to qualify for consideration as a new potential RNA.

In summary, under the action alternatives and the Proposed RMP, the BLM is considering for designation areas within:

- 81 currently designated ACECs
- 34 previously nominated potential ACECs that are currently under interim management
- 16 newly nominated potential ACECs that are currently under interim management
- 32 designated and 1 new potential ACECs that are also RNAs[34]
- 4 designated and 1 previously nominated potential ACECs that are also ONAs

In preparation for this plan revision, the districts evaluated designated ACECs, previously nominated potential ACECs, and newly nominated potential ACECs. During these evaluations, the districts combined areas into new potential ACECs when the areas had similar values and were over-lapping or in close proximity to one another. Many of the nominated potential ACECs are additions to designated ACECs. While the BLM found 16 of the new nominations to meet the relevance and importance criteria, 7 were merged with designated or previously nominated potential ACECs, leaving 9 new potential ACECs.

Previously Designated and Previously Nominated Potential ACECs No Longer Meeting ACEC Criteria

The BLM determined that 10 existing and previously nominated potential ACECs no longer meet the ACEC designation criteria. The BLM made these determinations on the basis that the relevant and important values no longer exist within the ACEC boundary, or that the values would be protected without additional special management. The following areas no longer meet the ACEC criteria:

- Long Gulch in the Medford District
- China Ditch, Stouts Creek, North Umpqua River, and Umpqua River Wildlife Area in the Roseburg District
- Little Grass Mountain, North Santiam, Sheridan Peak, Wells Island, and Yampo in the Salem District

The Medford District determined that special management associated with ACEC designation would not be required to protect or maintain the unique trellised drainage pattern at Long Gulch because Riparian Reserve management direction would provide all of the needed protection.

The Roseburg District determined management consistent with the requirements of the Endangered Species Act would adequately protect the relevant and important values at China Ditch and Stouts Creek without additional special management. In addition, Congress designated the North Umpqua River as a Wild and Scenic River in 1992. This designation provides the special management needed for scenic and fisheries relevant and important values of the North Umpqua ACEC.

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[33] This total number includes two ACEC nominations received after the solicitation period for this planning process. Interdisciplinary staffs for the respective districts evaluated both ACECs at the time they were received. Neither were found to meet the relevance and importance criteria. As such, these were not forwarded for further consideration.

[34] RNAs and ONAs are designations in addition to the ACEC designation. As such, the 33 RNAs and 5 ONAs listed here are a part of the total number of ACECs considered, not in addition to the numbers in the first 3 bullets.

The bald eagle was the single relevant and important value needing special management for the Umpqua River Wildlife Area ACEC. The bald eagle population has grown and the species has been delisted from the ESA, but continues to be protected under the BLM's Special Status Species program and the Bald and Golden Eagle Protection Act. This bald eagle population no longer meets the relevance and importance criteria.

The Salem District determined there were no relevant and important values present at the Little Grass Mountain, North Santiam, Sheridan Peak, and Yampo ACECs. The BLM found that the grassy bald at Little Grass Mountain does not contain any values to set it apart from other Coast Range grassy balds. The North Santiam area's highly valued river meander channels and associated alluvial forest habitat are not on BLM-administered lands. The adjacent BLM-administered lands do not have these relevant and important values. A large population of former Bureau Special Status botanical species, *Poa marcida* occupies Sheridan Peak, but it does not meet the relevance and importance criteria. Two Bureau Special Status botany species occurred at the Yampo ACEC. Tall bugbane (*Cimicifuga elata*) is no longer a Bureau Special Status Species, and the BLM has not observed thin-leaved peavine (*Lathyrus holochlorus*) on this small parcel since the 1980s. Therefore, relevant and important values no longer exist at Yampo.

The Salem District determined that while the Wells Island ACEC's values continue to meet the relevance and importance criteria, their maintenance does not require special management associated with ACEC designation. Wells Island, in the Willamette River, has no road access, which protects the relevant and important values from threatening activities. Any special management that the district would prescribe for Wells Island would be the same as what is already in place with designation of those lands as Riparian Reserve.

Affected Environment

There are 86 ACECs currently designated in the decision area, 38 previously nominated ACECs (nominated areas evaluated late in the development of the 1995 RMPs, nominations received after 1995, and nominations solicited during the 2008 planning effort) that have been under interim protective management (**Table 3-3)**, and 16 new potential ACECs nominated after the 2008 RMP planning effort (**Table 3-4**).[35] Designated and previously nominated ACECs comprise 3.7 percent, and new potential ACECs comprise 0.7 percent of the decision area. The BLM currently protects the relevant and important values, whether identified in a plan decision or in a nomination, for areas in all of these categories.

[35] The Medford District is currently preparing an RMP amendment and environmental assessment to change the boundary of the Table Rocks ACEC to include newly acquired federal lands and to encompass lands administered by The Nature Conservancy. If The Nature Conservancy parcels are acquired in the future by the BLM, The Nature Conservancy lands would become part of the ACEC (see the Existing Decisions section of Chapter 1).

Table 3-3. Designated and previously nominated potential ACECs and corresponding RNA or ONA if applicable

District/ Field Office	Designated ACECs (Number)	Potential ACECs (Number)	RNAs* (Number)	ONAs (Number)	Designated and Potential ACECs (Acres)	BLM-administered Lands (Acres)	Potential ACEC Percentage of District/Field Office or Total BLM Acres
Coos Bay	11	5	1	-	14,258	325,824	4.4%
Eugene	13	9	5	1	14,841	313,705	4.7%
Klamath Falls	3	3	1	-	7,385	215,077	3.4%
Medford	24	7	10	1	21,125	810,261	2.6%
Roseburg	9	3	7	-	10,504	425,805	2.5%
Salem	26	11	8	6	24,713	402,983	6.1%
Totals	**86**	**38**	**32**	**8**	**92,826**	**2,493,655**	**3.7%**

* The RNAs and ONAs are also designated as ACECs, and their numbers are already counted within the designated and potential numbers.

Table 3-4. New potential ACECs and corresponding RNA or ONA if applicable

District/ Field Office	New Potential ACECs (Number)	RNAs (Number)	ONAs (Number)	New Potential ACECs (Acres)	BLM-administered Lands (Acres)	Percentage of District/Field Office or Total BLM Acres in New Potential ACECs
Coos Bay	1	-	-	45	325,824	< 0.01%
Eugene	7	-	-	10,788	313,705	3.4%
Klamath Falls	2	-	-	319	215,077	0.14%
Medford	4	1	-	5,177	810,261	0.06%
Roseburg	1	-	-	368	425,805	< 0.01%
Salem	1	-	-	805	402,983	0.20%
Totals	**16**	**1**	**-**	**17,502**	**2,493,655**	**0.7%**

The BLM restructured all of the areas considered (designated, and previously and newly nominated potential ACECs) in the planning process into a new set of 121 potential ACECs totaling 97,053 acres as shown in **Appendix F** (**Table F-1**). **Table 3-5** displays the number of potential ACECs evaluated under this analysis with relevant and important values by district.

Table 3-5. Value categories for potential ACECs evaluated in this analysis

District/ Field Office	Historic, Cultural, or Scenic	Fish and Wildlife	Natural Process or System	Natural Hazard
Coos Bay	6	11	17	-
Eugene	1	8	24	1
Klamath Falls	3	5	6	-
Medford	7	7	31	-
Roseburg	1	2	9	1
Salem	12	16	27	1
Totals*	**30**	**49**	**114**	**3**

* Many ACECs contain more than one qualifying relevant and important value and therefore the sum of the totals exceeds 121.

Environmental Consequences

This analysis examines the designation of ACECs and the effects on relevant and important values.

Under the alternatives and the Proposed RMP, the varying designations of ACECs would have differing effects on the relevant and important values that the designations protect. **Appendix F** provides the names of the ACECs that the BLM would designate under the various alternatives and the Proposed RMP by district, the associated acres, and the relevant and important values (**Table 3-5** and **Table F-1**). This analysis provides a broad discussion of the various resources that the BLM would protect through ACEC designations.

The BLM's removal of areas from the potential ACECs to avoid precluding O&C Harvest Land Base sustained-yield production or Special Recreation Management Area management creates variation in the number and acres of ACEC designations under the action alternatives and the Proposed RMP. Another factor contributing to this variation is that management direction for the underlying land use allocations or lands with special designations provides for the relevant and important values for some of the potential ACECs. Some ACECs included in this analysis contain portions that overlap with Congressionally Reserved Lands and lands under the National Landscape Conservation System, such as Wild and Scenic Rivers, National Recreation Trail Management Corridors, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, Wilderness Areas, and Wilderness Study Areas (**Appendix F**). For this analysis, the BLM includes acres managed for these other designations as part of the described potential ACEC boundary's acreage because these landscapes also contain relevant and important values. However, the BLM would manage these acres foremost for the management needs under the congressional designation or National Landscape Conservation System needs. These overlapping areas have been included in the analysis of ACEC acres considered, because the associated management needs would support the maintenance and improvement of the relevant and important values identified within these landscapes, and it is important to account for the total acreage of maintained values on BLM-administered lands.

Although the BLM considers areas for designation, the BLM retains discretionary authority as to whether or not to designate potential ACECs as described later in 'Potential ACECs not Designated Under the Action Alternatives and the Proposed RMP.' The BLM's assessments of the need for continuing protective management of existing and proposed ACECs are the primary driver of differences between the action alternatives and the Proposed RMP, and the No Action alternative.

In all cases, where the BLM would designate ACECs or continue the protection of potential ACECs, the effect of the application of special management attention would continue the persistence of the relevant and important values, or affect change to those values towards a desired condition.

No Action

Under the No Action alternative, there would be no change to the designation of 86 existing ACECs or the application of interim protective management to the 39 previously nominated and 16 newly nominated potential ACECs. The districts would continue to implement special management attention in these areas. The effect of the application of interim special management attention on the resource values in these areas would be to maintain those values, or to change those values towards a desired condition.

Potential ACECs Designated Under the Action Alternatives and the Proposed RMP

The BLM would designate the most ACECs (108) and acres (93,515) under the Proposed RMP and the fewest ACECs (101) and acres (87,044) under Alternative C (**Table 3-6**). Alternative A and the Proposed RMP would provide special management attention to the largest number of relevant and important values; Alternative C would provide the least.

Table 3-6. All potential ACECs designations

District/ Field Office	Alt. A		Alt. B		Alt. C		Alt. D		PRMP	
	ACECs (Number)	Acres	ACECs (Number)	Acres	ACECs (Number)	Acres	ACECs (Number)	Acres	ACECs (Number)	Acres
Coos Bay	15	10,922	15	10,814	15	10,814	15	10,814	15	10,814
Eugene	22	14,661	23	14,826	22	14,476	23	14,736	23	14,736
Klamath Falls	6	7,332	4	1,253	4	1,253	6	7,332	6	6,383
Medford	27	25,499	27	25,499	27	25,499	27	25,499	28	25,527
Roseburg	9	10,197	9	10,197	9	10,197	9	10,197	9	10,197
Salem	28	25,934	27	25,859	24	24,806	27	25,798	27	25,859
Totals	**107**	**94,545**	**105**	**88,448**	**101**	**87,044**	**107**	**94,376**	**108**	**93,515**

Not precluding O&C Harvest Land Base sustained-yield production would require boundary revisions for 4 (Alternative A), 5 (Alternative B), 6 (Alternative C), 11 (Alternative D), and 7 (Proposed RMP) of the potential ACECs. The effect of the application of special management attention on the relevant and important values in the remaining portions of these potential ACECs would be to maintain those values, or to change those values toward a desired condition. The relevant and important values in the areas removed from the potential ACECs would not receive the special management attention needed to maintain or protect them and would eventually experience a loss or degradation of those values.

Under the action alternatives and the Proposed RMP, three ACECs would require boundary revisions to exclude small Special Recreation Management Areas (North Bank, Upper Willamette Valley Margin, and Willamette Valley Prairie Oak and Pine Area), and two ACECs would require boundary revisions to remove existing quarries (Dakubetede and East Fork Whiskey Creek RNA). The areas that would be removed do not contain relevant and important values. The effect of the application of special management attention on the relevant and important values in the remaining portions of these potential ACECs would be to maintain those values, or to change those values toward a desired condition.

The BLM would designate all 33 of the RNAs, and 3 of the 4 ONAs considered under the action alternatives and the Proposed RMP.

Potential ACECs Not Designated Under the Action Alternatives and the Proposed RMP

Identification of an area as having relevant and important values does not require designation of that area as an ACEC. To be considered for designation, the potential ACEC must also need special management to retain the relevant and important values. However, the presence of relevant and important values and the identification that special management would be needed to maintain those values does not require designation of that area as an ACEC. Under the FLPMA, the BLM is only required to consider these areas for designation in the land use planning process. The BLM retains discretionary authority to consider through analysis as to whether or not to designate an ACEC in favor of management for other priorities or because management of the ACEC would not be consistent with other land management activities.

Most of the areas the BLM would not designate do not warrant special management attention. Under the Proposed RMP, 11 potential ACECs do not warrant special management attention, 1 potential ACEC would not be designated because of conflicts with other management priorities, and 1 potential ACEC would not be designated because of conflicts with direction for managing the O&C Harvest Land Base.

The BLM would not designate between 13 and 20 of the areas under action alternatives and the Proposed RMP (**Table 3-7**). The potential ACECs not designated due to conflicts with management of the O&C Harvest Land Base and other management direction would not receive the special management attention needed to maintain or protect their relevant and important values, which would eventually experience a loss or degradation of these values.

Table 3-7. Potential ACECs not designated under the action alternatives or the Proposed RMP

District/ Field Office	Alt. A		Alt. B		Alt. C		Alt. D		PRMP	
	ACECs (Number)	Acres	ACECs (Number)	Acres	ACECs (Number)	Acres	ACECs (Number)	Acres	ACECs (Number)	Acres
Coos Bay	2	1,136	2	1,136	2	1,136	2	1,136	2	1,136
Eugene	2	243	1	76	2	427	1	167	1	167
Klamath Falls	2	318	4	5,449	4	5,449	2	318	2	318
Medford	5	1,610	5	1,610	5	1,610	5	1,610	4	1,582
Roseburg	-	-	-	-	-	-	-	-	-	-
Salem	3	259	4	334	7	1,387	4	395	4	334
Totals	**14**	**3,566**	**16**	**8,605**	**20**	**10,009**	**14**	**3,626**	**13**	**3,537**

In several instances, the BLM integrated existing and potential ACECs in the formation of potential ACECs for consideration under the action alternatives and the Proposed RMP. While this changed the number of ACECs considered under the action alternatives and the Proposed RMP, it did not remove acres or relevant and important values from potential protection.

The following table (**Table 3-8**) shows the summary of the values categories that would not receive special management attention by each action alternative or the Proposed RMP.

Table 3-8. Relevant and important value categories that would not receive special management attention

Value Category	Alt. A (Number)	Alt. B (Number)	Alt. C (Number)	Alt. D (Number)	PRMP (Number)
Historic, Cultural, and Scenic	-	2	3	1	-
Fish and Wildlife	-	4	6	1	-
Natural Process or System	2	5	6	3	2
Natural Hazard	-	-	-	-	-
Totals	**2**	**11**	**15**	**5**	**2**

Areas Not Warranting Special Management

The BLM would not designate between 9 (Alternative B) and 12 (Alternative A) of the potential ACECs because they would not warrant special management (**Table 3-9**). The BLM would not designate 11 potential ACECs under the Proposed RMP for this same reason. There would be no loss of relevant and important values associated with not designating these as ACECs. The management attention needed for their values comes through the management direction for the underlying land use allocations or for specific resource programs.

Table 3-9. Reasons for not designating potential ACECs

Reason For Non-designation	Alt. A (Number)	Alt. B (Number)	Alt. C (Number)	Alt. D (Number)	PRMP (Number)
Areas not warranting special management	12	9	10	11	11
Areas not designated due to conflicts with O&C Harvest Land Base	1	7	10	2	1
Areas not designated due to conflicts with other management priorities	1	-	-	1	1
Totals	**14**	**16**	**20**	**14**	**13**

The Coos Bay District would not designate the North Spit Addition potential ACEC under all action alternatives or the Proposed RMP because the district would maintain the relevant and important values under the BLM's Special Status Species program. For Steel Creek, the combination of management direction for the Late-Successional Reserve, Riparian Reserve, and management for ESA-listed species would protect the relevant and important values.

The Klamath Falls Field Office would not designate the Spencer Creek potential ACEC under Alternative A and the Proposed RMP or the Surveyor potential ACEC under all action alternatives and the Proposed RMP because management direction for the Late-Successional and Riparian Reserve would protect the relevant and important values.

The Medford District would not designate the Green Springs Mountain Scenic potential ACEC under any of the action alternatives or the Proposed RMP because management for Visual Resource Management

Class II and the Late-Successional Reserve would provide for the relevant and important values. In addition, management direction for the Late-Successional Reserve would also provide for the relevant and important values for the Hoxie Creek potential ACEC under Alternatives A and D, and the Proposed RMP, making designation unnecessary. The Medford District would not designate the Iron Creek and Tin Cup potential ACECs under any of the action alternatives or the Proposed RMP because the management direction for the Late-Successional Reserve would achieve the desired protection for their relevant and important values. The Moon Prairie potential ACEC would not be designated under Alternatives A, C, and D because Late-Successional Reserve management direction would provide the management needed to provide for the relevant and important values.

The Salem District would not designate the Beaver Creek potential ACEC under the action alternatives and the Proposed RMP because the management direction for the Riparian Reserve would provide for the relevant and important values. The Molalla River Segment B corridor is recommended for inclusion into the national Wild and Scenic River system, which would provide for the relevant and important values of the Molalla Meadows potential ACEC under the action alternatives or the Proposed RMP.

The Yaquina Head potential ACEC lies entirely within the congressionally designated boundary for the Yaquina Head Outstanding Natural Area and would be allocated to the Congressionally Reserved Lands and the National Landscape Conservation System land use allocation under all action alternatives and the Proposed RMP. The Outstanding Natural Area designation was established by Congress to protect unique scenic, scientific, educational, and recreational values. Under all action alternatives and the Proposed RMP, the BLM would manage the Yaquina Head Outstanding Natural Area under management direction to conserve and develop the scenic, natural, and historic values and allow continued use for which the area was designated. The Salem District determined between the Draft RMP/EIS and this Proposed RMP/Final EIS that the Yaquina Head Outstanding Natural Area's congressional designation and the management direction for the Congressionally Reserved Lands and the National Landscape Conservation System land use allocation provides all of the special management attention needed for the relevant and important values. For this reason, the BLM considered, but would not designate the Yaquina Head potential ACEC under any of the action alternatives or the Proposed RMP. Its relevant and important values are not included in **Table 3-8**.

Areas Not Designated Due to Conflicts with O&C Harvest Land Base

The BLM would not designate between 1 (Alternative A) and 10 (Alternative C) potential ACECs under the action alternatives or the Proposed RMP because the special management required for the protection or maintenance of the relevant and important values would preclude O&C sustained-yield timber harvest in the Harvest Land Base as shown in **Appendix F**, **Table F-1** (as annotated by No_a in this table).

The BLM would not designate the Williams Lake potential ACEC in the Salem District under the Proposed RMP for this reason. The Williams Lake potential ACEC contains relevant and important values of 'natural processes' due to the presence of fragile lakeside native plant communities. Under the Proposed RMP, lands within this potential ACEC are allocated to the Harvest Land Base. Because these lands are also O&C lands, any designation of an ACEC must not preclude sustained-yield timber management (see Chapter 1, 'Major Authorizing Laws – The O&C Act and the FLPMA'). The Salem District BLM staff reviewed management needs to protect the relevant and important values and determined that those management needs would preclude sustained-yield timber management, largely due to the fragile nature of the plant communities and the potential for disturbance from timber management. The relevant and important values for the potential ACECs not designated due to conflicts with management direction for the O&C Harvest Land Base would be lost or degraded over time **(Table 3-8)**.

Areas Not Designated Due to Conflicts with Other Management Priorities

The Hult Marsh potential ACEC in the Eugene District would not be designated under Alternatives A and D, and the Proposed RMP because the special management needed to maintain current hydrologic conditions may conflict with public health and safety. The Eugene District identified Hult Dam as a high hazard dam. Alteration to the dam and the recommended water levels to maintain public safety may not maintain current hydrologic conditions needed to maintain the relevant and important values in the potential ACEC. The Riparian Reserve inner widths under these alternatives and the Proposed RMP would also not provide for the relevant and important values. The BLM includes the loss or degradation of these values in **Table 3-8**.

References

USDI BLM. 2014. Resource management plans for western Oregon planning criteria. Bureau of Land Management, Oregon/Washington State Office, Portland, OR. http://www.blm.gov/or/plans/rmpswesternoregon/plandocs.php.

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Air Quality

Key Points

- All action alternatives and the Proposed RMP would produce more particulate emissions than the No Action alternative and current conditions. However, adherence to the requirements of the Oregon Smoke Management Plan would continue to limit impacts to human health and visibility from prescribed fires.
- Based on the amount of area where active management would occur, Alternative C has the most potential to reduce adverse effects to human health and visibility from wildfires over the long-term, while the No Action alternative would present the highest risk.

Summary of Notable Changes from the Draft RMP/EIS

- Changed **Figure 3-10** and **Figure 3-11** to display the emissions from prescribed fire only; wildfire emissions discussed separately to provide context for prescribed fire emissions and generalized more to reflect uncertainty over when wildfires would actually occur.
- Added an uncertainty analysis to the discussion on hazardous fuels prescribed fire emissions.
- Added a cumulative effects discussion.
- Removed the discussion concerning the potential of each alternative and the Proposed RMP to reduce wildfire emissions through active management, as it is not supported adequately by science.

Issue 1

How would the proposed management actions affect $PM_{2.5}$, PM_{10}, and expected visibility?

Summary of Analytical Methods

The effects analysis includes emissions from both the hazardous fuels and activity fuels prescribed fire programs. The expected emissions from prescribed fire to reduce hazardous fuels do not vary, because there is no reasonable basis for the BLM to forecast a difference in the acreage of treatments among the alternatives and the Proposed RMP. Therefore, the main variable in estimated particulate emissions from prescribed fire is the amount of activity fuels prescribed burning.

The Woodstock model produced estimates of the acres of activity fuels treatments by treatment type (e.g., hand pile burning, machine pile burning, and broadcast burning) for each alternative and the Proposed RMP. Based on input from district fuels specialists using professional expertise and experience, the RMP interdisciplinary team fuels specialist provided pile dimensions, estimates of the number of piles per acre, and the amount of fuel typically consumed in broadcast burns. The fuels specialist provided similar details for the hazardous, or natural, fuels program along with the expected acres of each treatment type for each district. The BLM input these details into Consume 3.0 to estimate particulate emissions. The Planning Criteria provides detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which is incorporated here by reference (USDI BLM 2014, pp. 33–35). Data sources include annual smoke reports from the Oregon Department of Forestry and visibility information from the Interagency Monitoring of Protected Visual Environments (IMPROVE) program for the existing condition. **Appendix E** contains a more detailed description of the analytical methods used to estimate particulate emissions from prescribed burning and wildfires.

This analysis does not quantify emissions from treating sudden oak death. At present, the number of acres treated through prescribed burning to control sudden oak death remains small, averaging 55 acres per year, but with considerable interannual variability (see Invasive Species, Issue 3 in this chapter for more detail). This small acreage of burning contributes a negligible amount to emissions, compared to other prescribed fire activities. Although it is reasonably foreseeable that the acreage treated for sudden oak death will increase over time, it is not possible to forecast that increase quantitatively, and emissions from sudden oak death treatments are likely to remain a negligible contribution to emissions compared to other prescribed fire activities.

The BLM analyzed the expected emissions from wildfires to provide additional context. Estimated wildfire emissions vary over time, but not among alternatives or the Proposed RMP. The BLM altered the analysis process used to estimate particulate matter emissions from wildfires to reflect uncertainties over when those emissions might occur. Instead of estimating the emissions per decade, the BLM totaled the number of acres burned in wildfires over the 50-year analysis period and estimated the average emissions per year. The BLM estimated emissions from wildfires to provide context for the emissions from prescribed fire.

Background

Western Oregon has a history of air quality problems due to the combination of weather patterns and topography. Poor air quality develops when a major polluting activity or event combines with temperature inversions and strong high-pressure systems that create stagnant air. The topography of the planning area contains several bowls that trap and concentrate pollutants in valley bottoms, exacerbating the effects of stagnant air. The worst air quality in winter typically occurs due to the combination of a strong and persistent inversion, high vehicle use, and biomass consumption associated with heat or power generation (particulates) (ODEQ 2012). The worst air quality in summer typically occurs due to the combination of strong persistent high pressure and high vehicle use (ozone) or widespread and large wildfires (particulates, ozone). Sources of pollutants may be chronic, such as from a factory or homes heating with wood during the winter, or transient, such as from prescribed burning or wildfires. Pollutants from BLM land management activities or wildfires can exacerbate existing air quality problems.

Smoke from prescribed fire and wildfire produces carbon monoxide, nitrogen oxide compounds, and particulates, along with certain air toxics such as acrolein, benzene, and formaldehyde. The main criteria pollutant of concern for BLM management activities is particulate matter (PM_{10} and $PM_{2.5}$) (ODEQ 2003, 2009, 2012, 2013a); in addition to posing a human health risk (see **Table 3-11**) due to their small size, particulate matter from wildland fuels are excellent at scattering light, thereby reducing visibility. Carbon monoxide, on the other hand, while a substantial human health risk, dilutes rapidly, making it a hazard to firefighters only. The concentration of air toxics found in smoke are typically very low, with regulations focused on industrial and commercial sources, vehicle emissions, and indoor air. Prescribed fire and wildfire do not produce ozone directly, but do produce two additional pollutants, nitrogen oxides (NO_x) and volatile organic compounds, which are precursors for ground-level ozone under certain conditions.

The Oregon Department of Environmental Quality (ODEQ) Air Quality Division implements the U.S. Environmental Protection Agency's (EPA's) air quality regulations and this division has delegated smoke management responsibilities to the Oregon Department of Forestry (ODF). All forest managers including the BLM conduct prescribed burning in western Oregon under requirements in the Oregon Smoke Management Plan (OAR 629-048-0001–0500). This plan requires dispersion, dilution, and avoidance techniques to minimize smoke impacts on mandatory Class 1 areas, designated air quality non-attainment and maintenance areas, and smoke sensitive receptor areas. Mandatory Class 1 areas are areas, such as designated Wilderness Areas, identified under the Clean Air Act as requiring the highest level of protection.[36] Non-attainment and maintenance areas are areas that are either not attaining, or have a history of not attaining, the National Ambient Air Quality Standards (NAAQS). [37] A Smoke Sensitive Receptor Area is an area that has the highest level of protection under the Oregon Smoke Management Plan due to a history of smoke incidents, its' population density, or from a legal protection related to visibility.

Visibility is protected in mandatory Class I areas as required by the Clean Air Act. The goal of the Regional Haze Rule (a part of the Clean Air Act) is to reduce haze in mandatory Class I areas to naturally occurring levels by 2064. Because visibility varies day by day, the rule requires that visibility on the 20 percent worst-case days be reduced to natural background conditions, while ensuring no degradation of the 20 percent best-case days. States are to take reasonable measures to make progress towards this goal.

Crater Lake National Park and the Kalmiopsis, Mt. Hood, Three Sisters, Mt. Jefferson, Mt. Washington, Diamond Peak, Gearhart Mountain, and Mountain Lakes Wilderness Areas are mandatory Class 1 areas within the air quality analysis area. Of these areas, visibility monitoring occurs at Crater Lake National Park and the Kalmiopsis, Three Sisters, and Mount Hood Wilderness Areas. Visibility is measured in deciviews with the lower the number, the better the visibility. The Interagency Monitoring of Protected Visual Environments (IMPROVE) program monitors air quality and visibility at selected mandatory Class 1 areas and has established natural condition deciviews at each monitored site for the clearest and haziest days. The program has estimated annual values and trends for the clearest days and haziest days since 2003 (data summaries available at http://views.cira.colostate.edu/fed/AqSummary/VisSummary.aspx?siidse=1).

The EPA regulates air quality under the Clean Air Act to protect human health and welfare, with visibility in mandatory Class 1 areas serving as the indicator for human welfare with respect to smoke. The EPA has established NAAQS for seven criteria pollutants (**Table 3-10**). The primary standard addresses human health and the secondary standard human welfare. On October 1, 2015, the EPA formally lowered the 8-hour ozone standard to 0.070 ppm.

[36] Mandatory Class 1 areas include 156 national parks, Wilderness Areas, international parks, and other areas identified by Congress in the 1977 amendment to the Clean Air Act. The areas designated include all national parks greater than 6000 acres in size and all designated Wilderness Areas and national memorial parks greater than 5,000 acres in size in existence as of August 1977. The amendment also set a visibility goal for these areas to protect them from future human-caused haze, to eliminate existing human-caused haze, and require reasonable progress toward that goal.

[37] National Ambient Air Quality Standards are specific target threshold concentrations and exposure durations of six pollutants based on criteria gauged to protect human health and the welfare of the environment.

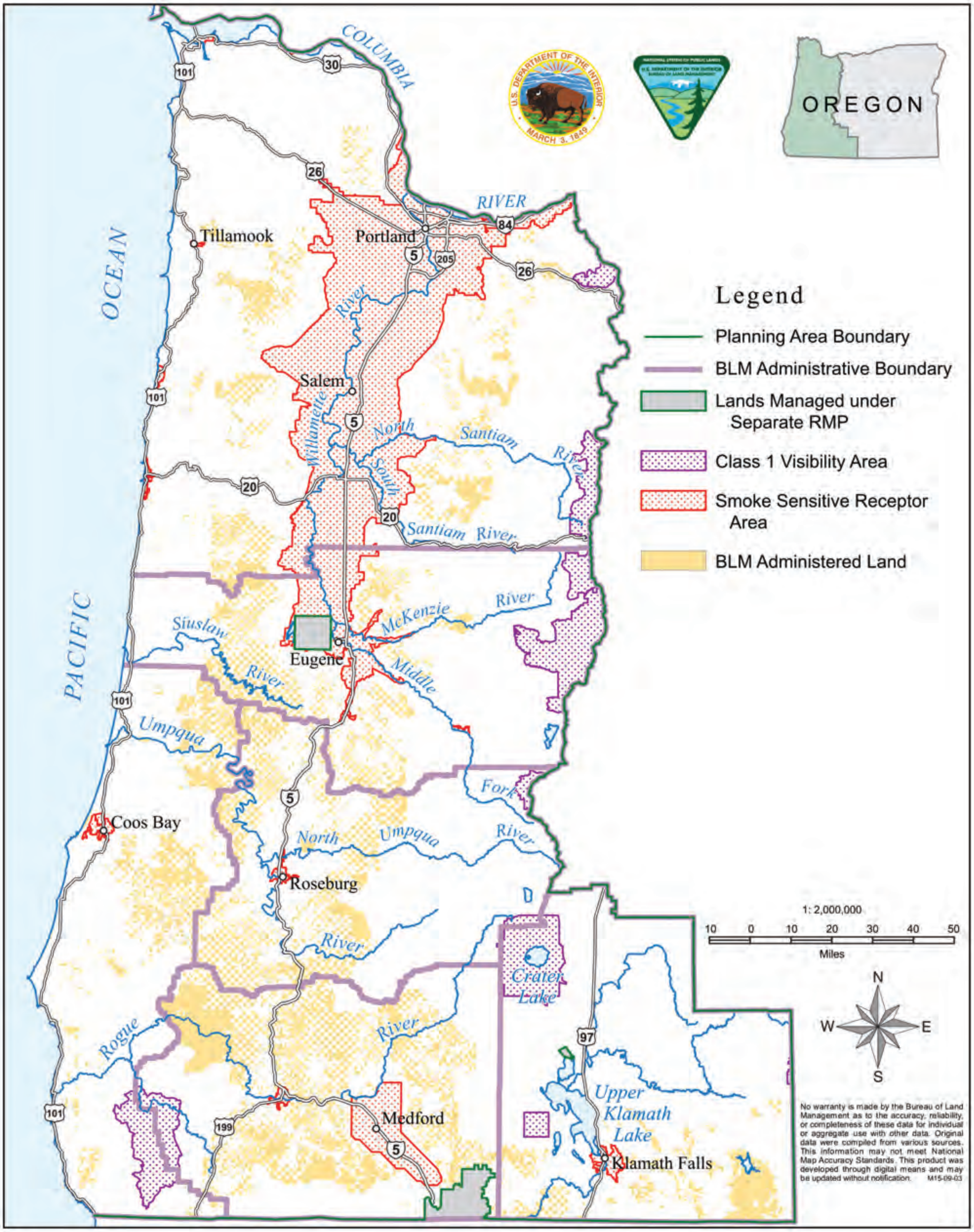
Table 3-10. Criteria pollutants regulated under the Clean Air Act and the current NAAQS for each

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)	Primary	8-hour	9 ppm	Not to be exceeded more than once per year
		1-hour	35 ppm	
Lead	Primary and Secondary	Rolling 3 month average	0.15 µg/m^3	Not to be exceeded
Nitrogen Dioxide (NO_2)	Primary	1-hour	100 ppb	98th percentile, averaged over 3 years
	Primary and Secondary	Annual	53 ppb	Annual mean
Ozone (O_3)	Primary and Secondary	8-hour	0.075 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
$PM_{2.5}$	Primary	Annual	12 µg/m^3	Annual mean, averaged over 3 years
	Secondary	Annual	15 µg/m^3	Annual mean, averaged over 3 years
	Primary and Secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
PM_{10}	Primary and Secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)	Primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

ppm = parts per million, ppb = parts per billion, µg = micron

Air quality non-attainment areas within the planning area include Eugene-Springfield and Oakridge for PM_{10}, and Oakridge and Klamath Falls for $PM_{2.5}$. Portland-Vancouver and Salem are air quality maintenance areas for ozone. However, the BLM does not know whether Portland-Vancouver and Salem would fall back into non-attainment under the new standard. The Oregon Smoke Management Plan identifies the following Smoke Sensitive Receptor Areas (SSRAs) within the planning area (**Map 3-1**):

- The cities of Carlton, Corvallis, Cottage Grove, Eugene, McMinnville, Portland, Sheridan, Silverton, Springfield, St. Helens, Stayton, Sublimity, Veneta, Willamina, and Yamhill;
- The acknowledged urban growth boundaries of the following cities: Astoria, Coos Bay, Grants Pass, Klamath Falls, Lakeview, Lincoln City, Newport, North Bend, Oakridge, Roseburg, and Tillamook;
- The area within the Bear Creek and Rogue River Valleys described in OAR 629-048-0160, including the cities of Ashland, Central Point, Eagle Point, Jacksonville, Medford, Phoenix, and Talent; and
- The area within the Columbia River Gorge Scenic Area, as described in 16 U.S.C. Section 554b (2003).



Map 3-1: Smoke Sensitive Receptor Areas as Described in the Oregon Smoke Management Plan

The BLM must register all prescribed burns on BLM-administered forestlands within the planning area with ODF in compliance with Oregon's administration of the Clean Air Act. The registration includes the location, the planned date and time of ignition, and the estimated fuel load and consumption. The day before each planned burn, ODF meteorologists evaluate this information along with the forecasted weather for the next day to determine whether smoke from a given burn is likely to enter a SSRA. Meteorologists must not knowingly allow a burn to occur which will cause an intrusion of smoke into an SSRA. Thus, each day these meteorologists create burn instructions for different parts of the forest region to prevent smoke from entering SSRAs. The BLM must follow these instructions in compliance with Oregon's administration of the Clean Air Act.

The Air Quality Index is widely used to report relative daily air quality in a common framework related to potential impacts to human health (**Table 3-11**). Index values range from zero to 300 and are typically displayed in a color-coded table or graph. The higher the value, the greater the level of air pollution and the greater the human health concerns. The Air Quality Index is based on the combined 24-hour concentrations of $PM_{2.5}$ and O_3. As pollution standards are changed, the formula used to calculate the air quality index is also adjusted in order to maintain the relationship to human health concerns.

Table 3-11. Air Quality Index with health advisories

Air Quality	Air Quality Index	Health Advisory
Good	0–50	No health impacts expected.
Moderate	51–100	Unusually sensitive people should consider reducing prolonged or heavy outdoor exertion.
Unhealthy for Sensitive Groups	101–150	People with heart disease, respiratory disease (such as asthma), older adults, and children should reduce prolonged or heavy exertion. Active healthy adults should also limit prolonged outdoor exertion.
Unhealthy	151–200	People with heart disease, respiratory disease (such as asthma), older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy outdoor exertion.
Very Unhealthy (Alert)	201–300	People with heart disease, respiratory disease (such as asthma), older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.

Ozone Maintenance Areas

Prescribed burning produces precursor emissions (e.g., NO_x and volatile organic compounds) that under higher temperatures and sunny days produce ground-level ozone. However, BLM prescribed burning activities are projected to be a long distance from the two ozone maintenance areas within the planning area. As a result, effects would be very low for the precursors of ozone. Local vehicular traffic in Portland, Vancouver, and Salem represents a primary source of air emissions that may lead to the development of ozone. Furthermore, the highest levels of ozone in the maintenance areas occur during summer, while most prescribed burning activity is during spring and fall. Therefore, it is very unlikely that any of the alternatives or the Proposed RMP would have a notable effect on ozone levels in ozone maintenance areas in the planning area; therefore, the BLM did not analyze for this pollutant.

Conformity

The General Conformity Rule (a part of the Clean Air Act) applies to Federal actions occurring in non-attainment or maintenance areas when the net change in total direct and indirect emissions of non-attainment pollutants (or their precursors) exceeds specific thresholds (known as *di minimis* levels). The intent of the General Conformity Rule is to prevent the air quality impacts of Federal actions from causing or contributing to a violation of the NAAQS (EPA 2013) or interfering with the purpose of the State Implementation Plan. This means that under the Clean Air Act, Section 176 and 40 CFR, Part 93, Subpart W, Conformity Rules, Federal agencies must make a determination that proposed actions in Federal non-attainment areas conform to the applicable EPA-approved State Implementation Plan before taking an action.

All prescribed burns within western Oregon must comply with the Oregon Smoke Management Plan, which prohibits smoke intrusions into SSRAs. As a result, the Conformity Rule is not applicable for BLM prescribed burning actions within non-attainment areas, since the burning would not—

- Be likely to cause or contribute to new violations of Federal air quality standards;
- Increase the severity of existing violations for Federal and State air quality standards; or
- Delay the timely attainment of Federal air quality standards.

Affected Environment

Particulate Matter Emissions

Most broadcast-type prescribed burning (broadcast burning, under-burning, jackpot burning) occurs in spring and early fall, when frequent cold fronts and short-wave troughs create atmospheric instability during the day. This instability promotes air mixing and transport of pollutants away from SSRAs and air quality non-attainment and maintenance areas. Most pile burning (hand piles, machine piles, landing piles) occurs in late fall and winter, when the atmosphere is typically more stable, with a higher potential to affect air quality adversely for relatively short periods.

Large wildfires contribute to air quality issues over large areas and for prolonged periods. During 2002, wildfires resulted in 14 daily $PM_{2.5}$ exceedences in Klamath Falls and one in Medford (ODEQ 2003); at that time, the daily $PM_{2.5}$ standard was 65 $\mu g/m^3$ (the standard has since been lowered). Elevated particulate levels were reported between late July and the end of August at Bend, Brookings, Cave Junction, Grants Pass, Klamath Falls, and Medford (ODEQ 2003). Similar issues developed in 2008 from extensive wildfires burning in northern California; smoke from those fires reached as far north as Portland (ODEQ 2009).

ODF began estimating $PM_{2.5}$ emissions from wildfires as part of their annual smoke management reports beginning in 2002, although only a statewide accounting is available. Estimated wildfire $PM_{2.5}$ emissions commonly exceed 1,000 tons per year and exceeded 6,000 tons per year in 2006, 2007, 2012, and 2014. The 2012 fire season resulted in the highest estimated $PM_{2.5}$ emissions from wildfire at nearly 12,000 tons. The 2014 fire season the second highest, at about 9,000 tons. Most of the 2012 emissions were from the large rangeland wildfires in southeastern Oregon. Several large wildfires in southwestern Oregon in 2013 contributed a significant amount of particulate pollution, and potentially created problematic surface ozone concentrations as well.

Large wildfires that started on BLM-administered lands within the planning area produced an estimated 1,217 tons per year of PM_{10} emissions and 731 tons per year of $PM_{2.5}$ emissions on average, based on acres burned from 1981 through 2013. However, there is considerable interannual variability in emissions. Notable years where wildfire emissions were particularly high include 1987, 2002, and 2014, principally from wildfires originating on the Medford and Roseburg Districts.

Based on ODF annual reports of tons consumed by prescribed burning in the Other Federal category from 1995 through 2012, actual emissions have averaged 840 tons (range 376 – 1,538 tons) of PM_{10} and 753 tons (range 337 – 1,378 tons) of $PM_{2.5}$ per year, primarily from hazardous fuels reduction treatments in southwest Oregon and slash disposal following forest management operations (**Figure 3-3**). These estimated emissions account for approximately 7.5 percent of total PM_{10} and $PM_{2.5}$ emissions from prescribed burning in western Oregon. The Other Federal category consists mostly of burning by the BLM, with only minor contributions from the National Park Service and U.S. Fish and Wildlife Service.

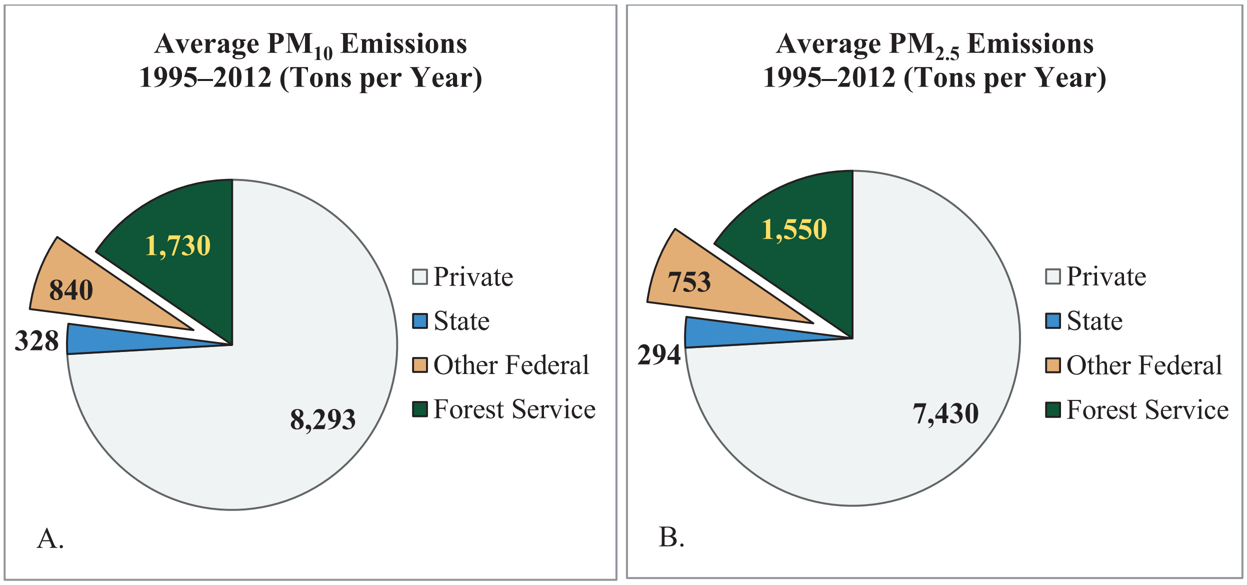


Figure 3-3. Estimated emissions from prescribed burning in western Oregon for (a) particulate matter 10 microns in size and smaller, and (b) particulate matter 2.5 microns in size and smaller

The Oregon Department of Environmental Quality (ODEQ) (2013a) reports that trends have been downward for most pollutants in most areas, except for daily $PM_{2.5}$ in Klamath Falls and Oakridge. Both Klamath Falls and Oakridge have exceeded the daily $PM_{2.5}$ standard of 35 $\mu g/m^3$ nearly every year since 2006, when the standard was lowered to that level. Residential home heating in winter is associated with most exceedences of the $PM_{2.5}$ standard, with summer wildfires a secondary factor. The EPA (2013) lowered the primary annual $PM_{2.5}$ standard to 12 $\mu g/m^3$, effective March 18, 2013. Whether this change will result in any areas designated as non-attainment for the annual $PM_{2.5}$ standard will not be known until late 2015 at the earliest. The daily $PM_{2.5}$ standard remains unchanged.

Despite the best efforts of both ODF smoke forecasters and BLM personnel, intrusions into SSRAs can and do occur. The occurrence of intrusions is not related to the number of acres burned in any given year (**Figure 3-4**) but, according to an evaluation of six smoke intrusion reports for 2008 and 2012, is most commonly a result of an unexpected shift in wind direction from the forecasted direction. Many of these shifts likely resulted from localized meteorological patterns, which could not be resolved with coarse-scale weather forecast models. Nearly all intrusions shown in were in southwest Oregon.

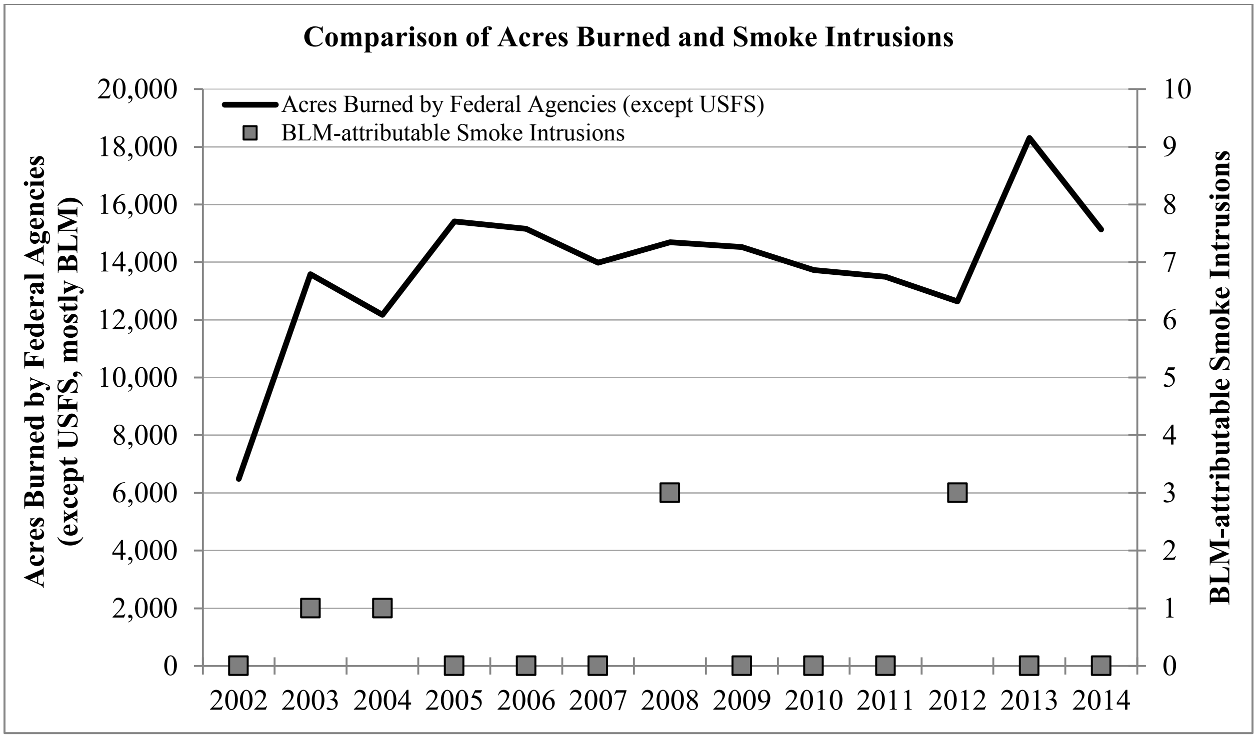


Figure 3-4. Number of smoke intrusions attributed to BLM prescribed fires into SSRAs compared to annual acres burned from 2002 through 2014 in western Oregon

Source: ODF annual smoke reports 2002–2014

Visibility and Air Quality

Of the four monitored mandatory Class 1 areas within or adjacent to the planning area, none meet the natural background conditions for haze for either the clearest or the haziest days, although Crater Lake National Park and Mount Hood Wilderness come the closest for the clearest days (**Table 3-12**). Visibility is generally improving at Crater Lake National Park and the Mount Hood and Kalmiopsis Wildernesses, although not all trends are statistically significant. Visibility at Three Sisters Wilderness is slowly degrading, although the trend is not statistically significant yet. The main contributors to the haziest days are organic carbon and ammonium sulfate.

Table 3-12. Visibility conditions and trends at four mandatory Class 1 areas within or adjacent to the planning area from 2003 through 2012 and the statistical trend

Parameter	Crater Lake National Park	Kalmiopsis Wilderness	Mount Hood Wilderness	Three Sisters Wilderness
Natural condition: clearest days	246 miles (0 deciviews)	~ 161 miles (~ 4 deciviews)	229 miles (1 deciview)	211 miles (2 deciviews)
Current condition: clearest days	> 211 miles (< 2 deciviews)	~ 143 miles (~ 6 deciviews)	211–229 miles (1–2 deciviews)	174–198 miles (2.5–3.5 deciviews)
Statistical trend in clearest days	Significant downward	Non-significant downward	Significant downward	Non-significant upward
Natural condition: haziest days	~ 112 miles (~ 8 deciviews)	~ 90 miles (~ 9.5 deciviews)	~ 112 miles (~ 8 deciviews)	92 miles (9 deciviews)
Current condition: haziest days	40–87 miles (10–18 deciviews)	37–68 miles (13–19 deciviews)	47–81 miles (11–17 deciviews)	37–62 miles (13–18 deciviews)
Statistical trend in haziest days	Non-significant downward	Significant downward	Non-significant downward	Non-significant upward

Source: IMPROVE website: http://vista.cira.colostate.edu/improve/. Accessed November 18, 2014

In 2013, ODEQ evaluated the contribution of prescribed fire to the 20 percent worst-case visibility days in Oregon's Class I areas, concluding that prescribed burning in close proximity to mandatory Class I areas was a statistically significant contributor to the 20 percent worse days (ODEQ 2013b). The Kalmiopsis Wilderness and Crater Lake National Park were particularly affected, especially in October and November (**Figure 3-5**). As a result, ODF revised the Oregon Smoke Management Plan to require that any personnel conducting a prescribed fire within 31 miles (50 km) upwind of these two mandatory Class I areas follow a checklist of procedures designed to keep the main plume out of Crater Lake National Park and the Kalmiopsis Wilderness.

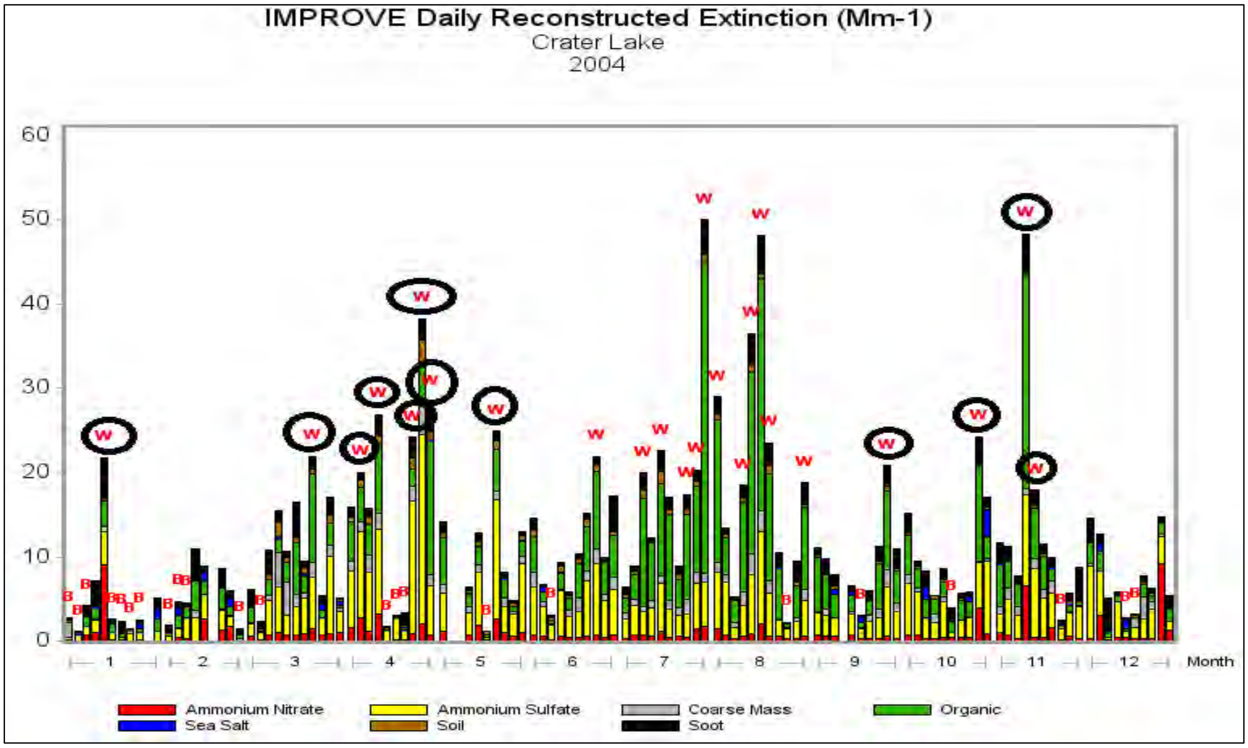


Figure 3-5. Example of identification of the 20 percent worse days in a given year and the proportional contribution of various factors to reduced visibility

Note: Black and green indicate vegetation burning as the source of the pollutant. W identifies a worse day and a circled W indicates prescribed fire as the probable cause.

Source: ODEQ 2013b

Adverse impacts to air quality that are caused by prescribed burning, including effects to visibility and human health, generally tend to be of short duration (hours) and limited to the local area (less than five miles from the burn). Conversely, wildfire adverse impacts tend to be of longer duration (days to weeks), occur over a much broader area, and produce much unhealthier conditions. **Figure 3-6** displays the daily Air Quality Index for Medford in 2008. Large spikes in July and August are from wildfires, while moderate air quality in September through January is primarily from woodstoves with some smoke from pile burning possible. Three intrusions into mandatory Class 1 areas were attributed to BLM prescribed burning.

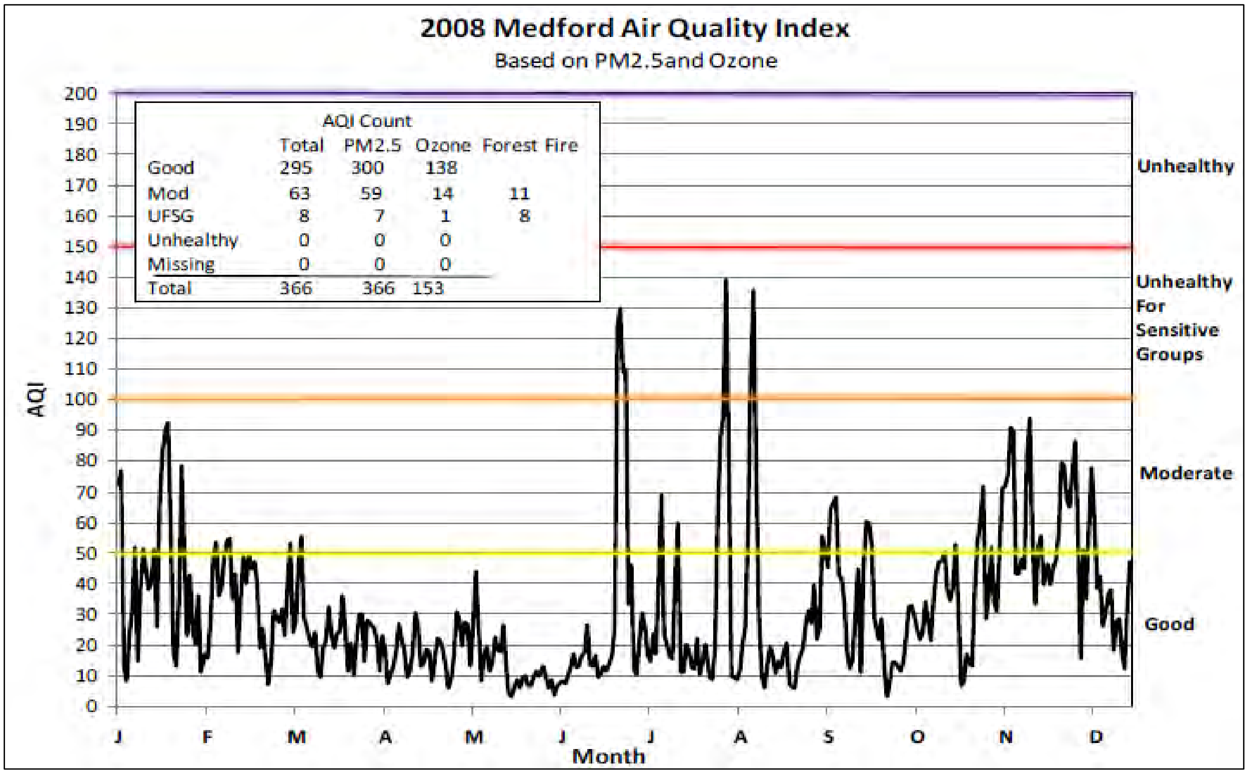


Figure 3-6. Daily air quality index for Medford in 2008
Source: ODEQ 2009

Air quality and visibility data from 2013 illustrate the impacts from wildfires. During that summer, wildfire impacts in southwest Oregon produced unhealthy or more severe levels for seven days in Medford (**Figure 3-7**) and for nine days in both Grants Pass and Cave Junction (**Figure 3-8**). The large spike in late July was due to a series of wildfires, of which the Douglas Complex was the largest. Additional air quality degradation occurred in Medford from November through February from sources other than prescribed fire. Wildfires also resulted in severe degradation of visibility in Crater Lake National Park (**Figure 3-9**) and the Kalmiopsis Wilderness (data not shown). Wildfires typically create five to ten times greater the impacts than other types of events and persist over several weeks.

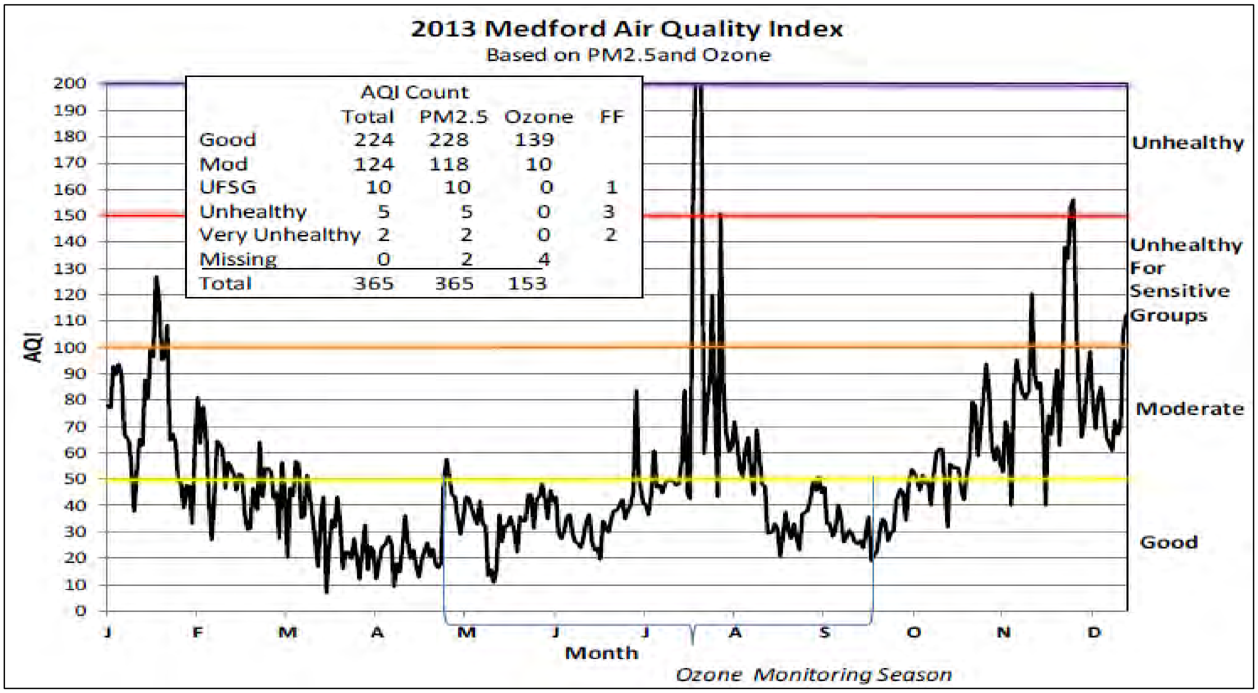


Figure 3-7. Air quality index for 2013 for Medford
Note: 'FF' refers to the days where air quality degradation was attributed to forest fires.
Source: ODEQ 2014

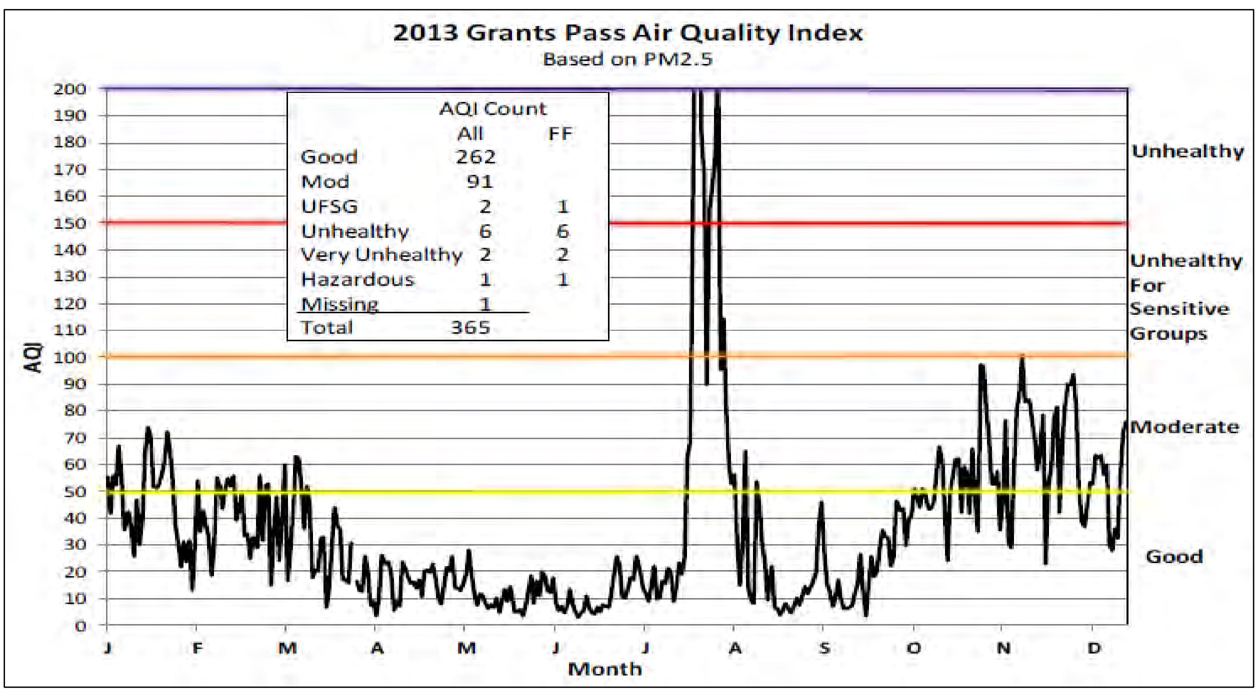


Figure 3-8. Air quality index for 2013 for Grants Pass
Note: 'FF' refers to the days where air quality degradation was attributed to forest fires.
Source: ODEQ 2014

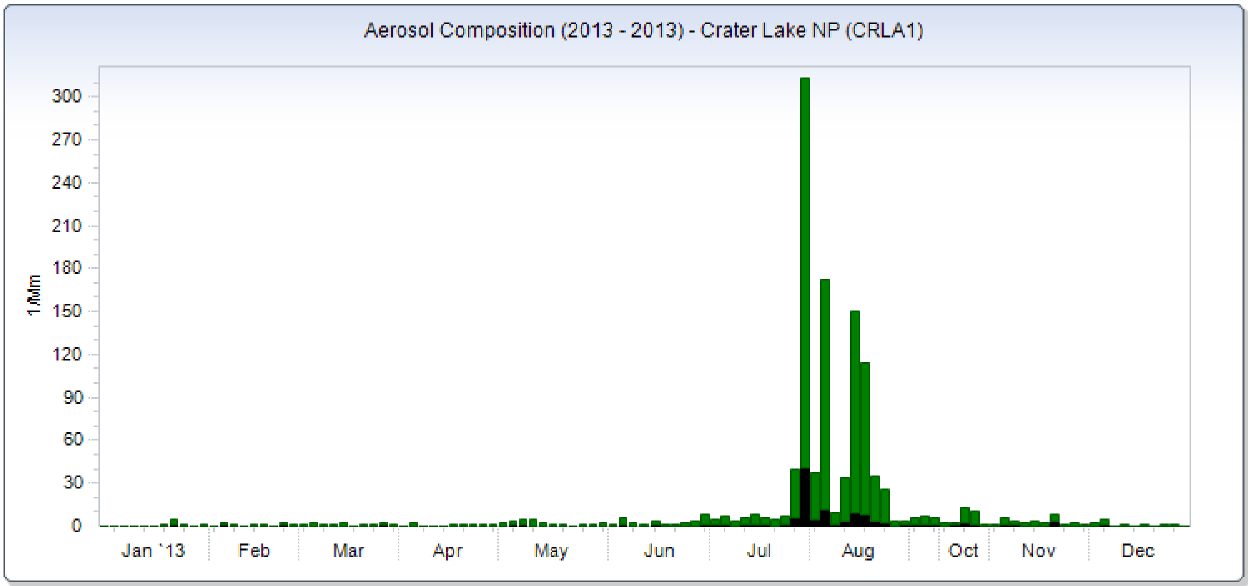


Figure 3-9. Degradation of visibility from burning vegetation in 2013 as measured through light scattering (inverse megameters) at Crater Lake National Park

Source: IMPROVE website, http://views.cira.colostate.edu/fed/DataWizard/Default.aspx, accessed November 25, 2014

Environmental Consequences

Particulate Matter Emissions

Emissions of both PM_{10} and $PM_{2.5}$ would increase relative to the 2013 baseline under all alternatives and the Proposed RMP because of the increase in activity fuels treatment levels (**Figure 3-10** and **Figure 3-11**). Although there are some decadal differences, prescribed burning emissions under the Proposed RMP would be very similar to those under Alternative B.

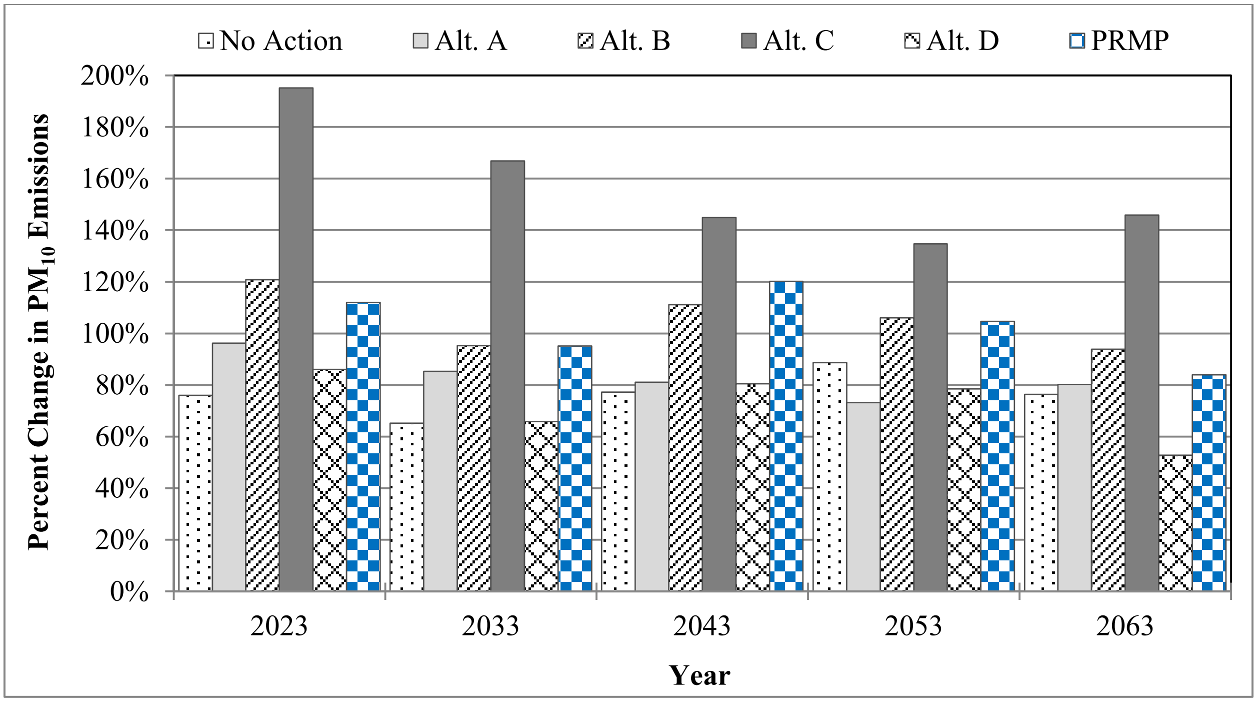


Figure 3-10. Expected increases in PM_{10} emissions from prescribed fire over time and relative to the estimate for current prescribed fires

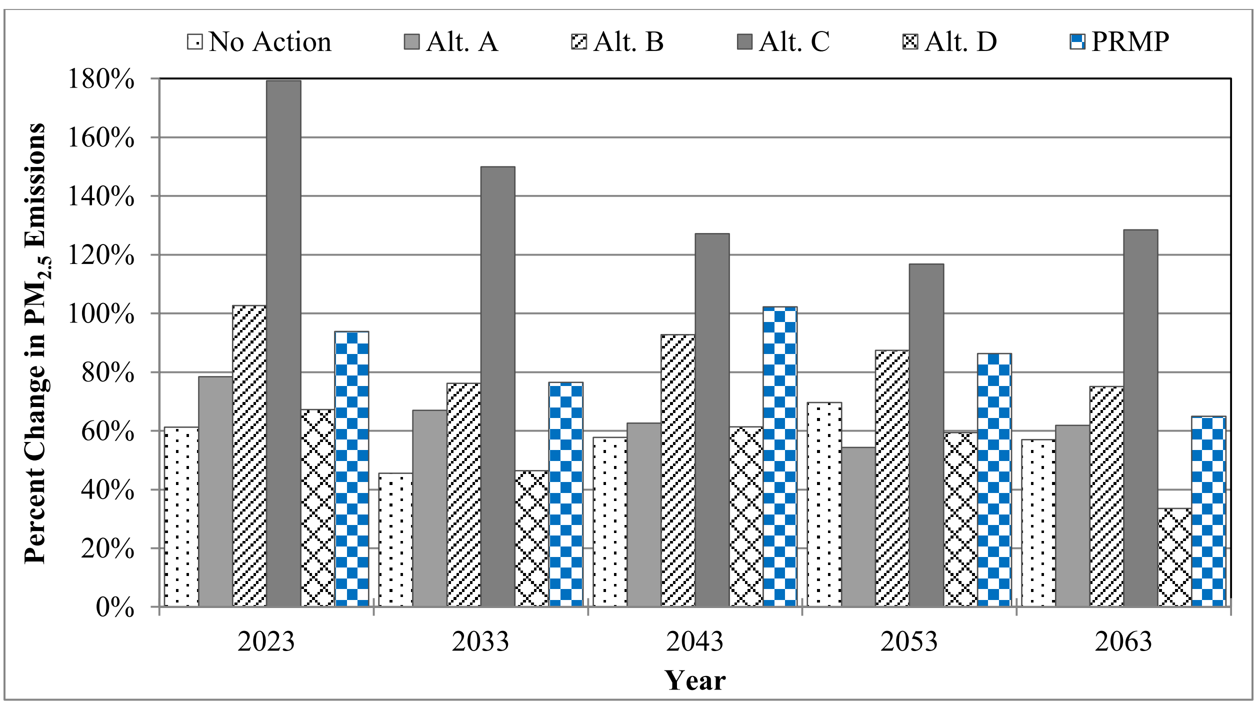


Figure 3-11. Expected increases in $PM_{2.5}$ emissions from prescribed fire over time and relative to the estimate for current prescribed fires

Some of the difference between the estimated current and projected emissions is likely due to the differing estimation methods used for each. Fuel treatment method (e.g., hand or machine pile burning and broadcast burning) affects the amount of particulates emitted by affecting the amount of fuel consumed and the relative proportions of flaming and smoldering combustion (Hardy *et al*. 2001). Smoldering combustion emits more than twice the particulates as flaming combustion (Hardy *et al*. 2001). The current condition is based on the tons of fuels consumed reported to ODF, with insufficient information to determine the proportions of actual treatment methods (Hardy *et al*. 2001, p. 100). Thus, the BLM assessed the current condition using a generic multiplier applied to the reported tons consumed. The BLM does not know whether this value represents an under-estimation or over-estimation of current conditions. The BLM estimated projected emissions on more detailed information using more sophisticated tools than a generic multiplier.

Although there is no reasonable basis for the BLM to forecast a difference in the acreage of hazardous fuels prescribed fire among the alternatives or the Proposed RMP, this program experiences considerable interannual variability in acres treated and treatment method (see the Fire and Fuels section of this chapter). As a result, the particulate matter emissions vary widely from year-to-year. Emissions for all prescribed burning can vary from the estimate due to actual verses assumed pile size, pile shape, and number of piles per acre and in fuel type, fuel loading, and fuel continuity in underburns and broadcast burns. Since fuels are more homogeneous in the activity fuels treatment program, the amount of variation is smaller than in the more heterogeneous fuelbeds of the hazardous fuels program. Accounting for these variations, the BLM estimated a potential range in average annual emissions of approximately 330 tons to 1,300 tons of PM_{10} and 230 to 1,030 tons of $PM_{2.5}$ with an expected annual average of 930 and 685 tons of PM_{10} and $PM_{2.5}$, respectively.

Similar to the current condition, the BLM projected that the Medford District would have the largest number of acres burned by wildfire, followed by the Roseburg District and then the Eugene and Salem Districts, with much smaller acres projected to burn over time on the Coos Bay District and the Klamath Falls Field Office. Since the projected hazardous fuels program is the same as the current program, the Medford District would continue to have the largest hazardous fuels program, followed by the Klamath Falls Field Office and then the Roseburg District. The Coos Bay District would have a small hazardous fuels program while the Eugene and Salem Districts essentially would have no hazardous fuels program. In contrast, which district has the largest activity fuels program would vary by alternative and the Proposed RMP.

Emissions from the BLM's prescribed fires under the alternatives and the Proposed RMP would typically exceed those projected from wildfires burning on BLM-administered lands for both PM_{10} and $PM_{2.5}$. The amount of the difference would vary by decade and by alternative or the Proposed RMP, with Alternative D having the smallest differences and Alternative C the largest differences. In more active wildfire periods, the particulate emissions from wildfire would nearly equal or exceed those from prescribed fire. If the predicted increases in wildfire activity arising from climate change occur, as discussed in the Climate Change section in this chapter, particulate emissions from wildfires burning on BLM-administered lands would exceed those from the BLM's prescribed fires more frequently later in the 50-year analysis period.

Under all alternatives, and the Proposed RMP, the Medford District would produce the most emissions from prescribed burning (**Figure 3-12**), with the highest emissions under Alternative B and the lowest under Alternative A. Emissions under the No Action alternative and Alternative D would be similar, with emissions under the Proposed RMP about midway in the range of estimated emissions. The Roseburg District would produce its highest emissions under Alternative C and lowest under Alternative A. Between these two districts, in combination with expected emissions from wildfire, the greatest potential impacts to air quality in the planning area would occur in the Rogue River and Umpqua River valleys and their associated SSRAs, along with the Kalmiopsis Wilderness and Crater Lake National Park. Much of the activity for hazardous fuels burning consists of pile burning, which typically occurs in late fall and winter. In late fall, limited atmospheric instability in the afternoon and relatively frequent storms provide enough ventilation to limit smoke impacts during the day, but areas down-drainage from burn locations could experience smoke impacts at night due to increased atmospheric stability after sunset. Inversions in winter could result in prescribed fire smoke mingling with woodstove smoke to affect air quality adversely at all hours, although compliance with the Oregon Smoke Management Plan usually would limit degradation of air quality.

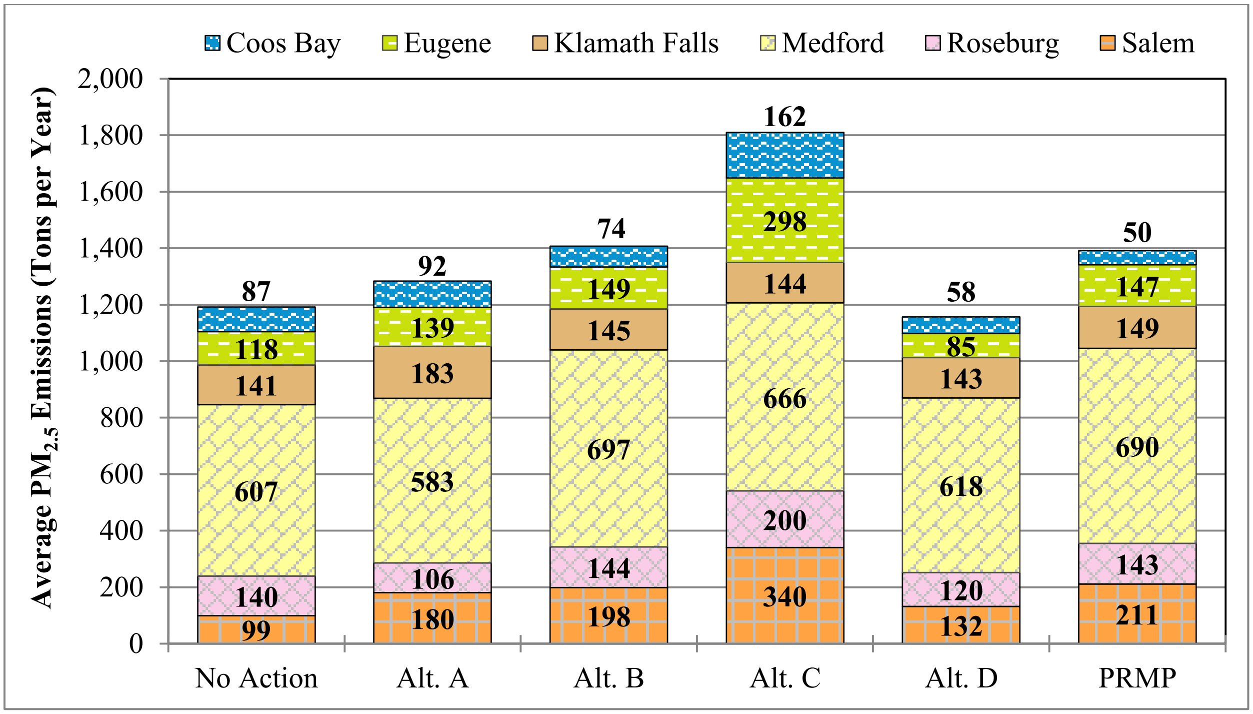


Figure 3-12. Average annual $PM_{2.5}$ emissions from prescribed burning over the 50-year analysis period

The Klamath Falls Field Office would produce its highest emissions under Alternative A with similar emissions among all other alternatives and the Proposed RMP (**Figure 3-12**). Due to compliance with the Oregon Smoke Management Plan, potential effects to the Klamath Falls non-attainment area likely would not differ from those currently experienced.

Expected emissions from the Coos Bay District vary little between the alternatives indicating little difference in the expected human health impacts given compliance with the Oregon Smoke Management Plan requirements. Alternative C would have the highest expected emissions and the Proposed RMP the lowest (**Figure 3-12**). Emissions would be similar for No Action and Alternatives A and B, while emissions from Alternative D would be slightly higher than under the Proposed RMP.

Due to expected increases in harvest levels and the associated prescribed burning, emissions from the Eugene and Salem Districts would increase under all alternatives and the Proposed RMP, except for Alternative D in the Eugene District, relative to the current condition, with the biggest increases under Alternative C (**Figure 3-12**). Emissions under the Proposed RMP would be slightly higher than under Alternative B for the Eugene District and slightly lower for the Salem District. As a result, the probability of adverse impacts to SSRAs in the Willamette Valley would increase, likely due to unexpected wind shifts, although the overall probability would remain low. Increased burning on the Eugene District may result in additional adverse impacts to air quality in Oakridge, although the combined effects of the location of BLM-administered parcels relative to Oakridge (greater than 10 miles to the west), compliance with the Oregon Smoke Management Plan, terrain, and the timing of burns relative to the timing of the worst air quality in Oakridge would keep the probability of such effects very low.

Visibility and Air Quality

Continued adherence to the Oregon Smoke Management Plan would limit adverse effects to visibility and air quality across all alternatives and the Proposed RMP, although some issues would likely remain in southwest Oregon where the efficacy of the new requirements as of 2014 have not yet been established. The increased amount of prescribed burning, particularly under Alternative C, may increase the risk of additional smoke intrusions into mandatory Class I areas, although past intrusions have not been correlated with the number of acres burned. At present, there are no factors that provide a clear indication that the increased prescribed burning under the alternatives or the Proposed RMP would result in additional effects on visibility and air quality from smoke intrusions as compared to the observed past.

The relative proportion of the landscape under some degree of active management can influence subsequent wildfires and the potential to affect human health and visibility adversely in summer. Because the BLM has no way to know whether and where planned vegetation management would intersect with a future wildfire, the estimated wildfire emissions in this analysis do not include any impact from forest management on potential wildfire emissions under any of the alternatives or the Proposed RMP over the analysis period. Active management, particularly where a primary objective is to alter fire risks, can reduce the potential for adverse impacts to human health and visibility from wildfires by increasing landscape diversity in terms of the mix of stand sizes, age classes, structure, and species compositions. Landscape heterogeneity tends to create burn pattern heterogeneity and can reduce the potential for large, homogeneous stand-replacing patches and long-term smoldering within large wildfires, especially in landscapes with active fire regimes (e.g., Mitchell *et al*. 2009, Miller *et al*. 2012, Loudermilk *et al*. 2014, and Volkova *et al*. 2014). Less active management under the current conditions has tended to create landscapes that are more homogeneous, particularly with respect to stand structure, promoting larger patches of similar burn severity, longer-term smoldering, and resulting emissions.

Effect of Emissions from BLM Prescribed Burning in the Context of All Sources

Particulate emissions from prescribed burning by the BLM would increase relative to the current condition under all alternatives and the Proposed RMP, including the No Action alternative. This increase in emissions arises from the increase in harvest levels compared to the harvest levels currently being implemented, thereby increasing the amount of activity fuel to treat. Currently, BLM prescribed burns produce 7.5 percent of both PM_{10} and $PM_{2.5}$ total average annual emissions from all sources in the planning area. Under the No Action alternative, Alternative A, and Alternative D, the BLM's average annual prescribed fire emissions would increase to approximately 12 percent for PM_{10} and 11 percent for $PM_{2.5}$ of the total estimated emissions. Alternative C would produce the largest increase to an estimated 17 percent and 16 percent of PM_{10} and $PM_{2.5}$, respectively. The BLM's prescribed fire emissions would increase to 14 percent and 13 percent of total PM_{10} and $PM_{2.5}$, respectively, under Alternative B and the PRMP. Generally, the largest increase in BLM's portion of particulate emissions would occur in the first decade, with a reduction in expected emissions in subsequent decades. Adherence to the Oregon Smoke Management Plan requirements and daily instructions issued by the Oregon Department of Forestry are explicitly designed to limit potential impacts to smoke sensitive receptors by limiting the amount of fuel burned on any given burn day and by maintaining adequate separation between burn units. As such, the BLM expects that the potential increases in emissions would have no additional impacts on human health under any alternative or the Proposed RMP.

Climate Change

Over time, climate change may result in a reversal of the trend in visibility and a worsening of air quality in summer and fall, despite any actions taken or not taken by the BLM and with full compliance with the Oregon Smoke Management Plan. Many climate projections foresee longer fire seasons and more severe burning conditions, which would lead to more acres burned, increased fire severity (e.g., Mote *et al*. 2014 and references therein), and greater particulate production over the life of such wildfires. One result would be an increase in the number of unhealthy days and reduced visibility in mandatory Class 1 areas. In addition, as the atmosphere warms, it holds more moisture; an increasing trend in relative humidity has already been documented in the United States (Walsh *et al*. 2014 and references therein). Certain pollutants are very responsive to even small increases in relative humidity, potentially degrading visibility with no change in pollutant level (Hand *et al*. 2011).

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Climate Change

Key Points

- Net carbon storage would increase under all alternatives and the Proposed RMP, with the largest increase under Alternative D and the least increase under Alternative C.
- Annual greenhouse gas emissions associated with BLM-administered lands would increase under all alternatives and the Proposed RMP, with the largest increase under Alternative C and the least increase under Alternative D. Annual greenhouse gas emissions associated with BLM-administered lands would remain less than 1 percent of the 2010 Statewide greenhouse gas emissions.
- Climate change provides uncertainty that reserves will function as intended and that planned timber harvest levels can be attained, with the uncertainty increasing over time.
- Active management would provide opportunities to implement climate change adaptive strategies and potentially reduce social and ecological disruptions arising from warming and drying conditions.

Summary of Notable Changes from the Draft RMP/EIS

The BLM has refined the calculations of carbon storage and greenhouse gas emissions, including the following:

- Removing the acreage in roads and water from the estimated carbon stored in soils
- Correcting the number of acres affected by wildfire
- Correcting the number of acres of expected underburning/broadcast burning
- Removing unmodeled forest as a category and replacing it with non-forest estimates
- Correcting the animal unit month values for the No Action alternative in the estimated greenhouse gas emissions

These refinements in the calculations alter the absolute values in these calculations, but do not alter the relative outcomes of the alternatives and the Proposed RMP or the overall analytical conclusions.

The BLM has corrected the values in **Table 3-13** for carbon density; the Draft RMP/EIS erroneously provided carbon density data in terms of Mg/ha instead of Mg/acre.

The BLM has added discussion and estimation of the effects of hazardous fuels treatments on net carbon storage and has expanded the discussion under Issues 1 and 2 of the cumulative effect of carbon storage and greenhouse gas emissions in the context of other actions.

Issue 1

What would be the effects of BLM forest management on long-term net carbon storage?

Summary of Analytical Methods

The BLM estimated changes in the amount of carbon stored on the landscape in vegetation and soils, and in harvested wood products. This analysis accounts for the removal of carbon through wildfire, prescribed fire, and timber harvesting and the addition of carbon through vegetation growth. As such, this analysis estimates changes in the net amount of carbon stored under the different alternatives and the Proposed RMP.

The BLM estimated net carbon storage on BLM-administered lands in the planning area by first estimating the amount of biomass on these lands and converting that to the carbon in live trees, standing and downed dead wood, understory vegetation, litter and duff, and in the upper 1 meter (3.3 ft.) of soil, except where noted. The Planning Criteria provides detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which is incorporated here by reference (USDI BLM 214, pp. 36–38). The volume harvested, whether part of the Harvest Land Base or reserves, drives the variation in carbon storage under the different alternatives and the Proposed RMP.

The BLM assumed the following categories to be constant across all alternatives and the Proposed RMP:

- Carbon stored in soils
- Carbon stored in non-forested lands
- Carbon loss from wildland fire

The BLM assumed no carbon is stored under roads or in water, and reduced the landbase used for net carbon storage estimation accordingly. Although there is some carbon storage under roads or in water, there is no data available to quantify this storage. Furthermore, the carbon storage would not measurably differ among the alternatives and the Proposed RMP over time, and thus would not alter the relative outcomes under the alternatives or the Proposed RMP.

Although the BLM used much of the analytical approach described in the Planning Criteria, the BLM modified the data source for aboveground carbon based on the actual outputs from the Woodstock model. Instead of using stand structure as the basis for estimating the amount of above-ground carbon, as described in the Planning Criteria, the BLM used approximate stand age in combination with the information available through the Carbon OnLine Estimator version 3.0 (COLE 3.0 2015) to estimate the amount of carbon stored in standing and downed dead wood, understory vegetation, the forest floor (litter and duff) and soil. Instead of using only two regions, the BLM filtered the COLE outputs to report carbon storage for all Federal lands in the counties in which the majority of each BLM district occurs. For example, the BLM used all Federal lands in Coos and Curry Counties as the basis for estimates for Coos Bay District. This approach allowed for estimates that were more refined and better captured the variability in carbon stored than using the two regions. The BLM used all Federal lands instead of all lands, as the data for private lands tended to be skewed towards younger age classes than are typically present on the Federal lands. Furthermore, the data for only BLM-administered lands lacked a sufficient number of the Forest Inventory and Analysis plots used by COLE to provide robust estimates. The Woodstock outputs did not specifically identify which cells were woodlands, so the BLM did not carry out this portion of the analysis as described in the Planning Criteria. Because wildfire was not included in the volume estimates for year 100, the BLM dropped that year from the analysis and added year 40, resulting in estimates for years 10, 20, 30, 40, and 50. **Appendix G** describes the carbon estimation method in further detail along with sources of uncertainty in the results.

The quantified analysis of changes in net carbon storage directly or indirectly incorporates the effects of land management actions, including timber harvest, prescribed burning, activity fuels treatments, and silvicultural treatments under the alternatives and the Proposed RMP through the vegetation modeling. Carbon affected by timber harvest has four potential fates:

- Removal from the site and processed into a wood product
- Removal from the site and burned as firewood or for energy production at a mill
- Retain on the site and burned in a fuels treatment
- Retain on the site and allowed to decay

The vegetation model accounted for the changes in net carbon storage from harvesting by reducing volume and affecting average stand age in the decade when timber harvest would occur.

The quantified analysis of changes in net carbon storage under the alternatives and the Proposed RMP does not incorporate the effects of hazardous fuels treatments[38] on net carbon storage, because it is not possible to estimate such effects on net carbon storage accurately and because the BLM assumes that the amount of hazardous fuels treatments would not vary among the alternatives and the Proposed RMP.

There is insufficient information on where and when the BLM would need to implement hazardous fuels treatments and how much biomass the treatments would remove. The BLM does not collect or store data on pre- and post-treatment biomass for the hazardous fuels treatments. Hazardous fuel treatments are highly variable in terms of acres treated and treatment methods. Hazardous fuel treatments are also highly variable in terms of treatment effects on carbon storage: not all fuels treatment methods remove the harvest residue and its carbon as a direct effect of the treatment. Material from treatments such as lop-and-scatter or mastication remains on site and decays naturally. Biomass removal, primarily for personal use firewood, currently accounts for only 4 percent of the acres treated under the hazardous fuels treatments, with an unknown amount of biomass affected. While biomass removal for commercial energy production may occur or increase in the future, currently low product value and high transportation costs means very few facilities have been built or planned within or near the planning area that would use forest residues as a fuel source, and none have been built that use forest residues as a primary fuel source. Since BLM cannot parameterize the stand conditions where the hazardous fuels treatments would occur, the BLM could not include hazardous fuels treatments in the vegetation model.

The primary effect of hazardous fuels treatments on net carbon storage comes from prescribed burning of piled vegetation, underburns, or broadcast burns. Factors influencing the amount of carbon removed by burning include pile size, pile shape, number of piles per acre, and amount of fuel both available and combusted through underburns or broadcast burns. With an estimated 173,300 acres of pile burning, underburns, and broadcast burning per decade, the additional reduction in net carbon storage from the hazardous fuels program would be less than 1teragram[39] of carbon (Tg C), or less than 1 percent, per decade. Because of the insufficient information about future hazardous fuels treatments, the high variability in the implementation of hazardous fuels treatments, and the high variability in the effects of hazardous fuels treatments on carbon storage, this estimation of the effects of hazardous fuels treatments under the alternatives and the Proposed RMP at this scale of analysis is of very low accuracy. The BLM includes this estimation here to give context to the magnitude of the potential effect of hazardous fuels treatments on net carbon storage.

It is possible that hazardous fuels treatments (and other land management actions) could indirectly reduce the loss of new carbon storage resulting from wildfire by reducing the severity and extent of future wildfires. However, it is not possible to quantify any change in future wildfire effects resulting from hazardous fuels treatments (see the Fire and Fuels section in this chapter).

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[38] Hazardous fuel treatments are non-commercial treatments that are designed to reduce existing, natural fuel accumulations. In contrast, activity fuel treatments are designed to reduce fuel accumulations created by management actions such as timber harvest (see the Fire and Fuels section in this chapter). The BLM assumed in this analysis that implementation of hazardous fuels treatments would not vary by alternative and the Proposed RMP. However, activity fuel treatments would vary by alternative and the Proposed RMP, because the BLM would implement activity fuel treatments in response to fuels created by differing management actions.

[39] Scientific literature on carbon storage at this scale of analysis reports carbon amounts in metric tons, which are equal to approximately 2,205 pounds. One million metric tons equals one teragram.

In addition to comparing the alternatives and the Proposed RMP, the BLM also considered two reference analyses as a means of providing additional context for the alternatives and the Proposed RMP: the No Timber Harvest Reference Analysis without wildfire (providing an estimate of potential carbon storage resulting from the vegetation growth) and the No Timber Harvest reference analysis with wildfire. Comparing these two reference analyses allowed the BLM to estimate the effect of this natural disturbance alone and then in conjunction with harvesting in the alternatives and the Proposed RMP.

The quantified analysis of changes in net carbon storage under the alternatives and the Proposed RMP does not incorporate the potential effects on carbon storage from changing climate conditions. The vegetation modeling did not incorporate projections of climate change into the simulation of the growth of stands through time (see the Vegetation Modeling section in this chapter). Climate change would alter the absolute estimates of net carbon storage over time, but would not alter the relative outcomes under the alternatives and the Proposed RMP. Based on recent research, climate change would likely result in smaller increases in future carbon storage in the decision area than estimated in this analysis, though differences may not be apparent within the time frame of this analysis. Using a different analysis method than the carbon analysis in this Proposed RMP/EIS that accounted for changing climate, Diaz *et al.* (2015) also found that net carbon storage in trees would increase on BLM-administered lands within the planning area until mid-century and then level off under lower emissions scenarios and decline under other emissions scenario. Creutzburg *et al.* (2016) found that climate change would slow expected carbon accumulation rates in the northern Coast Range by about 8 percent relative to a static climate, largely between mid-century and the end of the century, but that total carbon would continue to increase. Rogers *et al.* (2015), using three different climate models, found that in western Oregon and Washington, carbon storage would increase slightly under two of the models by the end of the century but decline substantially under the third model.

Future carbon storage on BLM-administered lands could differ from these estimates if the use of biomass for energy increases substantially. Using harvest-generated residues for bioenergy is a common proposition to reduce emissions from burning fossil fuels and both greenhouse gas and particulate emissions associated with prescribed burning to remove such residues. Although such changes in biomass utilization are possible, they are not reasonably foreseeable at this time (see the Sustainable Energy section in this chapter). A recent study in the Panther Creek watershed in northwestern Oregon indicates that if both private forests and BLM-administered lands were to ‘capture’ such residues for bioenergy production, net carbon storage would decline by only 2–3 percent relative to conventional harvest methods (Creutzburg *et al.* 2016). Rotation length and the age at which no harvesting would occur on BLM-administered lands had the main effect on carbon storage in the watershed, which includes a mix of BLM-administered and private lands. This same study also found that longer rotations and less intensive management on Federal and non-corporate private lands could counterbalance shorter rotations and more intensive management on private lands (Creutzburg *et al.* 2016).

There are multiple sources of uncertainty in estimating the amount of carbon stored on the BLM-administered lands within the planning area, which are discussed in more detail in **Appendix G**. Although it is not possible to quantify all of the sources of error, the potential error in the estimate for any one alternative and the Proposed RMP likely exceeds the amount of variance among the alternatives and the Proposed RMP. The U.S. Forest Service estimated standard errors ranging from 20 percent to slightly over 50 percent, averaging around 33 percent, for their lands in western Oregon (USDA FS 2015). The BLM standard errors are likely similar, albeit on the higher end of this range, given the estimation methods used.

Affected Environment

The BLM-administered lands within the planning area currently store an estimated 360 Tg C (**Table 3-13**). In the 2008 FEIS, BLM estimated current carbon storage at 427 Tg, using a similar but more simplified approach that relied primarily on regional averages (USDI BLM 2008, pp. Appendices – 28-29). The type of data available in 2008 for estimating carbon storage did not allow the more detailed approach used in this analysis.

Table 3-13. Estimated current total carbon stored in vegetation and soil and carbon density

District/ Field Office	Acres	Total Carbon (Tg C)	Carbon Density (Mg C/Acre)
Coos Bay	313,945	59	190
Eugene	300,736	60	198
Klamath Falls	210,386	9	41
Medford	782,524	93	119
Roseburg	408,680	63	155
Salem	385,806	76	196
Totals	**2,402,076**	**360**	**-**

The Medford District currently stores the most carbon, with an estimated 93 Tg C, largely due to the size of the district. The Klamath Falls Field Office stores the least, approximately 9 Tg C, largely due to the high proportion of non-forest plant communities within the Field Office boundaries and the small size of the Field Office. Approximately 6 Tg C is currently stored in products made from wood harvested from BLM-administered lands that are either still in use or are located in sanitary landfills where decay rates are minimal (Earles *et al.* 2012). In the 2008 FEIS, the BLM estimated carbon storage in landfills and wood products was 11 Tg C using an approach based on the assumed proportion of pulpwood to saw logs and estimates of the cumulative emissions of carbon over time by each type of product (USDI BLM 2008, pp. Appendices – 30). In this analysis, the BLM estimated carbon storage in landfills and wood products using a decay function derived from Earles *et al.* (2012) that consolidated the same type of information used in 2008 with estimates from the Oregon Department of Forestry on the annual board foot volumes harvested from BLM-administered lands within the planning area from 1965 through 2012. The combination of carbon stored on the districts and in wood products brings the total estimated carbon storage currently associated with BLM–administered lands in the planning area to 366 Tg C.

Carbon density, the amount of carbon per acre, provides a comparable measure between the districts that reflects carbon storage capability and general productivity. The Coos Bay, Eugene, and Salem Districts are moderate in size but have a high carbon density (**Table 3-13**). The Medford District has the largest acreage of BLM-administered lands of the administrative units in the decision area, and has the largest amount of total carbon storage, but has the second lowest estimated carbon density. The Klamath Falls Field Office has the smallest acreage of BLM-administered lands of the administrative units in the decision area and has the lowest carbon density.

Environmental Consequences

Timber harvest volume removed is the primary driver of differences across the alternatives and the Proposed RMP in net carbon storage on BLM-administered lands in the planning area, although a portion of the material harvested remains stored for up to 150 years in the form of wood products in use or in sanitary landfills (Earles *et al.* 2012). Comparing the No Timber Harvest reference analysis without fire to the No Timber Harvest Reference Analysis with fire indicates that wildfire reduces estimated net carbon storage by 0.4–0.7 percent across the planning area through 2063, varying by decade. For the Coos Bay, Eugene, and Salem Districts, and the Klamath Falls Field Office, the estimated reduction would be generally less than 0.3 percent of the net carbon stored on those Districts. On the Roseburg District, the reduction would be highly variable, ranging from as little as 0.12 percent to as high as nearly 3 percent.

The expected reduction on the Medford District would be less variable, ranging from 1 to 2 percent, given that approximately 82.5 percent of the acres burned are predicted to occur on that district.

All alternatives and the Proposed RMP, including the No Action alternative, would increase net carbon storage over time relative to the current condition (**Figure 3-13** and **Figure 3-14**). Differences among the alternatives and the Proposed RMP, and in comparison to the No Timber Harvest Reference Analysis with fire, would be minor until around 2033, and afterwards would become increasing apparent. Although Alternative D has the second largest Harvest Land Base of the alternatives and the Proposed RMP, the volume removed per acre would be low due to the overall approach to timber management (see the Forest Management section in this chapter). Alternative D would store the most net carbon, followed, in order, by Alternative A, the Proposed RMP, Alternative B, No Action, and Alternative C. The differences in net storage among the Proposed RMP, Alternative A, and Alternative B would be quite small. Carbon stored in wood products would range from an estimated 5 to 10 Tg, depending on alternative and the Proposed RMP and decade.

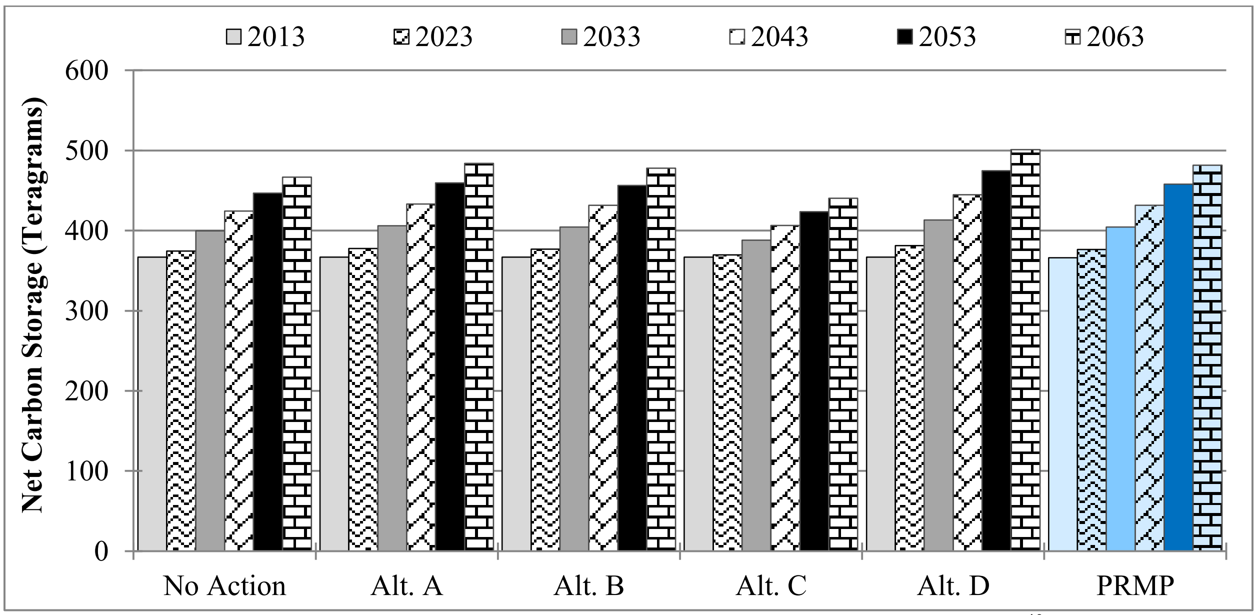

Figure 3-13. Estimated carbon storage over time by alternative and the Proposed RMP[40]

[40] The 2013 value for the Proposed RMP is slightly less than the alternatives, because the BLM has updated current vegetation baseline information to incorporate the effects of the 2013 and 2014 fire seasons (see the Analytical Methodologies and Assumptions section of this chapter).

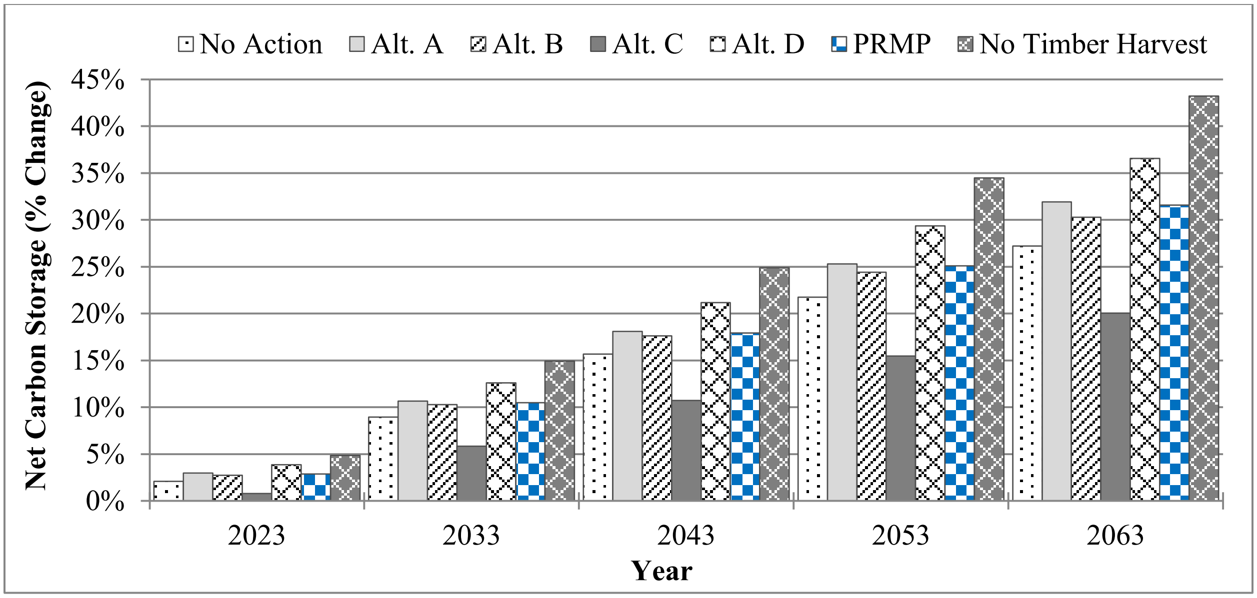

Figure 3-14. Change in carbon storage relative to the estimated total storage as of 2013

All alternatives and the Proposed RMP would increase net carbon storage, but not as much as under the No Timber Harvest reference analysis with wildfire (**Figure 3-15**). The difference in the increase in net carbon storage occurs as harvesting removes carbon and shifts stand characteristics, such as mean diameters and heights, in more of the landscape to smaller trees and younger age classes that store less carbon. Since Alternative C would harvest the most volume over time and would have the highest percentage of the landscape in younger age classes dominated by smaller trees, relative to the No Timber Harvest reference analysis, it would have the lowest increases in net carbon storage. After 2033, the Proposed RMP would store slightly less carbon than Alternative A, and slightly more carbon than Alternative B.

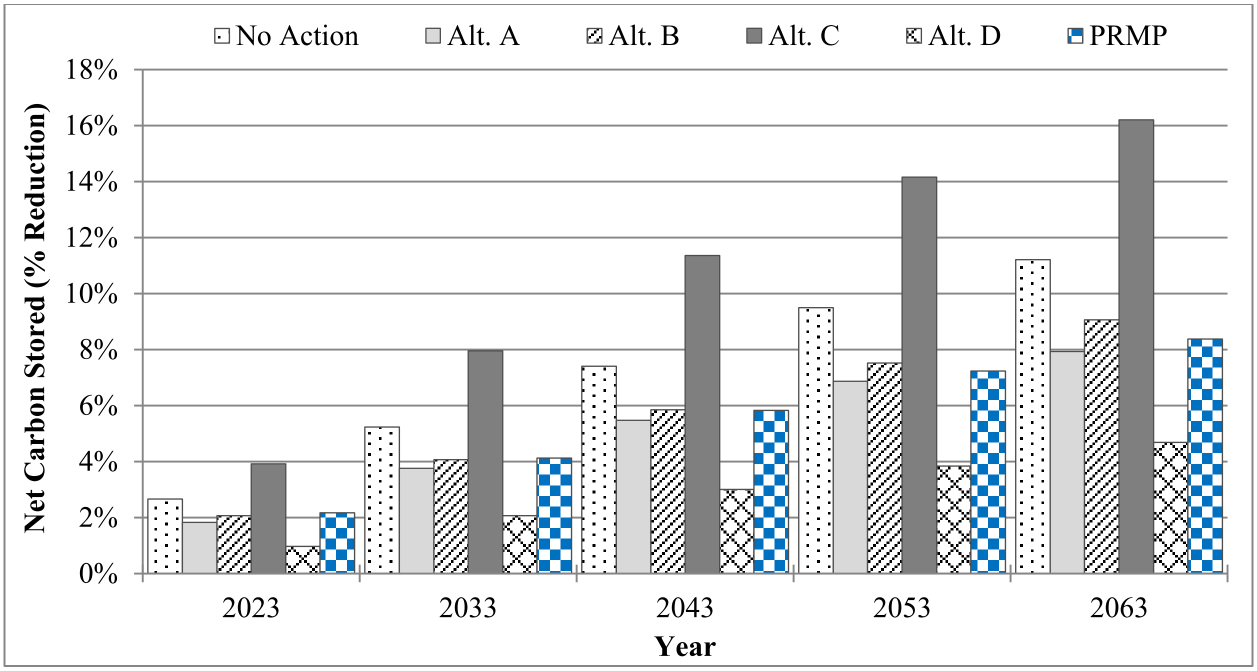

Figure 3-15. Percent reduction in aboveground carbon storage from timber harvest relative to projected carbon storage in the No Timber Harvest reference analysis with wildfire

Effect of Net Carbon Storage on BLM-administered Lands in the Context of Other Lands

Placing carbon storage on BLM-administered lands in context of other lands in the planning area is difficult due to the nature of the data available, which is variable in extent of geographic coverage, in assessment dates, and in the carbon pools assessed. The most recent published statewide assessment covered live and dead trees and downed wood measured between 2001 and 2005, but does not include all carbon pools (Donnegan *et al*. 2008). In that assessment, all the forests in Oregon, including juniper woodlands, store an estimated 1,215 Tg C in live and dead trees and downed logs and large branches. That assessment concluded that U.S. Forest Service lands, privately owned lands, and the BLM-administered lands store 56.7, 23.3, and 11.8 percent of the statewide total, respectively. The estimated statewide total for all BLM-administered lands (which includes BLM-administered lands outside of the decision area) of 144 Tg C as of 2005 is considerably less than the BLM estimated in either the 2008 FEIS analysis or in this analysis for western Oregon. Other Federal lands, State and local government lands, Tribal lands, and other private lands stored the remaining 8.4 percent, with slightly over half of that amount on State forests.

The U.S. Forest Service has also estimated the amount of carbon stored in all pools (live and dead trees, downed wood, litter and duff, and the top meter of soil) for all U.S. Forest Service lands in 2013, providing a basis of comparison with BLM-administered lands in the decision area. The BLM obtained the data for the Fremont, Mt. Hood, Rogue River-Siskiyou, Siuslaw, Umpqua, and Willamette National Forests to compare with the BLM estimates above. The BLM-administered lands (which constitute 34.8 percent of the acreage of U.S. Forest Service lands) stored approximately 39.4 percent of the amount of carbon stored on U.S. Forest Service lands;[41] that is, carbon is stored on BLM-administered lands at 113.3 percent of the density as on U.S. Forest Service lands (**Table 3-14**).

[41] This comparison does not account for the effects of wildland fires in 2013 and 2014, which affected both BLM-administered lands and U.S. Forest Service lands.

Table 3-14. Estimated carbon storage and carbon density for the major land ownerships in western Oregon

Land Owner/ Manager	Assessment Period	Total Carbon* (Tg C)	Acres	Carbon Density (Mg C/Acre)
BLM	2013	361	2,402,076	150.4
U.S. Forest Service	2013	916	6,900,020	132.8
State of Oregon	2001–2010	96	789,610	122.0
Private Landowners	2001–2010	559	6,614,392	34.2

* Does not include carbon stored in wood products still in use or in landfills

Based on data from 2001 through 2010, forests managed by the state of Oregon in western Oregon have a slightly lower carbon density than the U.S. Forest Service lands (Gray 2015, personal communication; **Table 3-14**). This lower carbon density may be due to the amount of area in younger forests, such as the Tillamook State Forest, even though most of the State forestlands are located in the highly productive Coast Range or at similar elevations as the BLM-administered lands in the Cascade Range. Although private forestlands in western Oregon store a large amount of carbon and encompass an area similar in size as U.S. Forest Service lands, they have the lowest carbon density (Gray 2015, personal communication, **Table 3-14**), likely due to the predominance of intensively managed forests, which the owners typically manage on a 40- to 60-year rotation.

Carbon storage increased on the western Oregon U.S. Forest Service lands by approximately 1.73 Tg/yr between 1990 and 2013, despite the decreases on the Siskiyou National Forest and the apparent stabilization on the Rogue River National Forest (USDA FS 2015). Gonzalez *et al.* (2015) reported that forest ecosystems in California lost carbon between 2001 and 2010, which they attributed principally to recent large wildfires in northern California and the Sierra Nevada Mountains. Southwest Oregon may be experiencing a similar effect given the high similarity in forest types with northern California and recent increases in area burned. The BLM does not know whether the BLM-administered lands in southwest Oregon (primarily Medford and Roseburg Districts) are experiencing the same loss or stagnation in carbon storage given the lack of long-term annual carbon data.

Carbon storage on BLM-administered lands in the decision area likely increased by a similar amount given the similarity in management between the BLM and the U.S. Forest Service over that period. The BLM estimated net carbon storage would increase by a low of 1.5 Tg/yr under Alternative C to a high of 2.7 Tg/yr under Alternative D. Under the Proposed RMP, carbon sequestration would average 2.3 Tg/yr over the next 50 years. However, these estimates do not account for potential sources of mortality other than fire and potential increases in wildfire occurrence, size, or severity that might reduce that sequestration rate. The expected increase in net carbon storage as well as other forest management actions (see the Forest Management section in this chapter) under all alternatives and the Proposed RMP supports the Oregon interim strategy for reducing greenhouse gas emissions, although to what degree is not known since the State has not established specific carbon storage goals (OGWC 2010, 2013).

Issue 2

What would be the BLM's expected contribution to greenhouse gas emissions from vegetation management activities such as timber management and prescribed burning?

Summary of Analytical Methods

In this issue, the BLM estimated the gross greenhouse gas emissions from timber harvest, prescribed burning, wildfires and livestock grazing. These estimates are the direct emissions for all greenhouse gases emitted through natural processes (carbon dioxide, methane, and nitrous oxide). The carbon analysis under Issue 1 accounts for the carbon losses from fire and timber harvest by evaluating changes in net carbon storage. This analysis includes all greenhouse gases, including those that lack carbon (nitrous oxide), and all relevant sources of emissions, including those that do not directly affect net carbon storage. Because methane and nitrous oxide have higher global warming potential than carbon dioxide, the BLM followed global and national standards by reporting greenhouse gas emissions as carbon dioxide equivalents (CO_2e). One methane molecule effectively equals 25 carbon dioxide molecules and one nitrous oxide molecule effectively equals 298 carbon dioxide molecules.

Greenhouse gas emissions from BLM management activities that are most likely to be substantial and to vary among alternatives and the Proposed RMP are timber harvesting, grazing, and prescribed burning. A wide variety of BLM activities produce greenhouse gases, but the absence of reliable data limits the BLM's ability to estimate emissions. For example, BLM-authorized mining operations are a source of greenhouse gases, but there is no data on which to base estimates of emissions from this sector, particularly since mining operations within the decision area currently involve salable and locatable minerals only (USDI BLM 2013, pp. 57–58). The BLM has no information on the type of equipment used for mining or for how long (see also the Minerals section in this chapter). The BLM could not locate any general information on greenhouse emissions from mining other than for coal; coal mining does not occur within the planning area.

The BLM estimated greenhouse gas emissions for each alternative and the Proposed RMP, expressed in the form of carbon dioxide equivalent (CO_2e), using projected timber harvest, permitted levels of grazing, and prescribed burning. The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which is incorporated here by reference (USDI BLM 2014, p. 38). The BLM changed the method for this analysis from what was described in the Planning Criteria by providing a greenhouse gas emission for year 40 and by not estimating emissions past year 50, since that was the last year for which the BLM modeled wildfire.

The BLM estimated emissions from timber harvest by converting the estimates of board feet harvested to cubic feet and applying the emissions factor listed in the Planning Criteria (USDI BLM 2014, p. 38). The BLM estimated methane emissions from public lands grazing using the emission factor described by the Intergovernmental Panel on Climate Change (Eggleston *et al*. 2006). Instead of the emission factor listed in the Planning Criteria for prescribed fires, the BLM used estimated emissions from Consume 4.2 for carbon dioxide and methane and the emission factor provided by the Environmental Protection Agency for burning wood and wood products as a stationary source for nitrous oxide (EPA 2014a, Table 1) as the BLM believes these emission estimation methods are more accurate than the single emission factor initially proposed in the Planning Criteria. To provide context for the emissions from harvesting and prescribed burning, the BLM also estimated greenhouse gas emissions from wildfires. The BLM used a combination of wildfire records, fuelbeds from the Fuels Characteristic Class System (FCCS) version 3.0, and emissions estimates from Consume 4.2 to estimate emissions from wildfires. **Appendix G** details the estimation methods and associated uncertainties.

This analysis may overestimate greenhouse gas emissions from both prescribed fire and wildfire. At least some of the carbon produced by wildland fires is deposited as pyrogenic organic matter, also known as charcoal, biochar, and black carbon, instead of being emitted into the atmosphere (Lehmann *et al*. 2006, Sohi *et al*. 2010, Santín *et al.* 2015). The amount of biochar produced depends on fire intensity (Nocentini *et al*. 2010, Sohi *et al*. 2010, Santín *et al*. 2012) and lignin content (Lehmann *et al*. 2006, Makoto *et al*.

2011). Biochar produced by wildland fire can persist in soils for several hundred to several thousand years (e.g., Spokas 2010, Sohi *et al*. 2010, Criscuoli *et al*. 2014, Santín *et al*. 2015, and Wang *et al*. in press), providing storage instead of emission. Factors governing the durability of biochar in the soil include soil texture (Pingree *et al*. 2012 and references therein), particle size (Nocentini *et al*. 2010), the oxygen to carbon ratio in the particles (Spokas 2010), and fire frequency (Nocentini *et al*. 2010, Pingree *et al*. 2012). Estimates of the amount of biochar produced vary widely, however, ranging from 1 to 28 percent of the above ground biomass (Lehmann *et al*. 2006, Sohi *et al*. 2010, Pingree *et al*. 2012, Santín *et al*. 2015), making any attempt to estimate this potential reduction in greenhouse gas emissions highly uncertain.

Background

Globally, atmospheric carbon dioxide (CO_2) concentrations have increased from an estimated 277 ppm (parts per million) before 1750 to 395.31 ± 0.1 ppm in 2013, the highest level in the last 800,000 years according to the Global Carbon Project (2015). Preliminary estimates indicate global atmospheric CO_2 concentrations reached 397.15 ppm in 2014. According to CO_2Earth.org (2015), monthly atmospheric CO_2 concentrations surpassed the 400 ppm benchmark during April through June of 2014 and February through July of 2015 at the Mauna Loa Observatory. Carbon dioxide is the primary greenhouse gas, comprising over 80 percent of total emissions globally, as well as in both the U.S. and Oregon. Fossil fuel combustion is the primary source of CO_2 (McConnaha *et al*. 2013, Le Quéré *et al*. 2014, 2015; EPA 2014b, 2015). United States emissions of greenhouse gasses (6,673 Tg CO_2e) were 14 percent of global emissions (~ 47,664 Tg CO_2e) in 2013 (Le Quéré *et al*. 2015; EPA 2015). In 2010, the latest year in which data are available, Oregon's emissions were about 1 percent of the U.S. emissions (McConnaha *et al*. 2013, EPA 2014b). Globally, ocean and land greenhouse gas sinks removed about 50 percent of that emitted in 2013 (Le Quéré *et al*. 2015). Land sinks in the U.S. effectively reduced total greenhouse gas emissions by 13.2 percent nationally in 2013, with forests and wood products accounting for about 11.5 percent (EPA 2015). The forests of western Oregon sequester more carbon per acre than the national average (Joyce *et al*. 2014, Figure 7.5).

Several scientific studies have concluded that greenhouse gas emissions from human activities are driving relatively rapid climate change (IPCC 2013 and references therein). Under the current state of the science, however, the BLM cannot identify the impacts of greenhouse gas emissions from any one project or program, or from its activities in western Oregon on global, national, or even local climate. In 2004, the state of Oregon released its statewide strategy for greenhouse gas reductions. Oregon's goal is to reduce statewide greenhouse gas emissions to at least 75 percent below 1990 levels by 2050, or to approximately 15 Tg CO_2e (ODOE 2004). To achieve this goal the State strategy calls for increased energy conservation, increased energy efficiency among natural gas and oil users, increased efficiency in transit and alternatives to driving cars and trucks, primarily in urban areas along the I-5 corridor, increased use of products that use less energy to produce and are designed for reuse or easy recycling, replacing fossil fuels with alternative energy sources, and increasing carbon capture and storage in forests and farms (ODOE 2014). Of these elements, BLM-administered lands would support this strategy through increased carbon capture and storage in forests.

Affected Environment

Total estimated greenhouse gas emissions from timber harvest, grazing, and prescribed fire on BLM-administered lands within the planning area averaged 122,398 Mg CO_2e/yr over the past 19 years (1995–2013) (**Figure 3-16**), or about 0.2 percent of Oregon's in-boundary[42] 2010 emissions (McConnaha *et al.* 2013). Prescribed fires emitted about 90 percent of the BLM management-related greenhouse gases. In contrast, average emissions from wildfires that originated on BLM-administered lands were

[42] In-boundary emissions are those that occur within Oregon's borders and emissions associated with electricity use within Oregon.

approximately 69,636 Mg CO_2e/yr or about 36 percent of all greenhouse gas emissions originating on BLM-administered lands within the planning area over the past 19 years (**Figure 3-16**). Prescribed fires emitted more greenhouse gases, on average, than wildfires over this time period. Emissions for any one year varied widely, largely depending on the amount of prescribed fire and wildfire, although emissions from prescribed fires varied much less than those from wildfires.

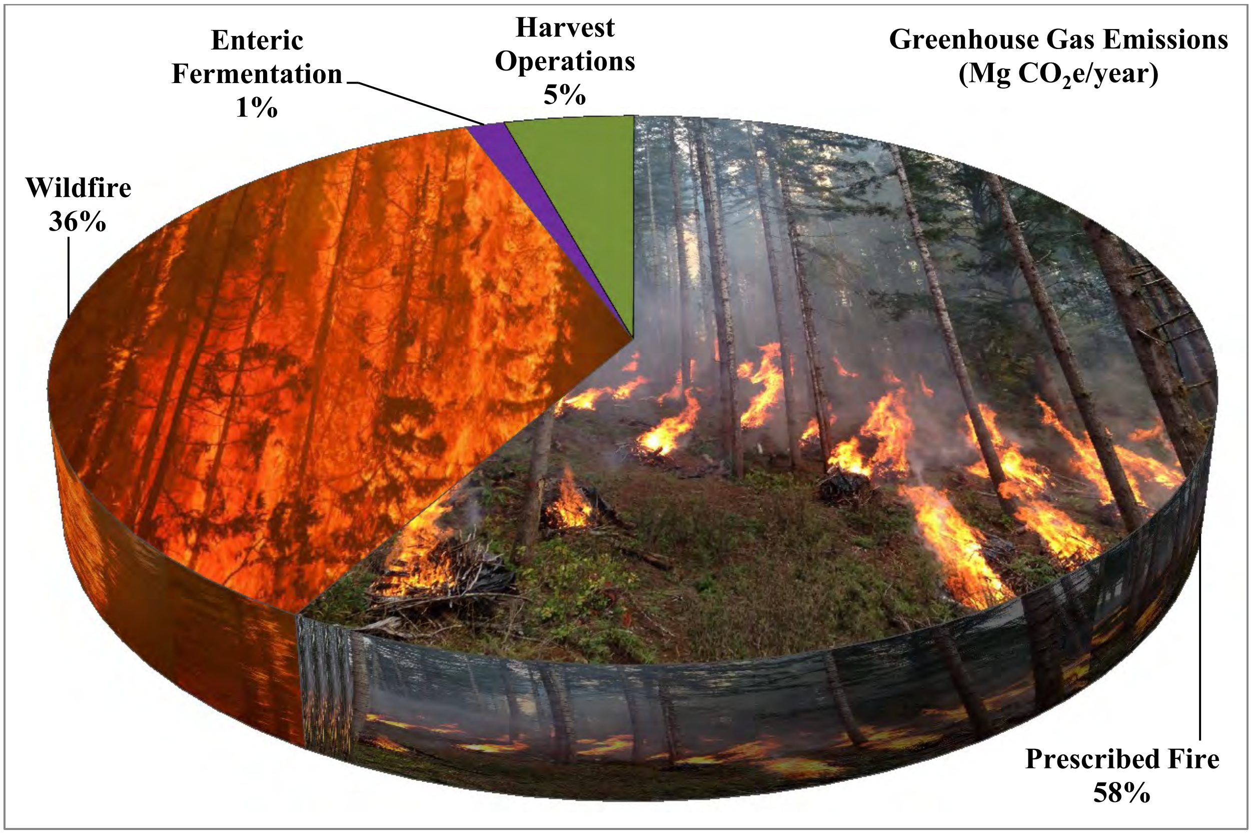

Figure 3-16. Proportion of estimated greenhouse gas emissions from livestock grazing (enteric fermentation), timber harvest operations, prescribed fires, and wildfires on BLM-administered lands within the planning area

The estimate of current greenhouse gas emissions for BLM-administered lands within the planning area represents the actual level of activity. This is in contrast to the analysis of the No Action alternative in the following section, which projects future implementation of 1995 RMPs as written. Actual harvest levels and grazing have been below what the 1995 RMPs anticipated (USDI BLM 2013). Therefore, prescribed burning of activity fuels created by harvesting activities is generally less than what was anticipated in 1995, but prescribed burning of so-called natural fuels, or hazardous fuels, under the National Fire Plan (USDA FS and USDI BLM 2000) has partially compensated for the reduction in activity fuels burning. The National Fire Plan increased funding for hazardous fuels reduction beginning in 2001.

The available data do not indicate how much of the prescribed burning was activity fuel reduction and how much was hazardous fuels reduction. The BLM explicitly designs the hazardous fuels reduction program to reduce potential fire behavior and effects and, hence, greenhouse gas emissions from wildfires. While the BLM does not design silvicultural treatments to reduce hazardous fuels, many treatments serve to do that as a secondary benefit of enhancing tree growth on the remaining trees (see also the Fire and Fuels section for additional analysis and references). Many studies also demonstrate that reducing the fuels created by any forest vegetation treatment, regardless of the primary purpose of the treatment, is essential to reducing potential wildfire behavior and effects and resulting greenhouse gas emissions (e.g., Pritchard *et al.* 2010, Lyons-Tinsley and Peterson 2012, Safford *et al.* 2012, and Shive *et al.* 2013).

The BLM is a relatively small emitter of greenhouse gases from harvest operations and prescribed fire within the planning area (**Figure 3-17**, the Other Federal category is largely BLM). Management on private forests and on U.S. Forest Service lands each result in greater emissions. In large part, these differences reflect the differences in land base and, in the case of private forests, management intensity. Prescribed fire emissions in private forests are largely due to clean up of harvest-generated residue (activity fuels), whereas a portion of the prescribed fire emissions from U.S. Forest Service lands and BLM-administered lands arises from the hazardous fuels reduction program in both agencies under the National Fire Plan.

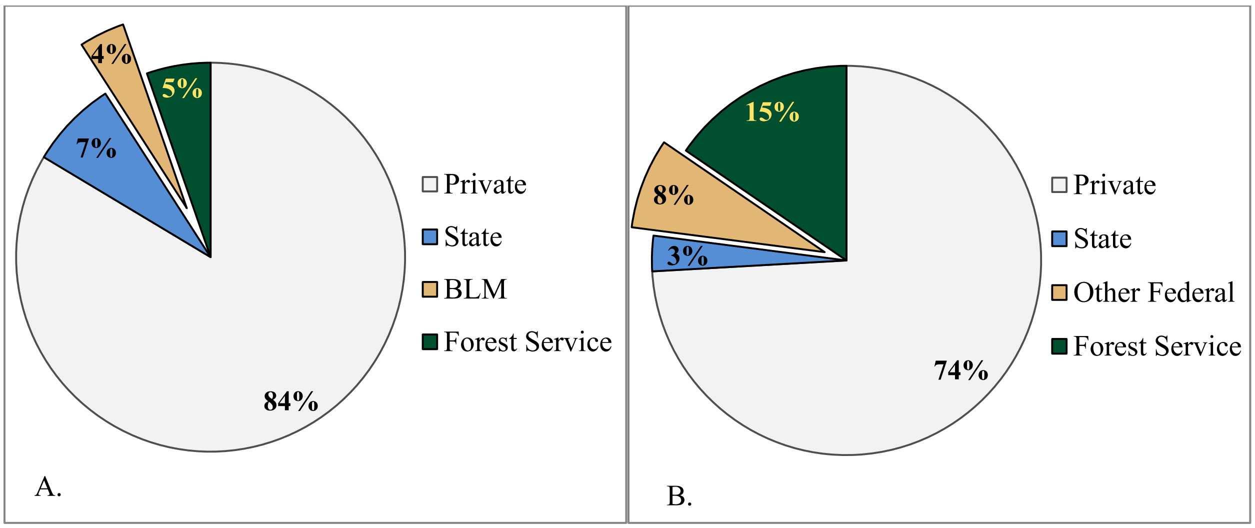

Figure 3-17. Proportion of estimated greenhouse gas emissions from (a) timber harvest and (b) prescribed burning by different entities

Trends in emissions are more difficult to ascertain. Emissions from grazing on BLM-administered lands within the planning area have very slightly declined since 1995, as more allotments became vacant and the amount of active use declined. No trend is evident in wildfire emissions due to very high interannual variability in the acres burned on BLM-administered lands over the period of record (1980–2013).

Although interannual variability in emissions from harvest operations and prescribed burning is also high, some trends are apparent. Harvesting on private forests reflects current economic conditions, particularly in the housing market. During the recent housing boom, harvesting and the resulting greenhouse gas emissions from private land harvesting increased from the late 1990s until 2007. Between 2007 and 2009, emissions declined sharply, reflecting the economic downturn, which had a substantial impact on housing demand and lumber. This same effect on greenhouse gas emissions was also apparent nationally (EPA 2014b). Since 2009, harvesting levels and associated emissions have recovered to pre-recession levels. In contrast, harvesting levels and resulting emissions have been slowly increasing on both BLM-administered and U.S. Forest Service lands since 2001, with a slightly higher trend on the U.S. Forest Service lands.

The trends in emissions from prescribed burning do not track the trends in emissions from harvesting operations. On private forests, emissions from prescribed burning have fallen since about 2006, even when harvest levels have risen. Whether the continued fall represents a lag between time of harvest and time of site preparation, a reduction in activity fuels due to higher utilization, or a shift in how the land managers handled activity fuels is unknown. Fluctuations in emissions from prescribed burning on BLM-administered lands and the U.S. Forest Service lands within the planning area may reflect a combination of higher utilization and fluctuations in the hazardous fuels program. Since 2009, prescribed fire emissions from U.S. Forest Service lands have risen slowly, while emissions have fallen slowly on BLM-administered lands.

Environmental Consequences

As with particulate emissions (see the Air Quality section of this chapter), the amount of activity fuels prescribed burning is the primary factor driving the differences between alternatives and the Proposed RMP and over time. Greenhouse gas emissions from BLM activities would increase substantially relative to the estimate of current actual emissions under all alternatives and the Proposed RMP, with the exception of Alternative D (**Figure 3-18** and **Figure 3-19**). This increase would be largely due to the amount of prescribed burning that would occur in conjunction with harvesting. Alternative C would result in the largest increases. However, even the highest projected emissions under Alternative C would remain less than 1 percent of Oregon's 2010 in-boundary greenhouse gas emissions and approximately 0.0008 percent of total U.S. greenhouse gas emissions in 2012 (EPA 2014b, Figure ES-1). Greenhouse gas emissions under Alternative B would be the second highest of all alternatives and the Proposed RMP. The Proposed RMP and Alternative A would result in similar emissions, lower than Alternative B and the No Action alternative. Alternative D would result in the lowest emissions of all alternatives.

The BLM has considered measures that would reduce or avoid increases in greenhouse gas emissions above current levels. The current implementation of the timber management program is not consistent with the 1995 RMPs as written (see the Purpose and Need for Action section in Chapter 1; current implementation has been predominately thinning, and the current practices are not sustainable at the declared timber harvest levels (see the Alternatives Considered but not Analyzed in Detail section of Chapter 2). The current level of greenhouse gas emissions is substantially lower than the emissions that this analysis shows would result from implementation of the No Action alternative. The level of sustained-yield timber production and associated prescribed burning generally would reflect the level of greenhouse gas emissions. Any alternative that would provide a sustained yield of timber and restore fire-adapted ecosystems would necessarily result in increases in greenhouse gas emissions above current levels. The alternatives and the Proposed RMP would result in varying amounts of increase in greenhouse gas emissions above current levels. However, it would not be possible to avoid increases in greenhouse gas emissions above current levels and meet the purposes of the action.

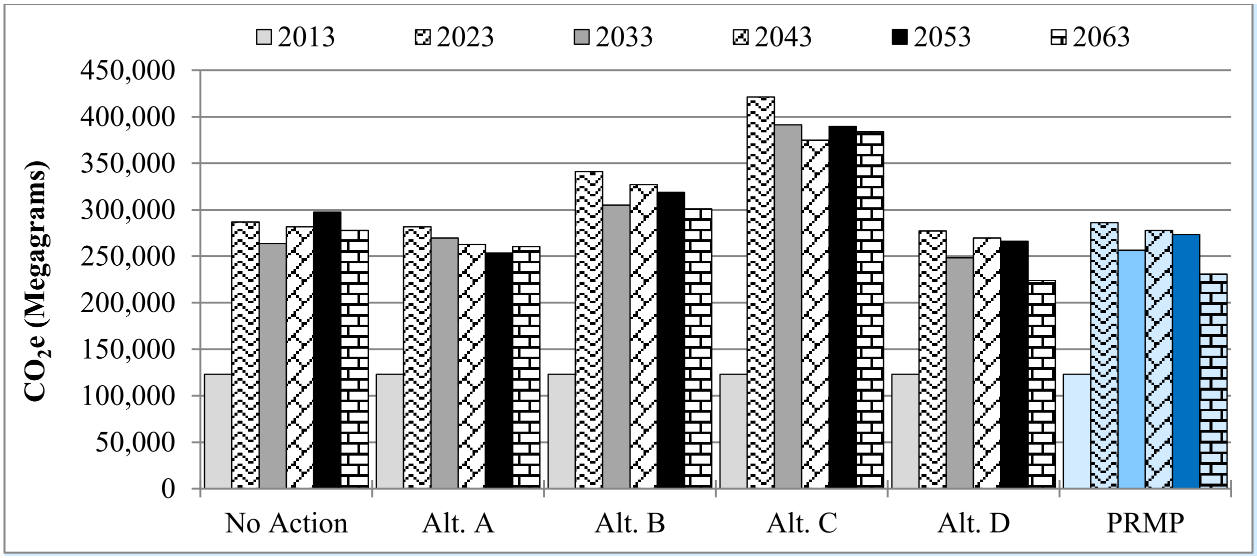

Figure 3-18. Estimated average annual greenhouse gas emissions from the combination of timber harvest, grazing, and prescribed fire

Note: Variation in activity fuels prescribed fire levels causes most of the fluctuation in expected emissions between decades.

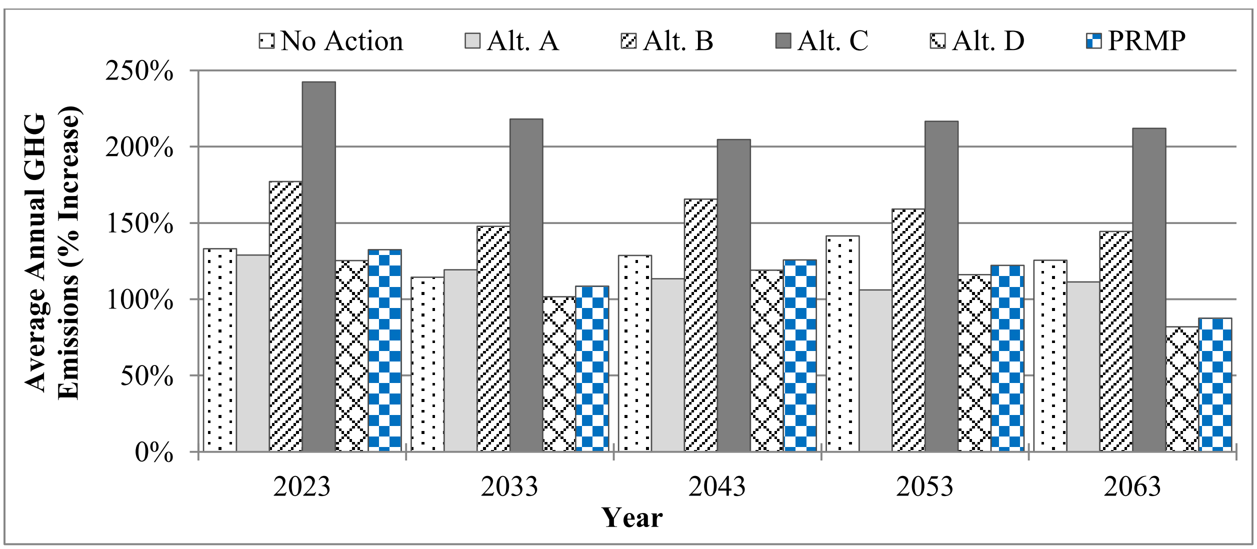

Figure 3-19. Projected increases in average annual greenhouse gas emissions from timber harvest, grazing, and prescribed burning relative to average annual emissions as of 2013

Effect of Greenhouse Gas Emissions from BLM-administered Lands in the Context of Other Sources

Placing BLM's greenhouse gas emissions in a statewide or national context is difficult for the same reasons as discussed above for carbon storage. In addition, greenhouse gas emissions are rarely estimated for the forestry subsector alone. The EPA groups emissions from forestry operations into the agricultural sector. In 2013, national emissions from the agricultural sector were 586.8 Tg CO_2e, or 8.8 percent of total U.S. emissions. Land use and forestry emissions accounted for 1.9 percent of agricultural emissions, or 10.9 Tg CO_2e (EPA 2015). Data for the state of Oregon does not include an estimate of emissions from land use and forestry.

The 2013 estimate for BLM's greenhouse gas emissions are 0.2 percent of the U.S. 2013 estimate for the agriculture sector. The BLM greenhouse gas emissions through 2063 would range from 0.3 to 0.7 percent of the U.S. 2013 estimate for the agricultural sector. Greenhouse gas emissions for each alternative and the Proposed RMP would fluctuate over the assessment period, depending on the extent of timber harvest and subsequent prescribed burning. Greenhouse gas emissions from timber harvest operations would be a higher proportion of BLM total emissions than they are in the national emissions, ranging from as low as 4.2–5.4 percent under Alternative D to as high as 8.6–9.4 percent under Alternative C. Under the Proposed RMP, harvest emissions would account for between 5.2–6.4 percent of BLM's expected total greenhouse gas emissions. The BLM emissions differ from the national emissions for the agricultural sector in that livestock and crop cultivation produced 90 percent of the national emissions whereas prescribed burning is expected to produce 90–96 percent of the emissions from BLM, depending on the alternative and decade.

The BLM also compared how the relative proportions of greenhouse gas emissions would change for harvesting and prescribed fire assuming no change in the emissions from private forest owners, the State of Oregon, and other Federal agencies, using average annual estimates over the entire analysis period (50 years). The BLM's proportion of annual harvesting-related greenhouse gas emissions would increase from about 4 percent of the western Oregon estimate to a low of 5 percent per year under Alternative D and a high of 14 percent per year under Alternative C. The Proposed RMP annual harvesting greenhouse gas emissions would approximately double to an estimated 8 percent of western Oregon harvesting emissions, or 0.02 Tg CO_2e per year on average. The BLM's proportion of greenhouse gas emissions from prescribed burning would increase from approximately 8 percent per year of the western Oregon total to a low of 15 percent per year under Alternative D and a high of 20 percent per year under Alternative C. The Proposed RMP prescribed fire greenhouse gas emissions would increase to 17 percent of the western Oregon prescribed fire emissions, or 0.28 Tg CO_2e per year, on average.

Issue 3

How would climate change interact with BLM management actions to alter the potential outcomes for key natural resources?

Summary of Analytical Methods

In this analysis, the BLM considered both how climate change would introduce uncertainty into outcomes described in other sections of this chapter and how the alternatives and the Proposed RMP might allow the BLM to undertake actions to adapt to climate change during plan implementation. The BLM described current and projected climate trends and analyzed how these trends could affect the resources described in other sections. The BLM then considered the extent to which the alternatives and the Proposed RMP would allow BLM to consider actions that promote adaptation to climate change during the implementation of the RMP.

The potential climate change impacts of most concern to the BLM are the indirect effects of changes in temperature, precipitation, and snow within the planning area, as these factors affect forest productivity and species composition, habitat for terrestrial and aquatic wildlife, and key disturbance regimes. This analysis focuses on the possible impacts to tree species composition and growth, fire regimes, insect outbreaks, certain diseases such as Sudden Oak Death and Swiss needle cast, stream flow and temperature in the context of fish habitat, and habitat for old growth-associated species such as northern spotted owl and marbled murrelet.

The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which is incorporated here by reference (USDI BLM 2014, pp. 39–40). The existing analyses in the NatureServe Climate Change Vulnerability Index website (2014) did not include any species of birds, fish, or mammals relevant to BLM-administered lands in the planning area as of September 3, 2014. The bulk of this analysis consists of a review and synthesis of key literature.

To assess observed changes in climate, the BLM elected to use temperature and precipitation data available through WestMap (2014), a tool developed by the Desert Research Institute, extracting the data by three hydrologic units: the Willamette River basin, Oregon coastal basins, which include southwest Oregon, and the Klamath River Basin. Data for the Klamath River basin includes northern California. Data extracted included precipitation, average temperature, average maximum temperature, and average minimum temperature, both annually and seasonally. The BLM used the water year (October 1 to September 30) for the annual basis and meteorological/climatological seasons (winter = December to February, spring = March to May, summer = June to August, and fall = September to November). The BLM imported the data into Excel spreadsheets, summarized, and conducted linear trend analyses using Sigma Plot 12.3. The BLM considered the results statistically significant at P-values of 0.05 or less. The BLM also extracted snow course data from the Natural Resources Conservation Service website (NRCS 2014) and evaluated long-term trends in April 1 snow water equivalent using an Excel spreadsheet. The BLM did not analyze these data for statistical significance.

Background

Global assessments of climate over time have increased the certainty that climate is changing and that humans are a primary cause of that change through emissions of greenhouse gases, carbon dioxide in particular (IPCC 2013). According to the latest assessment from the Intergovernmental Panel on Climate Change (IPCC) global temperatures have increased by 1.53 ºF since 1880; the number of cold days and nights have decreased while the number of warm days and nights have increased; the frequency and intensity of heavy precipitation events have increased in North America and Europe; glaciers, sea ice, major ice sheets, and spring snow cover continue to shrink; and atmospheric concentrations of carbon dioxide, methane, and nitrous oxide exceed those of the last 800,000 years (IPCC 2013).

The latest national assessment for the United States affirms these same general trends. Average temperature in the United States has increased 1.3 to 1.9 ºF, with most of this increase since 1970. The year 2012 was the warmest year on record. The length of the frost-free season has decreased and the subsequent growing season increased; heavy downpours have increased in frequency over the last three to five decades; heat waves are more frequent and intense, while cold waves are less frequent and less intense; winter storms have increased in frequency and intensity since the 1950s, and the general track has shifted northward; glaciers and snow cover are shrinking (Walsh *et al.* 2014).

The Pacific Northwest (Oregon, Washington, Idaho, and western Montana) has experienced many of the changes noted globally and nationally. The Pacific Northwest has warmed by 1.3 ºF since 1895, with statistically significant warming in all seasons except spring, lengthening the frost-free period by 35 days (Snover *et al.* 2013, Abatzoglou *et al*. 2014). Spring precipitation has increased while summer and fall precipitation have decreased; with increasing potential evapotranspiration, the climatic water deficit has also increased (Abatzoglou *et al*. 2014). The frequency of extreme high nighttime temperatures has increased, with a statistically significant increase west of the Cascade Mountains; however, no clear change in other temperature extremes has emerged (Dalton *et al.* 2013, Snover *et al.* 2013). Annual precipitation has no clear trend either upward or downward, with high interannual variability (Snover *et* *al.* 2013). Although annual snowpack also fluctuates widely, snow accumulation is generally declining, and spring snowmelt is occurring earlier, leading to an earlier peak in streamflow in snowmelt-influenced streams (Snover *et al.* 2013).

Affected Environment

Three different climate types characterize the planning area: maritime, Mediterranean, and continental. The Coos Bay, Eugene, and Salem Districts have a maritime climate, typified by relatively cool, moist conditions year-round, although the Willamette Valley can be quite warm and dry in summer. The western portion of the Klamath Falls Field Office and the Medford District have a Mediterranean climate, characterized by cool to warm, moist conditions in winter and hot, dry conditions in summer. The eastern portion of the Klamath Falls Field Office has a continental climate, with cold, dry winters and hot, dry summers. The Roseburg District encompasses a transition zone between the Mediterranean and maritime climates, with no clear demarcation between the two climate types.

Based on the WestMap data, annual precipitation increased slightly in the Willamette River, Oregon Coastal and Klamath River basins since 1896, and in some seasons, although the increases were not statistically significant (**Figure 3-20**). The one exception is a statistically significant increase in spring precipitation in the Willamette River and Klamath River basins. All basins show a statistically non-significant decline in fall precipitation, and the Oregon coastal basins have a statistically non-significant decrease in winter precipitation.

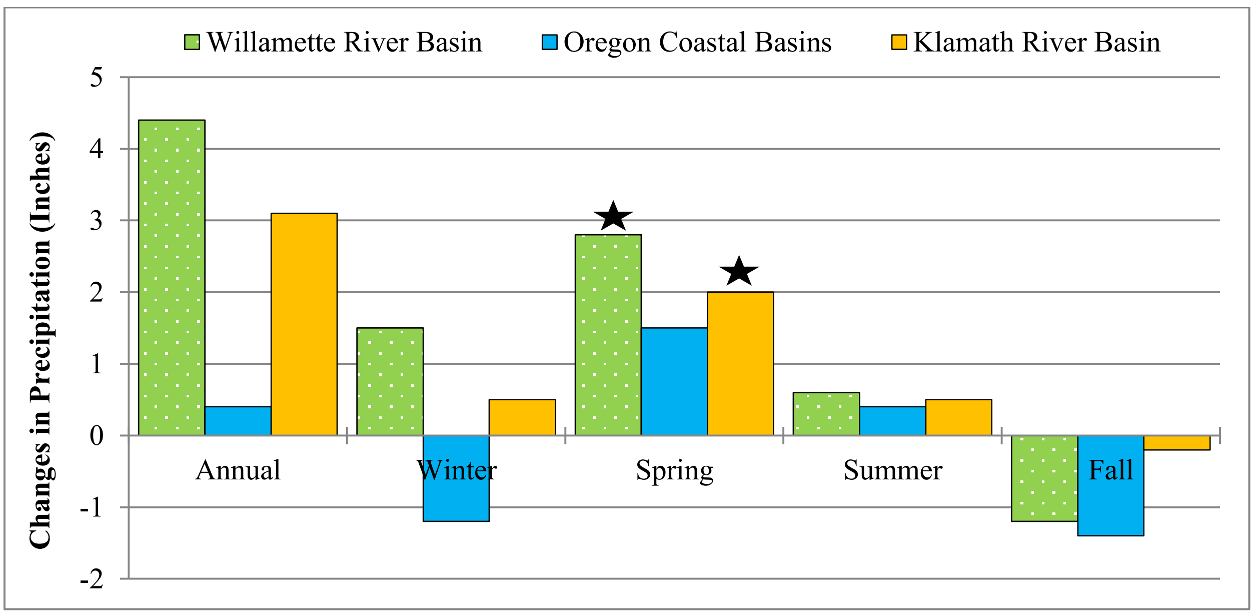

Figure 3-20. Observed changes in annual and seasonal precipitation by basin

Note: A star indicates change is statistically significant; Annual = October 1–September 30, Winter = December–February, Spring = March–May, Summer = June–August, Fall = September–November

The WestMap data also indicate that average annual and seasonal temperatures have experienced statistically significant increases across the planning area (**Figure 3-21**). Since 1896, average annual temperature has increased by 1.4 ºF in the Oregon coastal basins, by 1.6 ºF in the Willamette River basin, and by 1.8 ºF in the Klamath River basin. Increases in average spring temperature are not statistically significant in the Willamette River and Klamath River basins. Increases in minimum temperatures are statistically significant in all basins, both annually and seasonally, whereas increases in maximum temperatures are significant only annually and in winter in all basins. The increase in summer temperature is also statistically significant in the Klamath River Basin. Increases in minimum temperature are greater than the increases in maximum temperature. Given the small increases in precipitation and the more statistically significant increases in temperature, the entire planning area is becoming warmer and drier, particularly in winter and at night. The amount of effective change in the Willamette River basin is smaller than the change in the Oregon coastal basins and Klamath River basin.

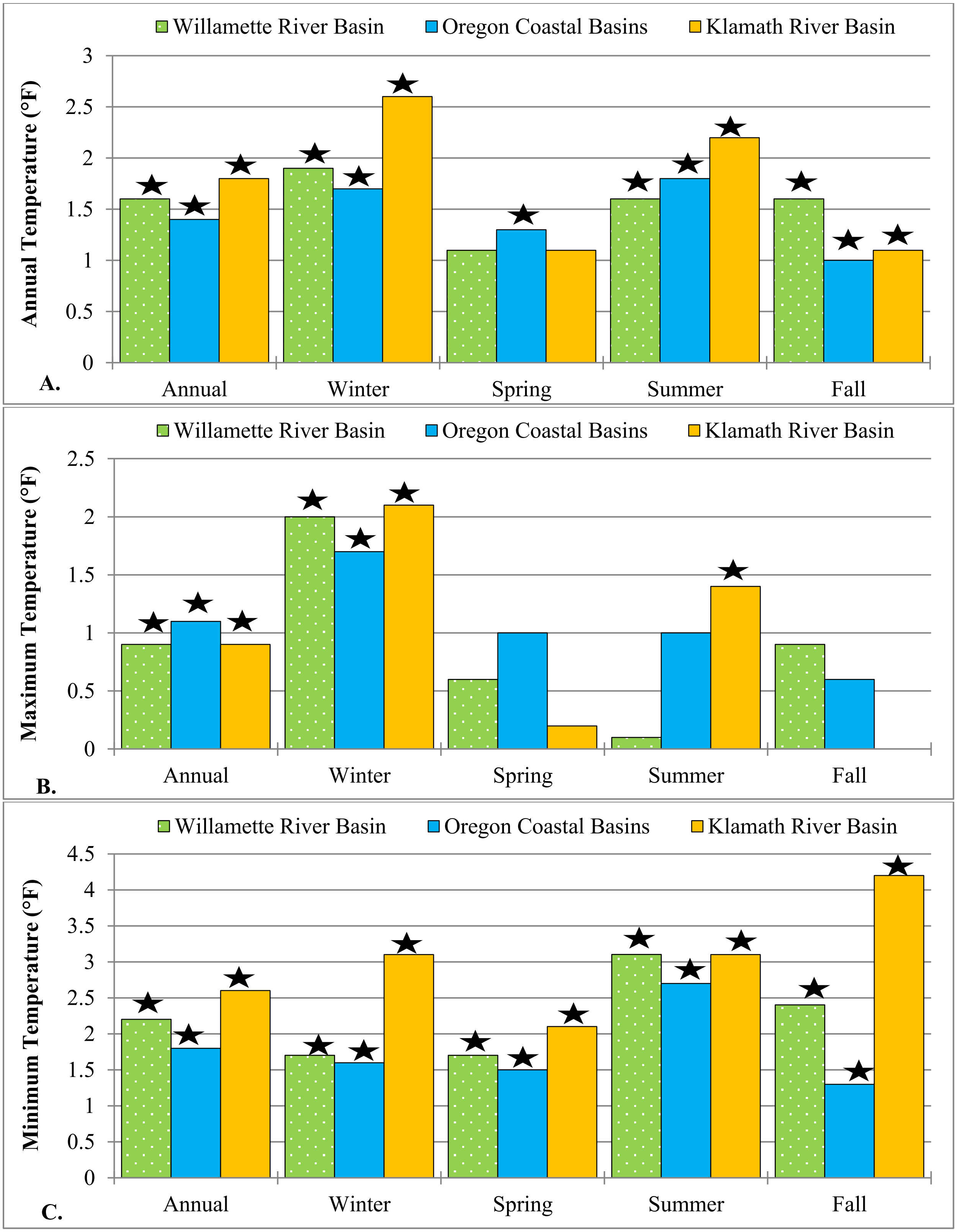

Figure 3-21. Observed changes in (a) annual, (b) maximum, and (c) minimum temperature in each basin
Note: A star indicates the change is statistically significant; Annual = October 1–September 30, Winter = December–February, Spring = March–May, Summer = June–August, Fall = September–November

Winter precipitation, in particular the amount, type, and timing, is an important factor in the response of vegetation and streams to climate change (Dalton *et al.* 2013, Peterson *et al.* 2014). Winter precipitation typically falls as rain in the coastal mountains and western Oregon valleys and a mix of rain and snow in the Cascade foothills and mountains (Safeeq *et al.* 2013, Klos *et al.* 2014). In the Cascades, only small differences in temperature differentiate between a rain event and a snow event (Lute and Abatzoglou 2014). Interactions between the phase of El Niño-Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO) influence winter temperatures and precipitation, resulting in high interannual variability in winter precipitation amount and timing (Dalton *et al*. 2013, Lute and Abatzoglou 2014). El Niño winters (ENSO warm phase) typically result in 20–60 percent less snow, while La Niña winters (ENSO cool phase) typically result in 30–70 percent more snow (Lute and Abatzoglou 2014). The larger differences tend to occur when the phases of ENSO and PDO align (Dalton *et al.* 2013).

Reflecting the observed changes in temperature in particular, April 1 snow water equivalent (the time when snowpack historically has peaked) has been decreasing across much of the western United States, with some of the largest relative decreases in western Oregon (Mote *et al.* 2005, Peterson *et al.* 2014). Snow course data for western Oregon indicate that decreases are occurring at all elevations across the planning area, although there is high interannual variability in snow amounts. Both the Cascade and Klamath Mountains can have high accumulations of snow, but that accumulation period is typically short, and the snowmelt period begins early and occurs more rapidly that most of the western United States (Trujillo and Molotch 2014). In contrast, the Coast Range has only intermittent snow all winter. Winter atmospheric rivers, often associated with La Niña winters, typically deliver the most snow and over short periods (1–2 days), but can also result in rain-on-snow events that result in very rapid melting and flooding (Lute and Abatzoglou 2014, Trujillo and Molotch 2014).

Thus far, the observed changes in climate have not yet lead to obvious changes in forests, most disturbance regimes, and terrestrial wildlife species ranges or habitat within the planning area, although subtle changes could well be happening. Assessments at larger spatial and temporal scales suggest some changes could be occurring already, but at levels indistinguishable from natural variability. In other words, within the planning area, climate-related changes in ecosystems cannot be detected over the "noise" of interannual and interdecadal variability at this geographic scale. Apparent temporal disconnects between changes in climate and changes in vegetation are common; older forests in particular experience such disconnections as established vegetation is able to tolerate larger changes in climate than seedlings.

Tree Species

In their evidence-based review of the science, Allen *et al.* (2010) found that tree mortality from climate-induced stress driven by drought and warmer temperatures appears to be increasing worldwide in all forest types. In North America, drought and warmer temperatures have been correlated to increases in the mortality of several pine species, several spruce species, white fir, incense cedar, two species of juniper, and Douglas-fir (Allen *et al.* 2010). In the western United States, background rates of mortality have increased in recent decades across elevation, tree size, dominant genera, and past fire histories with warming and increased water stress believed to be a major contributor to the increase (van Mantgem *et al.* 2009, Smith *et al.* 2015). The patterns of mortality are patchy with higher levels in drier forests, but increased mortality has been documented on productive sites where changes in moisture stress may well interact with density-dependent factors (Allen *et al.* 2010). In conifer forests and woodlands, climate-related mortality is more common during multi-year droughts than during seasonal droughts, and warmer temperatures can increase moisture stress independent of precipitation amount (Allen *et al.* 2010). Given these findings, climate change may have increased background tree mortality in the Klamath Falls Field Office and the Medford and Roseburg Districts, but it is less clear if background mortality may have increased in the Coos Bay, Eugene, and Salem Districts.

Devine *et al.* (2012) developed climate vulnerability rankings for major tree species U.S. Forest Service lands in Oregon and Washington, breaking out the results by geographic area. The authors based the ratings on tree species distribution, reproductive capacity, habitat affinity, adaptive genetic variation, and risk of insects and disease. Species deemed more vulnerable were those that are rare, have low seed production and low seed viability with very short dispersal distances, are habitat specialists, are either disjunct or at the edge of the species' range, and have insect pests or diseases that are increasing in distribution and impacts with typically high mortality of mature trees, among other characteristics. Species rated as less vulnerable are those with opposite characteristics (e.g., widespread, common, habitat generalists, and high seed production with high seed viability). The rankings used data on the distribution of species on U.S. Forest Service lands, although the rankings provide an indicator of potential vulnerability on BLM-administered lands within the planning area. The authors normalized rankings so they vary between 0 and 100, with the higher the ranking, the more vulnerable the species.

Rankings sometimes differ for species that occur in both northwest and southwest Oregon (**Table 3-15**). For example, the authors rated Engelmann spruce as less vulnerable in northwest Oregon than in southwest Oregon, whereas the opposite was true for sugar pine. The authors rated Douglas-fir as slightly more vulnerable in northwest Oregon than in southwest Oregon, largely due to differences in adaptive genetic variation and insects and disease risks. Generally, species found primarily at higher elevations tended to be ranked as more vulnerable than those found primarily at lower elevations. Some species may be more widespread on BLM-administered lands, which tend to be lower elevation, than on U.S. Forest Service lands, and therefore may actually have a somewhat lower vulnerability, whereas the opposite may also be true for other species. Examples of the former would be the various oak species, while the latter would be the higher elevation species.

Table 3-15. Climate change vulnerability scores for different tree species in western Oregon

Species	Northwest Oregon	Southwest Oregon
Subalpine fir	77	69
Pacific silver fir	66	56
Noble fir	60	-
Noble fir-Shasta red fir complex	-	48
Grand fir	59	-
Grand fir-white fir complex	-	55
Douglas-fir	41	36
Western hemlock	52	42
Western larch	52	-
Engelmann spruce	55	71
Sitka spruce	39	-
Whitebark pine	67	67
Lodgepole pine	56	42
Shore pine	17	-
Sugar pine	59	39
Ponderosa pine	46	46
Western white pine	39	36
Jeffrey pine	-	39
Knobcone pine	-	30
Western redcedar	36	35
Alaska yellow-cedar	59	-
Port-Orford-cedar	36	35
Incense-cedar	-	33
Western juniper	-	27
Bigleaf maple	50	39
Red alder	38	33
Tanoak	-	46
Oregon white oak	54	48
California black oak	-	45
Canyon live oak	-	40
Black cottonwood	27	-
Pacific madrone	-	46

Note: A higher score indicates greater vulnerability. In Devine *et al*. 2012, Northwest Oregon roughly corresponds to the Eugene, Roseburg, and Salem Districts, Southwest Oregon to the Coos Bay and Medford Districts and the Klamath Falls Field Office.
Source: Devine *et al*. 2012

One factor in the ratings is whether the species is at or near the limits of its range, although it is not clear if the authors rated species at the southern end of their range differently than species at the northern limit. A common climate change effect prediction is that species ranges would tend to shift poleward and upward in elevation; numerous studies of taxa other than trees have documented shifts consistent with this prediction (e.g., Parmesan and Yohe 2003, Root *et al.* 2003, Tingley *et al.* 2012, Comte and Grenouillet 2013, and Cahill *et al.* 2014). Pacific silver fir, subalpine fir, Alaska yellow-cedar, and Engelmann spruce are at or near the southern limits of their range in western Oregon, so may well be more vulnerable in southwestern Oregon. Conversely, incense-cedar, sugar pine, Jeffrey pine, canyon live oak, California black oak, and tanoak are at the northern limits of their range in western Oregon and could be expected to expand northward, making them less vulnerable.

Insects and Pathogens

Many insects and pathogens are influenced by temperature and precipitation amount and timing (Sturrock *et al.* 2011, Vose *et al.* 2012, Peterson *et al.* 2014). Sturrock *et al.* (2011) reviewed much of the literature concerning the potential impact of climate change on a variety of important forest diseases. Generally, warming winters and minimum temperatures and increasing moisture during the growing season will favor pathogens that require leaf or needle wetness to spread, while drying conditions disfavor such pathogens. Examples include Sudden Oak Death (Venette and Cohen 2006), *Dothistroma* needle blight (Woods *et al.* 2005), Swiss needle cast (Manter *et al.* 2005, Lee *et al.* 2013, Tillmann and Glick 2013), and white pine blister rust (Sturrock *et al.* 2011). Although not specifically discussed, Port-Orford-cedar root disease, another *Phytophthora* species, likely responds similarly to Sudden Oak Death. In contrast, warming and drying conditions will favor pathogens that increase when host species are water-stressed, such as *Armillaria* root disease and various canker species (Sturrock *et al.* 2011, *Vose et al.* 2012). The response of pathogens that depend on insects for spread will likely be complex, depending on how the particular insect vector responds to changing climate (Sturrock *et al.* 2011).

Since temperature is a primary control on insect development and survival (Peterson *et al.* 2014), warming temperatures will and are altering insect pest dynamics (Chmura *et al.* 2011). The best-known and documented example is mountain pine beetle with the recent outbreak across western North America the subject of many studies. Warming temperatures and increased drought stress are commonly cited factors in the scale of the current mountain pine beetle outbreak (Vose *et al.* 2012). Conditions that create water stress in trees limit the effectiveness of tree defenses and favors bark beetles (Evangelista *et al.* 2011, Vose *et al.* 2012, Tillmann and Glick 2013, Creeden *et al.* 2014). How changing climate is now affecting and will potentially affect defoliating insects is less clear. Outbreaks of this class of insects tend to be cyclical and involve predators, parasitoids, and pathogens of the individual insect species, and the role of climate in such cycles is not clear (Vose *et al.* 2012, Tillmann and Glick 2013). For example, outbreaks of western spruce budworm in the interior west tend to occur near the end of droughts (Flower *et al.* 2014), but in British Columbia tend to be associated with dry winters followed by average spring temperatures (Campbell *et al.* 2006). Chen *et al.* (2003) noted that the degree of damage in Douglas-fir was also correlated with close matches between the phenology of budburst and larval emergence. Changing atmospheric CO_2 concentrations will also influence insect dynamics by increasing carbon availability for tree defenses and altering the carbon:nitrogen ratios in leaves and needles, thereby reducing food quality (Peterson *et al.* 2014). Reduced food quality can lead to increased herbivory in order to obtain the amount of nutrients needed to complete insect life cycles.

Other than a documented increase in the incidence, damage, and inland spread of Swiss needle cast in northwest Oregon (Manter *et al.* 2005), no obvious climate change-related changes in the incidence of insects and diseases have been clearly noted within the planning area. Determining both whether increasing atmospheric CO_2 has a bigger impact than increasing temperature and whether the effects of increasing atmospheric CO_2 concentrations on insect dynamics has occurred within the planning area remains elusive.

Wildfire

Many studies have examined changes in area burned, individual fire severity, and fire season severity, concluding that changes in climate are a major factor driving these observed changes. Westerling *et al.* (2006) documented an increase in the length of fire season in the western U.S. by at least one month, based on start dates of fires at least 1,000 acres in size, attributing this change to earlier snowmelt and longer, drier summers. Van Mantgem *et al.* (2013) reported an increase in the probability of tree mortality due to the combination of drought and warming temperatures. Dry, warm conditions, particularly in the years of fire, are also strongly associated with greater annual area burned in the northwestern United States (Littell *et al.* 2009). Larger wildfires in recent decades also tend to have a higher proportion of high severity burn area in terms of tree mortality, and larger high severity patch sizes when conditions are warm and dry (Abatzoglou and Kolden 2013, Cansler and McKenzie 2013).

Within the planning area, fire season length and potential severity, as measured by energy release component, a measure of seasonal dryness used in fire danger rating, has increased (Dalton 2014; unpublished data). The changes in fire season severity and the severity of individual wildfires have occurred in the Northwest consistent with the results above for the western U.S.; however, there are simply too few wildfires that have originated on BLM-administered lands (or in western Oregon), to provide a clear signal of such changes. An analysis of large fires across the entire state of Oregon using data from the Monitoring Trends in Burn Severity site (MTBS 2013) indicates that the proportion of high-severity fire in forests generally has increased by 11 percent since 1984, with much of the increase since 2000.

Streamflow and Temperature

Several studies have concluded that observed changes in stream flow regimes and temperature in the western U.S. are a result of climate change, but that these changes depend on more than just changes in air temperature, precipitation amount, and timing. Geology, topography, vegetation, and other factors also play a role (Dalton *et al.* 2013, Safeeq *et al.* 2013). Safeeq *et al.* (2013) report that streams that are primarily groundwater-sourced respond differently to changing climate from those that are surface water-sourced. In western Oregon, streams arising in the Coast Range are surface water-sourced from rain, whereas streams arising in the Cascades are groundwater-sourced from a mix of rain and snow, with predominately rain below 1,300 feet elevation, predominately snow above 4,900 feet, and a mix of rain and snow between 1,300 and 4,900 feet (Tague and Grant 2004, Safeeq *et al.* 2013, Klos *et al.* 2014). Total annual streamflow has been declining in the Pacific Northwest and current flows are similar to those in the 1930s, one of the driest periods on record (Luce *et al.* 2013). While scientists do not understand the exact causes, some combination of warming temperatures, decreasing snow, and decreasing mountain precipitation due to weakening of the westerly winds in winter appear to play a role (Dalton *et al.* 2013, Luce *et al*. 2013, Berghuijs *et al.* 2014).

The timing of peak flows is also shifting across the western U.S. with an increased proportion of the annual flow occurring in winter and a decreasing proportion in summer (Safeeq *et al.* 2013). Rain-dominated streams have earlier peak spring flows and declining late fall and winter flows, whereas snow-dominated streams have greater reductions in summer flows (Safeeq *et al.* 2013). However, the response of individual streams varies, depending on underlying geology. For example, streams originating in geology that supports slow-draining, deep groundwater exhibit less variability in flow regimes than streams originating in geology that supports shallow, rapid subsurface flow (Tague and Grant 2004 and 2009). However, as snowpack declines, the absolute change in summer base flows is greater in the deep groundwater systems than in the shallow, rapid subsurface systems (Tague *et al.* 2008, Tague and Grant 2009, Safeeq *et al.* 2013).

Stream temperatures in the United States as a whole and in the Northwest have been increasing (Bartholow 2005, Kaushal *et al.* 2010, Dalton *et al.* 2013). However, there is local and regional variation. Kaushal *et al.* (2010) reported statistically significant upward trends for Fir Creek, the North Santiam River and Rogue River, statistically non-significant trends for the Bull Run, South Fork Bull Run, and North Fork Bull Run rivers, and no trend for the South Santiam River. Blue River had a statistically significant cooling trend, although all records for Oregon were relatively short. The direction and significance of stream temperature trends depend on the period of record, sample size, and spatial extent of the samples (Arismendi *et al.* 2012).

Northwest streams typically have cooling trends in spring, consistent with increasing precipitation, but warming temperatures in summer, fall, and winter. The cooling in spring is not enough to fully offset warming in the other seasons, leading to an overall warming trend in stream temperatures (Isaak *et al.* 2012). The rates of warming are highest in summer, with greater summer warming occurring in streams with the largest decrease in discharge instead of the streams with the lowest discharge (Isaak *et al.* 2012). Overall, stream temperatures track with air temperatures, although there is often a slight lag (Isaak *et al.* 2012, Arismendi *et al.* 2013). Diabat *et al.* (2013) found that increasing nighttime temperatures appears to be a bigger driver of stream temperature changes than increasing daytime temperatures, indicating that the observed increasing minimum temperatures in all seasons may be important factors. In the John Day River in eastern Oregon, the time lag between stream temperature maxima and stream flow minima has decreased by approximately 24 days since 1950, potentially due to earlier timing of stream flow minima, especially given no observed change in the timing of stream temperature maxima (Arismendi *et al.* 2013). Similar changes are likely within the planning area, given that the same air temperature and stream flow changes are occurring across Oregon.

Wildlife and Wildlife Habitat

Several different studies have documented changes in fish and wildlife species consistent with those expected with increasing temperatures worldwide, nationally, and statewide. These observed effects include changes in migration timing, species ranges, species abundance, and similar impacts (Parmesan and Yohe 2003, Hixon *et al.* 2010, Tillmann and Glick 2013, Groffman *et al.* 2014). Detailed discussion of any observed climate change effects on all fish and wildlife species found within the planning area is not possible. However, a brief discussion of climate influences on northern spotted owl and marbled murrelet illustrates how climate change may be influencing two important species.

Climate can affect species persistence directly by affecting survival of the young and indirectly by altering habitat, such as nesting sites or prey abundance. With northern spotted owls, climate conditions that affect prey abundance affect owl survival, with populations decreasing when winters and early spring were cold, wet and stormy or summers are droughty, and populations increasing when late spring through early fall are moist (Franklin *et al.* 2000, Glenn *et al.* 2010, Glenn *et al.* 2011). In Cascade populations, owl survival also decreases as the number of summer days with temperatures at or above 90 ºF increases (Glenn *et al.* 2010, Glenn *et al.* 2011). Under stable habitat conditions, climate is apparently the dominant influence on owl populations, but as habitat quality declines, the effects of climate variation on survival increases (Franklin *et al.* 2000). Climate effects appear to be local, rather than regional, with some locations experiencing lags in effect with respect to sub-adult survival (Glenn *et al.* 2010, Glenn *et al.* 2011).

Marbled murrelets are affected by both land and ocean conditions. Various studies have attributed population declines in the 1990s and 2000s to loss of nesting habitat and low food availability at sea (Strong 2003, Peery *et al.* 2004, Becker *et al.* 2007, Norris *et al.* 2007, Miller *et al.* 2012b, Raphael *et al.* in press), but disagree on which is more important. Poor ocean conditions arising from climate may have contributed to murrelet population declines in the 1990s by affecting food availability at sea, but given improved ocean conditions since the mid-2000s, climate may not have been a substantial factor in continued declines. Raphael *et al.* (2015) found that at the current low murrelet population levels, much of the ocean habitat with apparently suitable forage conditions is presently unused, but also that access to finer-scaled spatial and temporal conditions may have increased their ability to detect marine influences on murrelet at-sea distributions. Norris *et al.* (2007) found that since the 1950s, murrelet populations in southern British Columbia were adversely affected by low food quality, specifically by less abundance of small fish in the bird's diet. Off the central California coast, Becker *et al.* (2007) found that murrelet productivity was correlated with rockfish and krill productivity, which were higher when ocean temperatures were cooler. When food resources are low, murrelet adults must fly further and dive more often, using more energy (Peery *et al.* 2004). As with northern spotted owls, these findings indicate that even when sufficient high-quality nesting habitat is available, climate events and climate change can influence murrelet populations by affecting the conditions important for prey species.

Climate Change Projections and Potential Effects on Resources

Dalton *et al.* (2013) summarized the most recent climate change projections for the Pacific Northwest (Oregon, Washington, Idaho, and western Montana) under representative concentration pathways (RCP) 4.5 and 8.5. These pathways represent a substantial reduction in greenhouse gas emissions in the near future and "business as usual," respectively. Current greenhouse gas concentrations and atmospheric CO_2 concentrations are tracking with the RCP 8.5 pathway (Peters *et al.* 2013, Le Quéré *et al.* 2014). By 2041–2070, temperatures are projected to increase in all seasons, with the largest increase in summer (**Table 3-16**). Precipitation is projected to increase modestly in winter, spring and fall and decrease in summer throughout the Pacific Northwest. The area west of the Cascades where the maritime influence is strong would not warm as much as elsewhere in the Pacific Northwest, particularly in spring. Dalton *et al.* (2013) did not identify any sub-regional differences in precipitation.

Table 3-16. Expected changes in mean annual and seasonal temperature and precipitation by 2041–2070 as compared to means in the 1950–1999 for RCP 4.5 and RCP 8.5

Season	Temperature		Precipitation	
	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
Annual	4.3 ºF (2.0–6.7 ºF)	5.8 ºF (3.1–11.5 ºF)	+2.8% (-4.3–10.1%)	+3.2% (-4.7–19.8%)
Winter (Dec.–Feb.)	4.5 ºF (1.0–7.2 ºF)	5.8 ºF (2.3–9.2 ºF)	+5.4% (-5.6–16.3%)	+7.2% (-10.6–19.8%)
Spring (Mar.–May)	4.3 ºF (0.9–7.4 ºF)	5.4 ºF (1.8–8.3 ºF)	+4.3% (-6.8–18.8%)	+6.5% (-10.6–26.6%)
Summer (Jun.–Aug.)	4.7 ºF (2.3–7.4 ºF)	6.5 ºF (3.4–9.4 ºF)	-5.6% (-33.6–18%)	-7.5% (-27.8–12.4%)
Fall (Sep.–Nov.)	4.0 ºF (1.4–5.8 ºF)	5.6 ºF (2.9–8.3 ºF)	+3.2% (-8.5–13.1%)	+1.5% (-11.0–12.3%)

Note: Ranges are in parentheses

Some of the projected changes displayed in **Table 3-16** are not consistent with observed trends displayed in **Figure 3-20** and **Figure 3-21**, with differences in precipitation especially notable. Climate models project an increase in fall precipitation, yet the observed trend is a decrease. Similarly, the observed trend in summer precipitation is a slight, statistically insignificant increase, whereas the projection is for a decrease. Observed and projected temperature changes are more consistent, but the magnitude of change shows some differences. For example, the observed increase in maximum summer temperatures in the Willamette basin is small; suggesting that the mid-century increase may not be as large as projected.

The differences between the projections and observed trends likely arise due to differences in the size of area assessed and resolution of the data used. Trends in a smaller part of the Pacific Northwest can differ from those for the area as a whole. The WestMap data are at a finer resolution than the climate projection data, so likely better reflects the effects of topography on both temperature and precipitation. The projected changes in precipitation in particular encompass large ranges, including both increases and decreases in all seasons in both climate change scenarios, even though the ensemble mean indicates increases in winter, spring, and fall and decreases in summer. Lastly, observed trends in precipitation may not continue in the future if increasing temperatures result in fundamental changes in the atmospheric circulation patterns that bring moist air into Oregon.

By 2041–2070, the number of frost-free days is projected to increase by 35 days (± 6 days) relative to 1971–2000. Climate modeling indicated the number of growing degree-days using a base of 50 ºF would increase by 51 percent (± 14 percent). The number of hot days (i.e., days with maximum temperatures greater than 90 ºF, 95 ºF and 100 ºF, as well as the number of consecutive days above 95 ºF and 100 ºF) would increase, while the cold days (with minimum temperatures of less than 32 ºF, 10 ºF, and 0 ºF) would decline. The number of very wet days (with precipitation above 1 inch, 2 inches, 3 inches, and 4 inches) would increase, as would the dry spells (maximum run of days with less than 0.1 inch).

As temperatures continue to warm, the extent of snow-dominated winter precipitation would continue to decline (Mote *et al.* 2005). By mid-century, none of the Cascades ecoregion (EPA Level-III ecoregion 4) would remain strongly snow-dominated, and the extent of strongly rain-dominated area would increase by 42 percent to an estimated 59 percent of the ecoregion. Although none of the Coast Range (EPA Level-III ecoregion 1) and the Klamath Mountains (EPA Level-III ecoregion 78) are strongly snow-dominated, all of the Coast Range and 95 percent of the Klamath Mountains are projected to become strongly rain-dominated by mid-century (Klos *et al.* 2014).

Several different climate change assessments project that the frequency, duration, and severity of drought will increase globally, nationally, and regionally (Dai 2011, Gutzler and Robbins 2011, Jung and Chang 2012, Vose *et al.* 2012, Dalton *et al.* 2013, Walsh *et al.* 2014). However, the term 'drought' remains ill-defined, making projections of changing drought risks difficult to evaluate. Drought is not just a deficit in precipitation, but insufficient water to meet needs. Temperature plays a very important role that many drought assessment tools either do not incorporate or incorporate inadequately (Bumbaco and Mote 2010). Three different types of drought occur in the Pacific Northwest (Bumbaco and Mote 2010) and more than one kind of drought can occur in a given year. The first type is very low winter precipitation with seasonally typical temperatures (dry drought), as represented by conditions in 2001. The second type of drought consists of warm winter temperatures with normal precipitation, resulting in more rain and low snow packs, followed by a very warm, dry summer (hot-dry drought), as represented by conditions in 2003. This type of drought can develop suddenly with little or no warning and is associated with low summer streamflow in western Oregon. The third type of drought consists of a warm, dry winter followed by a near normal summer (warm-dry drought), as represented by conditions in 2005. A characteristic of all these drought types is a low winter snowpack combined with high evapotranspiration demand during the growing season. The warm-dry drought and hot-dry drought are also associated with more severe fire seasons in western Oregon. Based on the temperature and precipitation projections, Northwest climate scientists expect the warm-dry and hot-dry drought types will increase in frequency while the dry drought type will likely decrease in frequency (Bumbaco and Mote 2010).

A particular emerging concern among forest scientists who study climate change is the increasing role of drought in tree and forest mortality (e.g., Allen *et al*. 2015 and references therein, McDowell and Allen 2015, and Millar and Stephenson 2015 and references therein). Variously called 'global-change-type drought', 'hot drought', and 'hotter drought', the focus is the role higher temperatures play in increasing drought intensity and severity, tree and forest water stress, and subsequent tree vulnerability to insects, pathogens, and fire (Allen *et al*. 2015, Millar and Stephenson 2015). While the most severe effects have occurred in semi-arid forests, scientists are increasingly concerned about the vulnerability of temperate forests (Millar and Stephenson 2015). There is scientific disagreement on just how vulnerable these forests are (Allen *et al*. 2015). In a review paper, Allen *et al*. (2015) identified six global vulnerability drivers:

- Droughts eventually occur everywhere
- Warming produces hotter droughts
- Atmospheric moisture demand increases nonlinearly with temperature during drought
- Mortality can occur faster in hotter drought
- Shorter droughts occur more frequently than longer droughts and can become lethal under warming, increasing the frequency of lethal drought nonlinearly

- Mortality happens rapidly relative to growth intervals needed for forest recovery

These so-called hotter droughts could increase tree mortality in western Oregon in the future. These hotter droughts could also affect cold-water fish and aquatic organisms, species that depend on cooler temperatures, and species that depend on relatively frequent rain in summer.

There are substantial uncertainties associated with the various predictions discussed below. The choice of global climate model used is typically the largest source of variability in simulation study results (Hurteau *et al.* 2014). There is also a fundamental scale mismatch between the spatial resolution of climate predictions, even those that have been downscaled, and the size of the typical management unit simulated in many studies (Hurteau *et al.* 2014).

Tree Species

Understanding how climate change may affect species composition and forest productivity has been the topic of numerous studies. Results vary depending on the spatial and temporal scale of the studies and assumptions about climate drivers and the interaction between climate and non-climate drivers that underpin such studies. Therefore, interpreting what these results might mean for land management remains challenging. Generally, trees can respond to changing climate through phenotypic plasticity (altering physiology), morphology, and reproduction within their existing genetic capability, through natural selection, or through migration, as summarized by Peterson *et al.* (2014, Chapter 5).

There are several approaches to modeling potential vegetation change based on statistics, ecological processes, or a mix of the two, all with their strengths and weaknesses (Peterson *et al.* 2014, Chapter 6). Most studies of how tree species compositions may shift use bioclimatic envelope models, a statistical method that bases predictions on the climate where species are present and absent. Despite their limitations, bioclimatic envelope models are the most widely used, due to ease of use and applicability at a number of scales (Araújo and Peterson 2012, Peterson *et al.* 2014). Other factors, such as competition, land uses, soils, topography, and disturbance regimes, can prevent a species from occupying an area that is otherwise suitable climatically, or allow it to remain in a location that broader-scale climate predictions indicate would not remain suitable (Peterson *et al.* 2014). Process-based models and hybrid models can incorporate many non-climate drivers. However, these models remain rarely used to date, due to the lack of information needed to parameterize such models for most species, high computational demand, and lack of information on how climate affects many forest tree processes, particularly regeneration, growth, and mortality (Peterson *et al.* 2014).

Using the climate module of the Forest Vegetation Simulator (Climate-FVS), the climatically suitable area for many important timber species in the planning area would contract by mid-century, primarily from the lower elevations, with generally much greater contraction under RCP 8.5 than under RCP 4.5 (Diaz et al. 2014). The suitable climate for western hemlock, western redcedar, Pacific yew, incense cedar, Port-Orford-cedar, grand fir, white fir, noble fir, and sugar pine are projected to contract substantially in western Oregon under both pathways. Several modeling approaches indicate probable loss of climatically suitable areas for western hemlock and western redcedar, primarily in southwest Oregon, but the projected losses from Climate-FVS are likely too high (Diaz et al. 2014). The area climatically suitable for Douglas-fir may increase in the Klamath Falls Field Office. The Climate-FVS analysis projected that the climatically suitable area for several species more typically found in California, such as several species of oak, white alder, California laurel, and knobcone pine would expand into Oregon and up the eastern side of the Coast Range and foothills of the Cascades.

The fate of Douglas-fir is of particular interest due to its current dominance throughout western Oregon and importance for both timber and wildlife habitat. Many studies predict some degree of decline in the extent of Douglas-fir, particularly at lower elevations. The degree of decline varies widely between studies, ranging from major contractions, especially from the Coast Range, to little change (Bachelet *et al.* 2011 and references therein, Coops and Waring 2011, Peterson *et al.* 2014, Rehfeldt *et al.* 2014a).

Using the dynamic global vegetation model MC2, Bachelet (2014 in Diaz *et al.* 2014) projected substantial contraction of the maritime conifer forest and expansion of both the temperate conifer forest more typical of eastern Oregon and temperate cool mixed forest more typical of the central and southern Coast Range (data available at DataBasin 2014). Using MC1, Rogers *et al*. (2015 and references therein) also projected a contraction of the highly productive maritime conifer forests and expansion of the lower productivity warm temperate and subtropical mixed forests in western Oregon by the end of the century, although the degree of change varied by climate model. Douglas-fir is a substantial component of all three forest types, but consists of different ecotypes, or climatypes,[43] of the species (Rehfeldt *et al.* 2014c). In addition, the temperate cool mixed-conifer forest type includes a number of so-called hardwoods, such as tanoak, madrone, and several species of oaks, suggesting broad consistency between the statistical approach used by Climate-FVS and the process-based approach used in MC1 and MC2.

With shifting bioclimate suitability, a primary concern is the rate at which climate is changing (climate velocity), relative to the rate at which a given species can migrate. For plants, migration rates depend on seed production rates, seed dispersal distances, average seed viability, presence or absence of barriers, biotic interactions between migrating species and current species, and the presence of suitable habitat between the current location of a given climatype and the likely future location of suitable climate (Peterson *et al.* 2014). Climate velocity is generally slower in complex terrain, and complex terrain is more likely to provide climate refugia (Peterson *et al.* 2014), such as is present in western Oregon. The reserve land use allocations in the different alternatives and the Proposed RMP may provide some climate refugia, depending on location, size, orientation, and conditions on adjoining lands. Further, species migration rates typically lag behind climate velocity rates with considerable regional variation in both rates and direction (Dobrowski *et al.* 2013). Thus, while several studies indicate that climate velocity exceeds the migration rate of many plant species, including many tree species, determining the vulnerability of individual species to climate change based on climate velocity is difficult with large uncertainties.

As climate shifts, forest scientists expect background tree mortality will increase, but do not expect major die-offs of mature trees because of changing climate alone. Instead, die-offs are expected from the interaction between changing climate and disturbance events, such as drought and fire (Allen *et al.* 2010, Peterson *et al.* 2014) or the interaction between changing climate and increased competition for water and carbon (Clark *et al.* 2014). Changes in vegetation are likely to be abrupt following an event such as prolonged drought, insect outbreak, or wildfire, when mature trees are killed and regeneration fails. The bioclimatic envelope for seedlings of montane species, such as Douglas-fir and ponderosa pine, typically differs from and is narrower than the bioclimatic envelope in which established trees can persist (*Bell et al.* 2014). Species with broad distributions typically have ecotypes/climatypes adapted to local conditions; as local conditions change, a given climatype may not be able to reestablish following a disturbance. Using climate variables, Rehfeldt *et al.* (2014b, 2014c) predicted that the varieties of Douglas-fir and ponderosa pine found in western Oregon are likely to persist, although probably would not persist in an area that includes the Klamath Falls Field Office. In contrast, St Clair and Howe (2007), using characteristics such timing of bud set and bud break and root:shoot ratios, predicted that most coastal Douglas-fir ecotypes in western Oregon and Washington would be maladapted to the expected climate at the end of the 21st century. The authors posited that much of the risk arises from differences in drought hardiness in the different ecotypes relative to expected changes in seasonal and prolonged drought, and lengthening of the growing season (St Clair and Howe 2007). A more recent study found that Douglas-fir

[43] A climatype is a population defined primarily by the temperature and precipitation ranges to which it is presumably adapted genetically.

populations from areas with relatively cool winters and warm, dry summers, similar to that found in the Willamette Valley basin, might be better adapted to cope with future expected drought conditions than Douglas-fir from other areas (Bansal *et al.* 2015).

Available soil water during the growing season and soil water storage capacity are important drivers of which tree species can grow where and how well, particularly at lower and middle elevations (Chen et al. 2010, Weiskittel *et al.* 2011, Clark *et al.* 2014, Mathys *et al.* 2014, Peterson *et al.* 2014). Year-round soil water availability and evapotranspiration demand are primary factors in the distribution of western hemlock (Gavin and Hu 2006, Mathys *et al.* 2014). Western redcedar distribution is controlled in part by the availability of soil water in summer and winter (Mathys *et al.* 2014). Climate change is projected to extend growing seasons and increase evapotranspiration demand in summer, increasing the amount of drought stress forests in western Oregon will experience (Peterson *et al.* 2014). Site index for many species in western Oregon could decrease by 10–30 percent by 2060, largely due to increased dryness in the growing season (Weiskittel *et al.* 2011).

Potentially mediating the expected increased drought stress is the increasing atmospheric CO_2 concentrations. As atmospheric CO_2 concentrations increase, trees do not have to open stomates as frequently or for as long to obtain the amount of CO_2 necessary to drive photosynthesis, thereby reducing water loss that occurs at the same time (photorespiration) and increasing drought tolerance (Peterson *et al.* 2014). A recent study in the northern Rockies indicates that while both ponderosa pine and Douglas-fir have experienced increases in water use efficiency with increases in basal area increment in the latter half of the 20th century, ponderosa pine had greater increases, suggesting a possible shift in competitive advantage (Soulé and Knapp 2014). However, few studies have examined how different tree species might respond to changing atmospheric CO_2 concentrations, particularly in conjunction with changing temperatures.

Along with changing species composition is an expected decline in growth rates and overall site productivity, particularly under business as usual emissions scenarios (Shive *et al.* 2014, Diaz *et al.* 2015). Climate modeling indicates that such downward shifts would begin about mid-century with larger changes potentially occurring in the Coos Bay, Eugene, and Salem Districts, than in the Medford and Roseburg Districts and the Klamath Falls Field Office (Diaz *et al.* 2015). Using Climate-FVS Diaz *et al.* (2015) found that overall productivity could decline by one site class by mid-century and by two to three site classes by the end of the century as compared to current conditions, with the exception of the Klamath Falls Field Office. In the Klamath Falls Field Office area, productivity increased slightly by mid-century and then leveled out through the end of the century. These differences are likely due to how the different species and genotypes, and forests of different ages respond to drought and changing atmospheric CO_2 concentrations, particularly with respect to seedling establishment and survival (Anderson-Teixeira *et al.* 2013). The Coos Bay, Eugene, and Salem Districts have humid to subhumid climates whereas the Medford and Roseburg Districts and the Klamath Falls Field Office are semi-arid. Forests in humid climates respond primarily to short-term drought, in subhumid climates to both short- and long-term drought, and in semiarid climates to long-term drought (Vincente-Serrano *et al.* 2014). Thus, forests in the warmer, drier part of the planning area are less vulnerable to drought.

The changes in growth rates and site productivity have implications for timber production beyond mid-century. Under lower emissions scenarios that hold the rise in the average global temperature to less than 3.6 ºF, harvest volume can remain relatively unchanged, although total volume on the landscape declines and then levels out and management intensity may need to increase (Diaz *et al.* 2015). However, under business as usual emissions scenarios, maintaining a set harvest value is likely to result in the combination of harvest and tree mortality exceeding growth by the end of the century (Diaz *et al.* 2015). After mid-century, sustaining a particular yield of timber would likely require shorter rotations and more clearcutting with less thinning and uneven-aged management and would become increasing difficult as the variability in the harvestable volume available increases (Diaz *et al.* 2015). As the desired volume of stable harvest increases so does the difficulty in sustaining that volume become after mid-century under business as usual emissions scenarios, especially for the Coos Bay, Medford, and Roseburg Districts.

Insect Outbreaks and Pathogen Spread

Warming temperatures, wetter springs, and increased drought stress may increase the extent and impact from Swiss needle cast, sudden oak death, Port-Orford-cedar root disease, other root diseases such as Armillaria and Heterobasidion, bark beetles, and western spruce budworm in western Oregon (Chen *et al.* 2003, Manter *et al.* 2005, Campbell *et al.* 2006, Venette and Cohen 2006, Stone *et al.* 2008, Bentz *et al.* 2010, Chmura *et al.* 2011, Evangelista *et al.* 2011, Sturrock *et al.* 2011, Vose *et al.* 2012, Lee *et al.* 2013, Creeden *et al.* 2014, Flower *et al.* 2014, Peterson *et al.* 2014) (the discussion under Insects and Pathogens above has more detail). With their short generation times, both insects and pathogens can evolve more quickly than trees. Most insects and pathogens can migrate at faster rates than hosts, since wind and water disperse many of them farther than tree seeds (Sturrock *et al.* 2011, Peterson *et al.* 2014).

An additional effect may be the appearance of new insects and pathogens currently not present in western Oregon or the emergence of a minor insect or pathogen into a major disturbance factor (Bentz *et al.* 2010, Vose *et al.* 2012, Tillmann and Glick 2013, Peterson *et al.* 2014). Climate change will also alter biological synchrony between hosts and pests, since most pests are host-specific, but such changes and the resulting impacts are difficult to predict (Chmura *et al.* 2011, Sturrock *et al.* 2011). For example, both Douglas-fir bark beetle and spruce bark beetle have obligate adult dormancy periods (diapause) triggered by low temperature that could be disrupted by increasing minimum temperatures (Bentz *et al.* 2010).

Wildfire

A number of recent studies have examined the potential effects of climate change on wildfire, as well as what the potential changes in wildfire could mean to greenhouse gas emissions and carbon storage. Most studies have examined how annual burned area may change, while an increasing number of studies have begun examining how the probability of wildfire and wildfire severity may change. Using Climate-FVS Diaz *et al.* (2015) found that the area of high fire hazard would change very little under lower emissions scenarios and increase somewhat after mid-century under the business as usual emission scenario in the moister districts (Coos Bay, Eugene and Salem). In the warmer-drier portion of the decision area, the area of high fire hazard would increase somewhat under lower emissions scenarios but increase substantially and rapidly after mid-century under the business as usual scenario, particularly for the Medford and Roseburg Districts.

All studies examined indicate that the annual area burned would increase, although they differ on how much of an increase will occur, when, or where. Differing scales of analysis and analysis methods make direct comparisons between studies difficult. The National Research Council (2011) reported that for a 1 ºC increase in global temperature, burned area in the Cascades and Coast Range could increase by 428 percent and burned area in southwest Oregon could increase by 312 percent. Other estimates include a 78 percent increase in burned area by mid-century in the Pacific Northwest as a whole (Spracklen *et al.* 2009) and at least a 60 percent increase in western Oregon and Washington by the end of the century (Rogers *et al.* 2011). Warmer and drier conditions are the primary drivers behind these projected increases in burned area, as well as predictions of increased fire severity (Littell *et al.* 2009, Abatzoglou and Kolden 2013, Cansler and McKenzie 2013, Peterson *et al.* 2014). The wetter forests of western Oregon, mixed severity fire regimes, and high severity fire regimes are projected to see greater changes as warmer and drier conditions in summer and increased frequency of drought lengthen the fire season, the probability of severe fire weather increases, and the combination of drought and heating from fire adversely affect tree xylem conductivity (Hessl 2011, Rogers *et al.* 2011, Abatzoglou and Kolden 2013, van Mantgem *et al.* 2013, Peterson *et al.* 2014, Rogers *et al.* 2015). Rogers *et al.* (2015) attributed the increased vulnerability in the wetter forests to their inability to benefit from increased winter precipitation combined with the effects of increased summer drought. Under the Hadley climate model, increased fires in western Oregon would result in a predicted net loss of carbon by the end of the century (Rogers *et al.* 2015)

These same changes would also increase fire severity and the occurrence of very large fires (50,000 acres and larger) (Stavros *et al.* 2014b). Very large fires in the Pacific Northwest geographic area (Oregon and Washington) tend to occur under hotter, drier conditions, particularly in the first week following discovery of the fire, which historically occurred in three weeks (Stavros *et al.* 2014a, Stavros *et al.* 2014b). By mid-century, the number of weeks potentially supporting the occurrence of very large fires will increase to 6–8 weeks (Stavros *et al.* 2014b, supplementary table 1).

Other changes in wildfire include changes in fire probability and variability. Romps *et al.* (2014) projected a 50 percent increase in lightning occurrence across the continental U.S. by the end of the century. Guyette *et al.* (2014) predicted a 40–80 percent increase in fire frequency in western Oregon, with the largest changes predicted for colder and wetter ecosystems. Liu *et al.* (2013) also predicted increased inter-seasonal and inter-annual variability in fire potential along the Pacific coast. Using a process similar to one used in the Northwest Forest Plan 15-year monitoring report (Davis *et al.* 2011), Davis *et al.* (2014) projected that by 2060, the area where large wildfires are highly and very-highly probable would expand in the Klamath Falls Field Office, and the Medford and Roseburg Districts, and where large fires are at least moderately probable would expand into the Eugene, Salem, and Coos Bay Districts. However, the probability of large wildfires would remain low in most of the Coos Bay and Salem Districts.

Changes in annual area burned and fire severity would have clear implications for air quality, carbon storage potential, and greenhouse gas emissions as well. Greenhouse gas emissions would increase and carbon storage decrease as burned area and fire severity increase. Air quality typically degrades in years with higher acres burned and higher fire severity, due to longer duration burning on individual fires and greater degree of smoldering combustion that occurs during more severe fire seasons. This degradation typically results in more intrusions into mandatory Class I areas and greater effects to human health in Smoke Sensitive Receptor Areas (see Air Quality in this chapter). Earles *et al.* (2014) expect that as drought and fire frequency increase, carbon storage will destabilize where fire suppression has increased stand densities and ladder fuels and altered species compositions. The authors also assert that studies that compare the carbon effects of active management to no management in fire-suppressed forests are using the wrong baseline, based on a definition of carbon carrying capacity provided by Keith *et al.* (2009) (Earles *et al.* 2014). Keith *et al.* (2009) defined carbon carrying capacity in a manner that includes natural disturbance regimes, such as fire, but excludes anthropogenic disturbance, such as logging. Under this definition, as fire frequency and drought-induced mortality increases, carbon carrying capacity decreases with the implication that variability in carbon storage is much higher in fire-suppressed forests than in fire-included forests (Earles *et al.* 2014).

Scale mismatches means that important bottom-up controls on fire (e.g., topography, vegetation, and fuel availability) cannot be adequately incorporated into projections of how climate change may affect wildfires (Cansler and McKenzie 2013, Bowman *et al.* 2014). Other sources of uncertainty include whether drought-induced tree mortality will increase and tree responses to increased atmospheric CO_2 concentrations (Hurteau *et al.* 2014). Predictions of changes in burned area, fire size, and fire severity assume that past relationships between climate and fire continue to hold (Littell *et al.* 2009, Cansler and McKenzie 2013, Bowman *et al.* 2014). If past relationships between climate and fire do not hold, it is not clear what would change, how, or when. If they do hold, then the landscapes of the future are likely to have a higher proportion in homogeneous, early seral patches, lower biodiversity, and lower resilience to other stressors, primarily in drier forests (Cansler and McKenzie 2013, Peterson *et al.* 2014). Climate and weather are top-down controls on fire (e.g., Littell *et al*. 2009, Abatzoglou and Kolden 2013, and Higuera *et al*. 2015), but bottom-up controls are also important (e.g., Halofsky *et al*. 2011, Bowman *et al*. 2014, Peterson *et al*. 2014, and Higuera *et al*. 2015); the greater the spatial complexity of bottom-up controls, the less likely that top-down controls will override them (Cansler and McKenzie 2013).

Streamflow and Temperature

By mid-century, climate modeling indicates peak flows from snowmelt would occur 3–4 weeks earlier in the Pacific Northwest as compared to the current timing (Dalton *et al.* 2013 and references therein). All streams in western Oregon would be rain-dominant by the end of the century (Dalton *et al.* 2013 and references therein, Figure 3.2; Klos *et al.* 2014). Since rain-dominant streams tend to experience peak flows earlier than snow-dominant systems, some streams originating in the Cascades would experience earlier peak flows and reduced spring and summer flows (Dalton *et al.* 2013). If winter precipitation increases as projected, peak flows would increase in magnitude, but timing would otherwise not change in systems that are already rain-dominated (Dalton *et al.* 2013). Mean annual streamflow could initially decrease by the 2020s, possibly due to increased evapotranspirational demand, and then increase through the end of the century by 0.6 to 5.5 percent, apparently driven by projected increases in winter precipitation (Wu *et al.* 2012). Mean summer streamflow is expected to continually decrease, becoming approximately 30 percent less by the end of the century (Wu *et al.* 2012)

Non-climate factors, such as degree of stream shading, amount of groundwater input, and how streams and reservoirs are managed are also important drivers of stream temperatures, and can result in stream cooling at the same time that air temperatures are warming (Arismendi *et al.* 2012). Regardless, in the Northwest, warming air temperatures and declining summer base flows are strongly associated with warming stream temperatures (Kaushal *et al.* 2010, Isaak *et al.* 2012), with additional warming expected through the 21st century. If past trends continue, then some streams would be 1.6–2.0 ºF warmer by mid-century than the 1980– 2009 baseline (Isaak *et al.* 2012, Wu *et al.* 2012).

Wildlife and Wildlife Habitat

Very few studies have examined the potential implications of climate change for northern spotted owls, and the BLM found no studies that directly addressed marbled murrelet. Rapid climate change could place additional stress on species already at risk of extinction from habitat loss, such as Fender's blue butterfly (Hixon *et al.* 2010). Fish and wildlife species considered most vulnerable to climate change include—

- Several terrestrial and many aquatic invertebrates;
- Amphibians and cold-water fish, especially those with restricted ranges or narrow temperature requirements;
- Long-distance migratory shorebirds that winter or stop over in western Oregon; and
- Forest birds, especially those associated with either early seral habitat or old-growth habitat (Hixon *et al.* 2010 and references therein, NABCI 2014).

Projecting climate change effects on most terrestrial species is limited by the current inability of vegetation models to project changes in stand structure in response to climate changes, and the lack of knowledge of how climate directly influences the presence, absence, and fecundity of a given species (Carroll 2010, Hixon *et al.* 2010). Carroll (2010) projected that the extent of suitable habitat for northern spotted owl could contract in the Coast Range and southwest Oregon and shift upward in elevation in the Cascades by the end of the century, primarily due to changes in precipitation regimes that affect survival (see also Franklin *et al.* 2000, Glenn *et al.* 2010, Glenn *et al.* 2011).

Changes in disturbance regimes could disfavor species associated with old-growth forests, by shifting more of the landscape into earlier seral stages, altering species compositions to ones less preferred, reducing the extent of large trees and structurally-complex forest, and decreasing patch sizes preferred for different life stages, such as nesting (Vose *et al.* 2012, Dalton *et al.* 2013, section 5.4.2, Peterson *et al.* 2014). These same types of changes could also adversely affect preferred prey species for predators like the northern spotted owl, although the ability of the owl to shift prey preferences is not well documented. Ocean warming and changes in ocean chemistry along with increasing extent and duration of dead zones (Hixon *et al.* 2010, Section 7.4 and references therein, Dalton *et al.* 2013, Chapter 4) could adversely affect the prey base used by species such as marbled murrelet.

Potential Effects of Alternatives in Adapting to Climate Change

In general, BLM actions to respond to changes in climate (such as modifying seed stock for replanting after harvest) would be implementation-level decisions that would be made subsequent to the approval of the RMP. This discussion considers how the alternatives and the Proposed RMP would set the stage for the BLM to take such actions in the future.

The current Douglas-fir-western hemlock-western redcedar forests typical of western Oregon developed in the last 5,600 years, apparently in response to cooling climate (Shafer *et al.* 2010 and references therein, p. 178). Historical tree migration rates during the Holocene range from 6 to 93 miles per century, whereas the current climate velocity is estimated at 186–311 miles per century (Tillmann and Glick 2013 and references therein, p. 200). Given the expected climate velocity and the potential changes discussed above, scientists who study climate change impacts on natural resources recommend varying levels of active management in order to preserve or protect social and ecosystem values (e.g., Joyce *et al.* 2009, Spies *et al.* 2010, Peterson *et al.* 2011, Stein *et al.* 2014, and Millar and Stephenson 2015). Stein *et al.* (2014) classify potential management actions into three general categories:

1. Resistance actions – those intended to maintain the status quo of species and systems
2. Resilience actions – those intended to improve the capacity of the system to return to desired conditions or to maintain some level of desired functionality in an altered state
3. Realignment actions – those intended to enable or facilitate the transition to a new functional state

However, many of the recommended types of forest management actions tend to overlap at least two of the categories. Generally, recommended actions for responding to climate change consist of reducing existing stresses, increasing resistance and resilience to climate change and other stressors, and enabling change where it is inevitable (Joyce *et al.* 2009, Spies *et al.* 2010, Peterson *et al.* 2011, Vose *et al.* 2012, Peterson *et al.* 2014, Stein *et al.* 2014). As summarized by Joyce *et al.* (2009), Spies *et al.* (2010), and Peterson *et al.* (2011) specific types of recommended actions include—

- Thinning forest stands to reduce competition and drought stress, increase diversity (species, structure, age classes, sizes, patch sizes, spacing) at the stand and landscape scales, and increase resistance to fire, insects, and pathogens;
- Protecting large old trees, large snags, and large downed wood;
- Planting new genotypes/ecotypes/climatypes and species to aid development of communities that can persist under both the current and expected future climate; and
- Identifying potential climate change refugia at regional and local scales

These approaches are known as ‘no regrets’ decisions and bet-hedging, given the large uncertainties over the rate and magnitude of climate change in any one location (Vose *et al.* 2012).

Whether thinning would increase or reduce forest resiliency in the face of climate change is scientifically controversial. Studies have shown strong evidence that unmanaged forests have great capacity for so-called self-correction and self-organization following natural disturbances (e.g., Peterson 2002, Scholl and Taylor 2010, and Amoroso *et al*. 2013) and some types of harvest prescriptions (e.g., Drever *et al*.

2006 and Messier *et al.* 2015). Of particular concern is misapplying thinning prescriptions more suitable for low-severity fire regimes to mixed-severity fire regimes (e.g., Odion *et al.* 2014 and DellaSala *et al.* 2015). In part, the controversy is about the breakpoint between low and mixed severity. The severity of any particular disturbance occurs on a continuum which scientists and managers bin into categories usually labeled as low, mixed, and high severity. Since there is no scientific method for determining breakpoints along a continuum, the definition of severity categories is subjective. While the scientific community has long recognized that the low-severity bin includes some amount of high severity patches, scientists disagree on how much high severity can be present before the appropriate bin should be mixed severity. The BLM uses the fire severity classes developed under the LANDFIRE project; which defines low severity as 6–25 percent stand replacement (high severity patches) (NIFTT 2010, p. 99). Others believe that low severity regimes contain less than 25 percent stand replacement (e.g., Odion *et al.* 2014 and Hanson *et al.* 2015). This differing view creates disagreement on what parts of the landscape fall into the different fire regimes and, therefore, what thinning prescriptions are appropriate. In addition, climate change will result in shifting the locations of the different fire regimes, but no one can say with much accuracy or precision when, where, and how rapidly these shifts may occur. Shifts are more likely to manifest after a stand replacement disturbance occurs and the site is no longer capable of returning to a condition similar to the past. One concern is that more intense thinning might trigger a similar outcome through the combined effects of reducing stand density and shading, shifting species composition, and the associated impacts of logging operations.

Within the scientific community, the use of assisted, or facilitated, migration as a climate change adaptation technique is controversial. Assisted migration consists of the deliberate movement of species or ecotypes into locations where they presently do not occur instead of waiting for natural migration into these locations. Hewitt *et al.* (2011) provides the most recent paper summarizing the nature of the scientific debate. Sixty percent of the papers the authors examined were supportive of assisted migration, 20 percent opposed, and 20 percent did not have a clear position. Arguments in favor of assisted migration include climatically suitable ranges outpacing migration rates, the risks of adverse outcomes are manageable with decision tools, the need for proactive measures to prevent biodiversity losses and extinctions, and the lack of appropriate or sufficient migration corridors. Arguments against assisted migration include risks of a species becoming invasive, costs, uncertainties over outcomes, the risk of legitimizing unauthorized and unregulated introductions, diversion of resources from higher conservation priorities, and bias toward species humans or societies deem important. Invasion risks are a particularly common argument against assisted migration, but seem to have the most relevance with respect to introducing completely new species or transferring species between continents (Vitt *et al.* 2010, Hewitt *et al.* 2011 and references therein, Winder *et al.* 2011). Moving different genotypes of species within its current range or assisting in relatively short-distance range expansions appears to be much less controversial, although these moves are not risk-free either (Aitken *et al.* 2008, Vitt *et al.* 2010, Hewitt *et al.* 2011, Winder *et al.* 2011). Some studies identified assisted migration as a primary need in order to preserve the presence of a forest, although not necessarily the present type of forest, in the face of climate change and associated changes in disturbance risks (Woods *et al.* 2010, Buma and Wessman 2013).

Management to adapt to climate change may not necessarily be consistent with management to maximize carbon storage. D'Amato *et al.* (2011) caution that rigid adherence to a single objective, such as maximizing carbon storage, is likely to result in adverse effects to other ecosystem components critical to long-term functioning in the face of changing climate. Increased burned area from wildfires in the mesic maritime forests of the Pacific Northwest could result in loss of up 1,900 Tg of carbon by the end of the century, an amount equal to 23 times the current combined emissions from all sources in Oregon and Washington (Rogers *et al.* 2011). Many studies have found that active management, particularly in forests adversely affected by fire suppression, could reduce both carbon losses and increases in greenhouse gas emissions from wildfires. Results from various thinning and burning prescriptions indicate that the short-term reductions in carbon result in long-term benefits to carbon storage and greenhouse gas emissions by reducing fire-induced mortality, maintaining a higher fraction of carbon in live trees, increasing drought resistance, and reducing competition for water, nutrients, and light (Stephens *et al.* 2009, Hurteau and North 2010, North and Hurteau 2011, Stephens *et al.* 2012, Bowman *et al.* 2013, Hurteau *et al.* 2014, Loudermilk *et al.* 2014, Volkova *et al.* 2014). Other studies indicate that such potential benefits are unlikely to occur in moister forests with longer fire return intervals (e.g., Mitchell *et al*. 2009, Campbell *et al.* 2011, McKinley *et al.* 2011, Bowman *et al.* 2013, and Keith *et al.* 2014).

The degree to which an alternative or the Proposed RMP promotes active management provides opportunities to adapt to changing climate. In dry forests under all action alternatives and the Proposed RMP, management would emphasize increasing fire resistance and resilience, which would often also increase resistance to drought, insects, and pathogens. The No Action alternative does not explicitly prohibit management to increase fire resistance and resilience, but does not have the same emphasis as in the action alternatives and the Proposed RMP, especially within the Late-Successional Reserve and the Riparian Reserve allocations. This uncertainty in the management direction of the No Action alternative adds uncertainty to the implementation of actions to increase fire resistance and resilience, especially within reserve land use allocations in the dry forest.

Retaining portions of stands through uneven-aged management would reduce risks associated with reforestation failure in dry forests. All action alternatives and the Proposed RMP would manage the Harvest Land Base in the driest forests with uneven-aged management. In contrast, the No Action alternative would include regeneration harvest throughout the Harvest Land Base in the driest forests, increasing the risk of reforestation failure.

Reforestation after timber harvest or disturbance would provide opportunities to shift tree species composition or genotypes/ecotypes/climatypes under all alternatives and the Proposed RMP, except Alternative B in the Light Intensity Timber Area, where the BLM would use only natural regeneration. In addition to the risk of reforestation failures, the inability to replant after timber harvest or disturbance in this portion of the Harvest Land Base under Alternative B would limit the ability to adapt to climate change through replanting (see the Forest Management section in this chapter).

Reserves with minimal or no active management may provide areas of greater ecological stability on the landscape and provide benchmarks for comparison with actively managed areas. However, it is unclear to what extent such minimally managed reserves would be more stable and more resistant to climate change effects. As discussed under the previous subsection on tree species, major shifts in plant communities are expected to be abrupt arising from the interaction of climate change and another disturbance (Paine *et al*. 1998, Allen *et al.* 2010, Lindenmayer *et al*. 2011, Peterson *et al.* 2014, Clark *et al.* 2014). These shifts can lead to new plant communities and ecosystems not previously seen within the planning area (Paine *et al*. 1998, Lindenmayer *et al*. 2011, Peterson *et al*. 2014). This disturbance could be forest management, one or more natural events, such as wildfire or insect outbreak, or both in combination. The combination of forest management and natural events could trigger development of so-called novel plant communities in the actively managed areas, whereas in minimally managed areas, the trigger would more likely be one or more natural events. Comparing recent satellite imagery of western Oregon with that collected in the mid-1990s, reserves with minimal or no active management tended to become homogeneous with respect to stand density, age, and condition. Such landscapes appear to be increasingly vulnerable to large, stand-replacing fire and the development of large, stand-replacing patch sizes based on recent fires and maps of burn severity. Shive *et al.* (2014) found that treating stands before a wildfire could be critical to retaining desired tree species in the face of climate change and the presence of wildfire even if at lower stand densities or basal area than in the past. Fire, insects, and pathogens often interact such that the occurrence of one of these disturbance types facilitates the occurrence of another (Vose *et al.* 2012, Tillmann and Glick 2013, Peterson *et al.* 2014). The larger the area in Reserves with minimal management, the more limited BLM's management options would be to adapt to climate change over time.

In contrast to the risks of minimal management, areas with minimal vegetation management may provide refugia against climate change. Within the decision area, minimal vegetation management would occur in Congressional Reserves such as designated Wilderness and some Wild and Scenic River corridors, certain other reserves, such as some ACECs and Wilderness Study Areas, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, portions of the Late-Successional Reserve that are structurally-complex forest or occupied marbled murrelet sites, and the inner zone of the Riparian Reserve under the action alternatives and the Proposed RMP. Climate change refugia provide conditions where species either may retreat or persist during long-term climatic change (e.g., Keppel *et al*. 2015, Olson *et al*. 2012, Gillson *et al*. 2013, and Buttrick *et al*. 2015). Species with narrow distributions or specialized habitat requirements that greatly constrain the ability to migrate to new locations are most vulnerable to climate change (Damschen *et al*. 2010, and Keppel and Wardell-Johnson 2012). In the absence of refugia, such species are more likely to face local extirpation or general extinction (e.g., Damschen *et al*. 2010). Climate refugia are more likely to occur in complex terrain where landform, topographic shading, and cool air drainage can moderate expected increases in temperature, thus maintaining habitat stability and climatic stability or slowing the rate of change (Ashcroft 2010, Spies *et al*. 2010, Buttrick *et al*. 2015). Climate refugia can occur at more than one scale, usually referred to as macrorefugia and microrefugia, but need to be large enough to support a small population of the species of interest (Ashcroft 2010). The BLM's predominately checkerboard land ownership pattern limits the opportunity to provide macrorefugia. The Late-Successional Reserve network may provide climate change macrorefugia for species that are also able to disperse around or through the intervening lands, most of which are managed for timber production. In contrast, designated Wilderness, Wilderness Study Areas, some ACECs, and District-Designated Reserve – Lands Managed for their Wilderness Characteristics and the inner zone of the Riparian Reserve in the action alternatives and the Proposed RMP, are likely to provide climate change microrefugia in some locations. Buttrick *et al*. (2015) identified much of western Oregon as having moderate to high terrestrial resilience to climate change (defined as likely to retain and support higher biodiversity as climate changes), although much of the lower elevations, where most BLM-administered lands occur in the planning area, range from below average to above average resilience.

The size of the inner zone of the Riparian Reserve provides the main difference among the alternatives and the Proposed RMP for climate change microrefugia. Alternative D, with the widest inner zone on all stream types, would provide the largest amount of potential climate change microrefugia, followed by Alternative A. The Proposed RMP would the same size inner zone along fish-bearing and perennial streams as Alternatives A and D, and would provide wider inner zones along intermittent and non-fish-bearing streams than Alternatives B and C in most watersheds. See also the discussion in the Hydrology section of this chapter under Issue 1 concerning effective stream shading as an indicator of potential climate microrefugia.

The ability of active management to mitigate projected changes in stream temperature appear to be limited since changing air temperatures account for much of the expected changes in stream temperature (Holsinger *et al.* 2014). Equally important, however, is that wildfires and fuels management appear to have limited ability to adversely affect stream temperatures much beyond the immediate affected area. The inner zone of the Riparian Reserve in the action alternatives and the Proposed RMP would provide some degree of mitigation for climate change, but the degree of that mitigation depends on landform, degree of topographic shading, degree of cool air drainage from higher elevations, and primary water source (e.g., surface water from rain versus ground water recharged from snowpacks). Checkerboard ownership patterns limit the ability of management direction on the BLM-administered lands to help reduce the magnitude or rate of stream temperature rise as streams cross through younger forests with shorter rotations.

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Cultural and Paleontological Resources

Key Points

- The BLM can reduce or eliminate effects to cultural and paleontological resources through systematic and thorough cultural and paleontological resource inventories.
- Implementation of Alternative A is the least likely to result in potential adverse effects to cultural and paleontological resources from timber harvest because it has the fewest acres of timber harvest in the first decade; and from public motorized travel use because it has the largest acreage designated as *closed* for public motorized access within the decision area.
- Implementation of Alternative D is the least likely to result in potential adverse effects to cultural and paleontological resources from road construction and livestock grazing because it includes the least amount new road construction and eliminates all livestock grazing.

Summary of Notable Changes from the Draft RMP/EIS

The BLM has adjusted the model from Gnomon Inc. by using different parameters than were used in the Draft RMP/EIS to calculate more accurately the areas with a high probability for finding cultural resources in western Oregon. For this analysis, the BLM redistributed the values for slope and distance to water to reflect more accurately the archaeological landscape in western Oregon. The BLM also added a temporal aspect to the comparison of the alternatives and the Proposed RMP to depict more meaningfully the potential effects from timber harvest by modeling probability zones against the first decade of timber harvest. The BLM also added a discussion of the potential effects on cultural resouorces from livestock grazing.

The BLM has revised the analysis on paleontological resources and present it as an 'issue considered but not analyzed in detail' because the small quantity of localities within the planning area did not allow for a meaningful analysis of effects.

Issue 1

How would BLM land management actions affect cultural resources across the decision area under each alternative?

Summary of Analytical Methods

Each BLM district in the decision area provided Gnomon Inc. with cultural site and survey information, which Gnomon Inc. then digitized. The BLM synthesized this digitized information in the sections below. The BLM used a model created by Gnomon Inc. for the purposes of forecasting the likelihood for cultural resources to occur within the decision area. The model used two key factors to determine the relative probability that cultural properties would be present within any given acre in the decision area. The two factors used were slope and the distance to perennial water. Archaeological data in western Oregon shows that past human activity most often took place on level ground and near freshwater sources, as revealed by the location of archaeological sites across the landscape (USDI BLM 2014a). For the model, the BLM assigned values between 0 and 50 to different slope breakpoints as well as to the distance to water breakpoints (**Table 3-17**). The breakpoints for distance to water represent discrete sets of distance in meters along a range from 0 to > 500. Similarly, the breakpoints for degrees of slope represent discrete sets of slope degrees that range from 0 to > 20. The BLM assigned the breakpoints based on previously recorded site data by looking at which value ranges in each dataset were most associated with site presence. The model then calculated total values between 0 and 100 for the entire decision area and subsequently assigned a probability based on that value (**Table 3-18**). More details of the modeling methodology are in Ingbar *et al.* (2014).

Table 3-17. Values for slope and distance to water break points

Slope (Degrees)	Value	Distance to Water (Meters)	Value
0–10	50	0–100	50
11–20	25	101–250	25
> 20	0	251–500	12
		> 500	0

Table 3-18. Total value scores and corresponding probability

Total Value Score (Sum of Slope Value and Distance to Water Value)	Probability Zone
51–100	High
26–50	Medium
0–25	Low

The model placed each of the 2.5 million acres of BLM-administered lands in the decision area into one of three categories: high, medium, or low probability for finding cultural resources (**Table 3-19**). Then, for each alternative and the Proposed RMP, the BLM overlaid these three categories with the acreage of timber harvest in the first decade. The BLM calculated acres of timber harvest in the first decade for each probability category to determine which alternatives or the Proposed RMP are most likely to create the potential for disturbance of cultural resources (**Table 3-8**). This portion of the analysis focused on potential effects from timber harvest because of the associated ground disturbance, and timber harvest levels vary substantially by alternative and the Proposed RMP. The acreage of timber harvest in first decade was used as a surrogate for the total acreage potentially affected.

Table 3-19. Distribution of all acres within the decision area by probability zone

Probability Zone	Decision Area (Acres)
High	491,971
Medium	900,781
Low	1,086,104

Additionally, the BLM considered the risk of disturbance to cultural resources from road construction by comparing the mileage of new road construction in the first decade by alternative and the Proposed RMP. The BLM used new road construction miles as a factor because of the associated ground-disturbance. The BLM also considered potential effects from public motorized access designations. In comparing the potential effects of the alternatives' public motorized access designations on cultural resources, the BLM assumed that *open* areas are the most likely to cause unintended disturbance of cultural resources from public motorized travel activities, while such disturbance is much less likely in *limited* areas and very unlikely in *closed* areas. Lastly, the BLM considered potential effects to cultural resources from acres available to livestock grazing by alternative and the Proposed RMP.

As described below, this analysis considered the potential for effects from timber harvest, new road construction, public motorized access designations, and livestock grazing, but also assumed that pre-disturbance surveys will prevent effects in most instances.

Certain cultural resource types do not adhere to the parameters of the model as described. Sites such as rock shelters, trails, mines, traditional cultural properties, and sacred sites may not fall within areas deemed High probability by the model. BLM archaeologists are keenly aware of the difficulty of predicting the location of such sites. BLM archaeologists use resources such as tribal consultation and background research (e.g., literature, maps, and photos) to aid in identifying the location of these types of sites.

It is important to note that events and actions by others that the BLM cannot specifically predict (e.g., wildfire and looting) may also negatively affect cultural resources.

Although the BLM has some site-specific and anecdotal information about illegal public motorized travel activities, the BLM does not have a basis for predicting the location or effects of any widespread or systematic illegal public motorized travel activities. In addition, much of the decision area has physical limitations to potential illegal public motorized travel activities, including dense vegetation, steep slopes, and locked gates. Terrain, vegetation, and a greater amount of open spaces in most of the interior/south can lead to degradation and erosion in a greater proportion than the coastal/north where vegetation is denser and terrain is steeper. However, the BLM lacks a basis for characterizing current illegal public motorized travel activities or forecasting potential illegal public motorized travel activities in the future under any of the alternatives and the Proposed RMP at this scale of analysis. In this analysis, the BLM assumed that members of the public participating in motorized travel recreation would operate vehicles consistent with BLM decisions about public motorized travel opportunities.

The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which is incorporated here by reference (USDI BLM 2014b, pp. 41–43). The analytical methods described above differ from those set out in the Planning Criteria. BLM annual reporting over the last 7 years spurred this change in analysis. The annual reports state that the implementation of project activities inadvertently damaged very few sites (i.e., two). Conversely, the BLM and project proponents discovered 641 sites prior to implementation of project activities, and the BLM applied mitigation measures to avoid adverse impacts to these sites. Predicting the numbers of sites within each physiographic province, as the BLM described in the Planning Criteria, does not show the effects to cultural resources. Without more accurate data that includes all effects to sites through inadvertent discovery, the BLM must assume that it will conduct adequate and thorough cultural resource inventories prior to ground-disturbing activities and that these inventories will result in the avoidance of damage to cultural resources in nearly all cases. Regardless, it is still useful to understand how the alternatives and the Proposed RMP vary among the activities most likely to affect cultural resources as well as the distribution of timber harvest across the three probability categories.

Background

While the public discover sites incidentally (e.g., while hiking on BLM-administered lands) and the BLM discovers sites occasionally through project implementation, the primary mechanism for identifying cultural resources is through inventories conducted by trained archaeologists. BLM archaeologists plan and implement cultural surveys in a strategic manner focusing on areas with a high probability to yield cultural resources. The Analysis of the Management Situation (USDI BLM 2013) contains a synthesized explanation of cultural resources in Oregon.

Cultural resource inventories are primarily project driven and conducted in support of management activities such as timber harvest, recreation management, aquatic restoration, and road construction, in compliance with Section 106 of the National Historic Preservation Act. The BLM complies with the National Historic Preservation Act through the State Protocol with the Oregon State Historic Preservation Office (USDI BLM 2015) as directed by the National Programmatic Agreement (USDI BLM 2012). In addition, each district undertakes a strategic and proactive survey strategy in compliance with Section 110 of the National Historic Preservation Act. Section 110 surveys focus on inventorying pieces of land deemed to have high probability for yielding cultural resources; Section 110 surveys are not project-related. These areas are determined using the cultural resource model described in the Analytical Methods section above.

Affected Environment

According to current district records, there are 2,468-recorded cultural sites on BLM-administered lands in the decision area. Since most of BLM-administered lands remain un-inventoried, it is very likely that there are far more undocumented cultural sites.

The following tables provide a snapshot of cultural resources and inventories on BLM-administered lands in the decision area. **Table 3-20** illustrates that the BLM has inventoried 10.5 percent of the decision area for cultural resources. These acres only reflect class III-intensive field surveys, as conducted per BLM Manual 8110.21C (USDI 2004). With 89.5 percent of the decision area considered unsurveyed, the BLM anticipates that inventories would continue for the near future in compliance with Sections 106 and 110 of the National Historic Preservation Act.

Table 3-20. Summary of acres of cultural resource inventories on BLM-administered lands

Administrative Boundary	Inventoried Lands (Acres)	Total Lands (Acres)	Inventoried Lands (Percent)
Coos Bay District	3,430	324,236	1.0%
Eugene District	4,801	311,064	1.5%
Klamath Falls Field Office	155,258	214,084	72.5%
Medford District	78,782	806,675	9.8%
Roseburg District	14,977	423,640	3.5%
Salem District	2,441	399,157	0.6%
Decision Area	**259,689**	**2,478,856**	**10.5%**

It is notable that the Klamath Falls Field Office, which is within the Eastern Cascades Slopes and Foothills physiographic province, has completed inventory of over 72 percent of their land base due to multiple large-scale projects (e.g., vegetation management and fuels treatments) where contractors surveyed thousands of acres at a time. Therefore, surveys have covered more acres across all probability zones in this region. Additionally, the parameters modeled for analysis (slope and distance from perennial water) do not reflect the cultural landscape of this area as well as it does in the rest of the planning area. Perennial water is not as pervasive in this area as it is in the coastal/north portion of the planning area; therefore, the model categorizes most of the landscape as Medium. In general, this area is considerably flatter and less vegetated than the forested areas of the coastal/north portion of the planning area. Distance to water would be less a hindrance in flatter terrain with less vegetation, therefore one would expect there still to be a high number of sites in Medium probability as modeled.

Table 3-21 illustrates the relationship between the total acres of cultural resource inventories conducted and numbers of sites recorded within the three probability zones. Medium probability areas have by far the most acres of inventory and the most sites. This may be attributed to a slight discrepancy in how the model predicts probability such as is explained above regarding the Eastern Cascades Slopes and Foothills physiographic province. Within the Eastern Cascades Slopes and Foothills physiographic province, the BLM conducted two-thirds of the inventories on Medium probability ground leading to the recording of a greater number of sites in Medium probability than High probability. How archaeologists conduct cultural inventories on the ground could account for the high inventory counts in Medium probability zones. In the model, areas with less than 10 percent slope but greater than 500 meters distance from water are categorized as Medium probability. In practice, archaeologists would inventory all acres with less than 10 percent slope unless the area was a small isolated parcel.

Table 3-21. Summary of acres of cultural resource inventories and recorded sites by probability zone

Probability Zone	Inventoried Lands (Acres)	Recorded Sites (Number)	Total Lands (Acres)	Inventoried Lands (Percent)	Ratio of Sites Identified Per Inventoried Acres
High	61,284	1,029	491,971	12.5%	60:1
Medium	139,975	1,167	900,781	15.5%	120:1
Low	58,430	272	1,086,104	5.4%	215:1
Decision Area Totals	**259,689**	**2,468**	**2,478,856**	**10.5%**	**105:1**

Table 3-21 shows that one site is identified for every 60 acres in High probability zones, 120 acres in Medium probability zones, and 215 acres of Low probability zones on average. Had the BLM applied different modeling parameters to the Eastern Cascades Slopes and Foothills physiographic province, there would likely be a stronger difference between probabilities of the number of sites identified per number of acres surveyed. However, the model has calculated the number of sites identified per acres of survey at levels that match documented observations within the planning area (See **Table 3-17** and **Table 3-18** for modeling values).

Table 3-22 shows the distribution of site types across the districts. Ground-disturbing activities may be more or less likely to damage sites depending on the site type and activity type. The term 'prehistoric site' generally refers to archaeological sites that Native Americans occupied prior to European contact (generally prior to 1770); in the decision area, most prehistoric sites are subsurface. Approximately 56 percent of the recorded sites in the decision area are prehistoric. 'Historic sites' refer to both subsurface and above ground sites, including structures that date from the contact period up to the recent historic period (generally 1770 to 50 years ago). Multicomponent sites are sites that date to multiple occupation periods and include both prehistoric and historic components. Ground-disturbing activities are more likely to affect subsurface sites inadvertently due to the lack of visibility of artifacts on the surface, especially in the densely vegetated landscape that composes a large majority of the lands administered by the BLM in the decision area.

Table 3-22. Distribution of site types

District/ Field Office	Prehistoric (Sites)	Historic (Sites)	Multicomponent (Sites)	Unknown (Sites)	Totals (Sites)
Coos Bay	30	24	1	1	56
Eugene	132	15	-	-	147
Klamath Falls	760	284	62	61	1,167
Medford	148	492	22	6	668
Roseburg	250	34	14	-	298
Salem	67	62	3	-	132
Totals	**1,389**	**911**	**102**	**68**	**2,468**

Table 3-23 shows the last known condition of all the recorded sites in the decision area. The BLM monitors recorded sites to assess their condition over time and note impacts that affect the integrity of the site such as erosion, looting, weathering or from the implementation of BLM actions. The BLM categorizes the largest percentage of sites as 'unknown' (39 percent); the lack of a known site condition is likely due to the large amount of subsurface prehistoric sites within the decision area. Without subsurface testing and evaluation of these sites, it is hard, if not impossible, to assess the level of intact deposits (soil and cultural materials) within the site. The BLM has determined that less than 1.5 percent of recorded sites have been destroyed. There are 37 percent of the sites in excellent or good condition and 22 percent in fair or poor condition.

Table 3-23. Conditions of recorded sites within the decision area

Site Condition	Recorded Sites (Count)	Recorded Sites (Percent)
Excellent	232	9.4%
Good	693	28.1%
Fair	256	10.4%
Poor	282	11.4%
Destroyed	34	1.4%
Other	11	0.4%
Unknown	960	38.9%
Totals	**2,468**	**100%**

Environmental Consequences

Under all alternatives and the Proposed RMP, the BLM would conduct adequate and thorough cultural resource inventories in advance of 'federal undertakings' and in accordance with Oregon BLM and Oregon State Historic Preservation Office Protocol (2015). The BLM anticipates avoiding or mitigating impacts to the vast majority of cultural resources through: (1) identification of cultural resources and potential impacts through inventory; and (2) applying appropriate mitigation measures.

Table 3-24 shows the acreage of timber harvest activities by each alternative and the Proposed RMP as modeled for the first decade, along with timber harvest distribution across the probability zones. Overall, Alternative A, which has the smallest Harvest Land Base, would have the lowest potential for disturbance to cultural resources from timber harvest; it has the lowest total acreage of timber harvest and the lowest acreage of harvest in high probability zones. Alternative C would have the highest potential for disturbance from timber harvest, with both the highest total acreage of timber harvest and the highest acreage of timber harvest in High probability zones. The Proposed RMP would have the third lowest potential for disturbance from timber harvest for both the total acreage of timber harvest and the acreage of timber harvest in High probability areas.

Table 3-24. Acreage of timber harvest for the first decade in each probability zone

Alternative/ Proposed RMP	Low (Acres)	Medium (Acres)	High (Acres)	Totals (Acres)
No Action	60,733	56,891	37,770	155,395
Alt. A	36,532	33,825	21,425	91,782
Alt. B	70,945	58,297	33,523	162,765
Alt. C	72,724	65,403	38,570	176,696
Alt. D	61,442	49,519	28,190	139,151
PRMP	65,846	54,603	30,949	151,398

Table 3-25 shows that the total mileage of new road construction, which generally corresponds with the total acres of timber harvest (**Table 3-24**). The No Action alternative and Alternative C would have the greatest potential for the disturbance of cultural resources through new road construction, while Alternatives A and D have the lowest potential for this type of disturbance. The Proposed RMP has the third lowest potential for disturbance through new road construction compared to the alternatives.

Table 3-25. Total mileage of new road construction

Alternative/ Proposed RMP	New Road Construction (Miles)
No Action	637
Alt. A	299
Alt. B	531
Alt. C	699
Alt. D	240
PRMP	437

For all action alternatives and the Proposed RMP, the BLM would apply interim management guidelines for public motorized travel activities until implementation-level travel management planning is completed (**Appendix Q**). On the majority of the BLM-administered lands, public motorized travel activities would be *limited* to existing roads and trails (see Trails and Travel Management **Table 3-218**). None of the action alternatives or the Proposed RMP has lands designated as *open* for public motorized access. This differs from current practices and the No Action alternative, in which there are 319,661 acres of land designated as *open*. Due to this change, the BLM would expect a reduction in inadvertent effects to cultural resources from public motorized travel activities under all action alternatives and the Proposed RMP. In accordance with current policy, the BLM is deferring implementation-level transportation management planning until after completion of these RMPs. All areas identified as *limited* for public motorized access would have completed Travel Management Plans within 5 years of completion of these RMPs. Route designation would occur as part of implementation-level travel management planning, and the BLM would consider affects to cultural resources in compliance of Section 106 of the National Historic Preservation Act. The Trails and Travel Management section of this chapter and **Appendix Q** contain more information on transportation management planning.

There are multiple activities associated with livestock grazing that cause effects to cultural resources. Impacts can come from congregation of livestock around watering or salting locations, the creation of trails, livestock movements (e.g., rubbing, trampling, and crushing), and fence construction. Creating trails, post-holing from hooves, hoof shearing, and trampling also cause erosion of the soil which can indirectly effect cultural resources by exposing them, which leaves them more susceptible to weathering, looting, or further trampling by livestock. The No Action alternative would have the largest potential for the disturbance of cultural resources based on available livestock grazing allotments, while Alternative D has no potential for this type of disturbance. Alternatives A, B, and C, would all have equal potential for disturbance from livestock grazing, and the Proposed RMP would have a slightly less potential from livestock grazing by making an additional four allotments unavailable. **Table 3-26** shows the number of available authorized livestock grazing allotments, associated acres, and animal unit months (AUMs, the number of cow/calf pair permitted per month based on available forage).

Table 3-26. Number of available authorized livestock grazing allotments, acres, and active use

District/ Field Office	Alternative/ Proposed RMP	Allotments (Number)	Public Land (Acres)	Active Use (AUMs)
Coos Bay	No Action	4	544	120
	Alt. A, B, C	-	-	-
	Alt. D	-	-	-
	PRMP	-	-	-
Klamath Falls	No Action	94	203,582	13,219
	Alt. A, B, C	92	203,377	13,199
	Alt. D	-	-	-
	PRMP	92	203,377	13,199
Medford	No Action	91	285,920	12,000
	Alt. A, B, C	50	156,926	9,372
	Alt. D	-	-	-
	PRMP	46	156,926	9,372
Totals	**No Action**	**189**	**490,046**	**25,339**
	Alt. A, B, C	**142**	**366,231**	**22,787**
	Alt. D	**-**	**-**	**-**
	PRMP	**138**	**360,303**	**22,571**

Issues Considered but not Analyzed in Detail

How would land management actions affect paleontological resources?

The BLM does not maintain a central or consolidated dataset of paleontological resources within the decision area. Individual districts are responsible for maintaining their paleontological records as well as considering them during project planning. The BLM must assume prior to ground disturbing activities it would conduct adequate paleontological resource inventories in areas of known paleontological localities as well as in areas where geologic formations lend themselves to contain paleontological resources. The BLM assumed that these inventories would result in the avoidance of damage to paleontological resources in nearly all cases.

Paleontological resources include the fossil remains of plants (leaves and wood), vertebrates, and invertebrates. They also include the traces of animals or plants, such as the tracks or claw marks and skin impressions. Geologic processes important in the formation of fossils can also be paleontological resources. The BLM refers to fossil locations on the ground as 'localities.' Fossils are fragile and non-renewable resources, and are susceptible to damage from weathering and erosional processes as well as from the public and Federal land management activities.

The BLM is required to identify locations likely to contain vertebrate fossils or exceptional invertebrate or plant fossils on land it administers. A BLM permit system regulates the collection of vertebrate or other scientifically important fossil specimens, including trace fossils on BLM-administered lands. The primary indicator for the significance of a paleontological resource is the characteristics of the fossil locality or feature that gives it importance and value for scientific or educational use. Natural weathering, decay, erosion, and improper or unauthorized removal can damage those characteristics that make the paleontological resource scientifically important.

There are a number of geologic formations that occur across the decision area, all of which span the Mesozoic and Cenozoic Eras (approximately 213–2 million years ago). The majority of paleontological resources within these formations are invertebrates and plants. Although vertebrate fossils are relatively less common, there are isolated occurrences of vertebrate fossils that are located mostly in cave settings within the decision area. The most prominent time period represented by vertebrate fossil localities within the decision area date from the late Miocene to early Pliocene epochs (approximately 23–1.8 million years ago, while the time frames for plants and invertebrates covers the Jurassic and Tertiary periods (245–145 million years ago). Some marine mammal fossils dated from the Mesozoic epoch occur in the decision area's coastal areas. In addition, there are small samples of terrestrial mammals from the late Cenozoic epoch.

Currently, the BLM does not maintain a comprehensive database with paleontological localities mapped in the decision area. Each district and the Klamath Falls Field Office have recorded localities to varying degrees (**Table 3-27**). The recorded localities may provide a sense of the distribution of paleontological resources throughout the decision area. **Table 3-27** lists the number of paleontological localities reported by BLM in the decision area. The BLM compiled these numbers by using annual reports and querying each districts' specialists for refinement of the number of recorded or known localities, which last occurred in 2008. No new paleontological sites have been reported since 2008; therefore, these counts are considered the most accurate information available. The condition of these localities is currently unknown.

Table 3-27. Number of reported paleontological localities

District/ Field Office	Paleontological Localities (Number)
Coos Bay	19
Eugene	1
Klamath Falls	1
Medford	2
Roseburg	18
Salem	6
Totals	**47**

As described above, the BLM would avoid the majority of damage to paleontological localities under the alternatives and the Proposed RMP by conducting adequate paleontological inventories in areas of known localities or in High probability landforms prior to implementation of projects that could damage paleontological resources. Each district would implement suitable protection measures for known paleontological localities.

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Fire and Fuels

Key Points

- In the absence of natural fire as a disturbance agent, management activities, including prescribed fire and mechanical management of vegetation, can serve as a partial surrogate for natural disturbance, and promote and maintain desired forest stand structure, composition, and resistance to fire. These conditions may also provide opportunities for effective fire management, including the ability to utilize wildfire to meet land use and resource objectives consistent with management direction (**Appendix B**). However, due to the configuration of BLM-administered lands within the larger landscape, particularly their proximity to where people live, the ability to use wildfire may have limited application, and prescribed fire would likely account for the majority of managed fire under any alternative and the Proposed RMP.
- The BLM-administered lands constitute only a small portion of the entire interior/south dry forest landscape. Consequently, the modest shifts in forest structure and composition under any alternative or the Proposed RMP would not result in any substantial change in the overall landscape fire resilience. The dry forest landscape would continue to have an overabundance of mid-seral closed forest and a deficit of late-seral open forest.
- All alternatives and the Proposed RMP would increase stand-level fire resistance within the dry forest and reduce fire hazard on BLM-administered lands within the Wildland Urban Interface compared to current conditions. Within the Harvest Land Base, there would be greater variation in these variables among the alternatives and the Proposed RMP over time.
- The treatment of activity fuels associated with forest management is necessary to reduce potential fire intensity, particularly in areas with higher fire risk. Alternative C for the entire decision area and Alternative B and the Proposed RMP in southern portion would result in the highest levels of potential activity fuel risk.

Summary of Notable Changes from the Draft RMP/EIS

The BLM corrected a coding error for the acreage of early seral departure from reference conditions in Issue 1 and modified the extent of the Wildland Development Area in Issue 3 to be consistent with the extent used in Issue 4.

Background

Fire History and Fire Regimes

Fire has played a major role as a natural disturbance agent shaping vegetation patterns and structures across western Oregon landscapes for millennia (Agee 1991a and b, and Hessburg and Agee 2003).

Fire regimes quantify the historic spatial and temporal interaction of fire disturbance. Most fire regime classifications describe the presumed conditions under which vegetation communities have evolved and been maintained for a given ecosystem or landscape (Sommers *et al.* 2011). Different fire regime classifications exist, some of which focus on specific and specialized plant communities (e.g., grasslands, chaparral, and peat systems), while others include seasonality of burn and other nuanced factors (Sommers *et al.* 2011). This discussion will focus on the five fire regime groups recognized by LANDFIRE (Barrett *et al.* 2010), based on fire frequency, and expected severity (**Table 3-28**).

Table 3-28. Fire regime groups and descriptions used in current LANDFIRE Fire Regime Condition Class Guidebook Version 3

Fire Regime Group	Frequency	Severity	Severity Description
I	0–35 years	Low/Mixed	Generally low-severity fires replacing less than 25% of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75% of the overstory
II	0–35 years	Replacement	High-severity fires replacing greater than 75% of the dominant overstory vegetation
III	35–200 years	Mixed/Low	Generally mixed-severity; can also include low severity fires
IV	35–200 years	Replacement	High-severity fires
V	200+ years	Replacement/ Any Severity	Generally replacement severity; can include any severity type in this frequency range

Source: Barrett *et al*. 2010

In mixed-severity fire regimes, the influence of fuels, topography, and weather play out across the landscape to affect fire behavior, resulting in highly variable forest structure, vegetation patterning, successional stages (Perry *et al.* 2011, Donato *et al*. 2012), and rich biodiversity (Stephens *et al.* 2015, DellaSala and Hanson 2015). In low-severity fire regimes, fuels tend to be the dominant factor influencing fire behavior, while in high-severity fire regimes weather is the primary driver of fire behavior (Halofsky *et al.* 2011, Hessburg *et al.* 2005, Jain *et al.* 2012, Sommers *et al.* 2011), both of which result in less edge and larger patch sizes than mixed-severity regimes. At both local and regional scales, the influence of terrain, slope position, aspect, management actions, and ignition loading can result in a fine-scale mosaic of fire regimes (Agee 1991b, 1998, and 2005, Odion *et al.* 2004, Taylor and Skinner 2003), particularly in mixed-severity fire regimes.

Within the administrative boundaries of the Coos Bay, Eugene, and Salem Districts (coastal/north portion of the planning area), high proportions of the landscape, ranging from 44 to 53 percent, fall into the infrequent (> 200 years) and commonly replacement-severity fire regime group, with fire return intervals measured in hundreds of years (**Table 3-29**). Historically, fire was not an important frequent change agent acting to influence stand structure distribution of these forested ecosystems. Natural ignitions, weather, and fuel conditions to support fires in these areas rarely aligned, and fires that burned were large and of high severity (Morrison and Swanson 1990).

Table 3-29. Fire return intervals (FRI) by Historic Fire Regime Groups across the planning area

District/ Field Office	Historic Fire Regime Group and Description				
	I	II	III	IV	V
	0-35 Year FRI, Low and Mixed Severity (Percent)	0-35 Year FRI, Replacement Severity (Percent)	35-200 Year FRI, Low and Mixed Severity (Percent)	35-200 Year FRI, Replacement Severity (Percent)	> 200 Year FRI, Any Severity (Percent)
Coos Bay	39%	-	16%	-	44%
Eugene	17%	-	34%	-	50%
Klamath Falls	42%	6%	25%	23%	4%
Medford	91%	-	7%	1%	1%
Roseburg	40%	-	48%	1%	12%
Salem	22%	-	25%	-	53%

Source: LANDFIRE 2010 (LF_1.2.0)

The Klamath Falls Field Office and the Medford and Roseburg Districts (interior/south portion of the planning area) have high proportions, 73–98 percent, of lands within their administrative boundaries classified into low- and mixed-severity fire regime groups (I and III) with frequent (0–35 years), to moderately frequent (35–200 years) fire return intervals (**Table 3-29**). Historically, frequent to moderately frequent fire acted as a relatively important change agent affecting the landscape within the interior/south portion of the planning area.

Much of the southern portion of the planning area is within the Klamath ecological province, recognized for floristic diversity, geographic complexity, highly varied climatic gradients, and the prominent historic role of fire (Whittaker 1960, Atzet and Wheeler 1982). Prior to the 20th century, low- to mixed-severity fires played a substantial role in most dry forest ecosystems (Agee 1991a, Leiberg 1900, Colombaroli and Gavin 2010). Regional studies have found historic pre-settlement median fire return intervals ranging from 8–20 years in the drier and southern portions of the planning area (Sensenig *et al.* 2013, Taylor and Skinner 1998 and 2003), and longer median fire return intervals (35–120 years) in more mesic locations of the dry forest (Agee 1991b, Olson and Agee 2005, Van Norman 1998). These pre-20th century fires resulted both from lighting and human-caused ignitions (Sensenig 2002, Atzet and Wheeler 1982, Lalande 1995). Native Americans influenced vegetation patterns for over a thousand years by igniting fires to enhance values that were important to their culture, sustainability, and for vegetation management (Lalande 1991). Early settlers used fire to improve livestock grazing and farming, and to expose rock and soil for mining, and they set frequent and extensive fires (Atzet and Wheeler 1982, Leiberg 1900), heavily altering natural fire regimes.

Fire Exclusion in the Dry Forest

Historically, frequent low- to mixed-severity fire interacted with the complex landscape, vegetation, and climate to create and maintain patchy, mixed seral stages of shrubland, woodland, and mixed conifer/hardwood forests, in both open and closed conditions (Taylor and Skinner 1998, Hickman and Christy 2011, Duren *et al.* 2012, Dipaolo and Hosten 2015, Baker 2011). Frequent fire also cultivated large open grown trees, hindered the regeneration of fire intolerant species, promoted fire tolerant species and understory diversity, reduced forest biomass, and decreased the compounding impacts of insects and diseases (Halofsky *et al.* 2011, Perry *et al.* 2011, Jain *et al.* 2012). Historically, these heterogeneous landscape patterns and uneven-aged, uneven-structured stands of fire-dependent species contributed towards the fire resilience and rich biologic diversity of the southern Oregon landscape.

In the early 1900s, suppression of all wildfires became a goal of land management agencies and policy (Graham *et al.* 2004). This effectively took hold in western Oregon in the 1940s with the advent of mechanized equipment and the establishment of the smoke jumper base in Cave Junction (Atzet and Wheeler 1982, Atzet 1996). Effective fire exclusion and other land management practices (e.g., extensive even-aged forest management, mining, and grazing) has altered natural fire return intervals (Hessburg *et al.* 2015), and many areas have missed two to five fire cycles in the interior south (Agee 1991b, Taylor and Skinner 1998 and 2003, Olson and Agee 2005).

The absence of frequent low- and mixed-severity fire along with other land management practices has altered landscape seral distribution (Haugo *et al.* 2015), successional pathways (Donato *et al.* 2012), forest structural development (Halofsky *et al.* 2011), tree establishment (Sensenig *et al*. 2013, Comfort *et al.* in press), forest opening size and frequency (Skinner 1995, Taylor and Skinner 1998, Larson and Churchill 2012), and the horizontal and vertical fuel profile and loading (Agee 1998, Graham *et al.* 2004, Hessburg *et al.* 2005).

Currently, many of the dry forest stands are overly dense, are missing large fire-resistant trees, or are at risk from encroachment or fire-induced mortality (North *et al.* 2009, Jain *et al.* 2012, Comfort *et al.* in press). Dry forest species composition has shifted, resulting in significant reductions in the proportion and diversity of fire-adapted conifers, hardwoods, shrubs, and herbaceous species (Taylor and Skinner 1998 and 2003, Franklin and Johnson 2010, Duren *et al.* 2012). The proportion of shade-tolerant species to fire-tolerant species has increased along with the proportion of small trees to large trees (Comfort *et al.* in press*)*. The abundance of densely forested conditions has compromised individual tree vigor, resulting in extremely slow growth, which can delay or hinder the development of structurally-complex forest (Sensenig 2002, Sensenig *et al.* 2013). Open areas, such as forest gaps, shrublands, savannahs, grasslands, and hardwood woodlands, have been converting to closed areas via the recruitment of conifers (Taylor and Skinner 1998, Hosten *et al.* 2007, Comfort *et al.* in press). Surface, ladder, and canopy fuels have increased in loading and continuity, increasing the potential for larger scale crown and stand-replacing fires (Agee 1998, Sensenig 2002, Graham *et al.* 2004, Hessburg *et al.* 2005).

In general, the result of previous land management practices has resulted in homogenized vegetation patterns and fuel conditions at multiple scales (Hessburg *et al.* 2015) threatening overall forest health, and resistance and resilience to disturbance from fire, insects, and disease (Franklin and Johnson 2012, Sensenig *et al*. 2013). A recent regional evaluation of forest structure and restoration needs suggests that, 40 percent of Oregon and Washington’s conifer forests are in need of disturbance through thinning or wildland fire (Haugo *et al.* 2015).

Current Fire Climate Environment and Future Trends

The area south of the Rogue-Umpqua divide generally has more severe and frequent thunderstorms with little precipitation, relative to the northern and coastal portions of the planning area (Agee 1991a, Atzet and Wheeler 1982, Sensenig 2002). While dry lightning is still infrequent in the coastal/north districts (Coos Bay, Eugene, and Salem), human ignitions are prevalent and account for greater than 90 percent of all ignitions within these districts (**Figure 3-22**). Human caused ignitions typically occur in relatively accessible locations and are sparse compared to multiple strikes in lightning events; coupled with overarching climatic patterns, human ignitions are typically manageable for suppression resources. Relative to frequent fire ecosystems, fire exclusion is an inconsequential factor influencing current fire frequency and severity, and structural stage distribution (Brown *et al.* 2004).

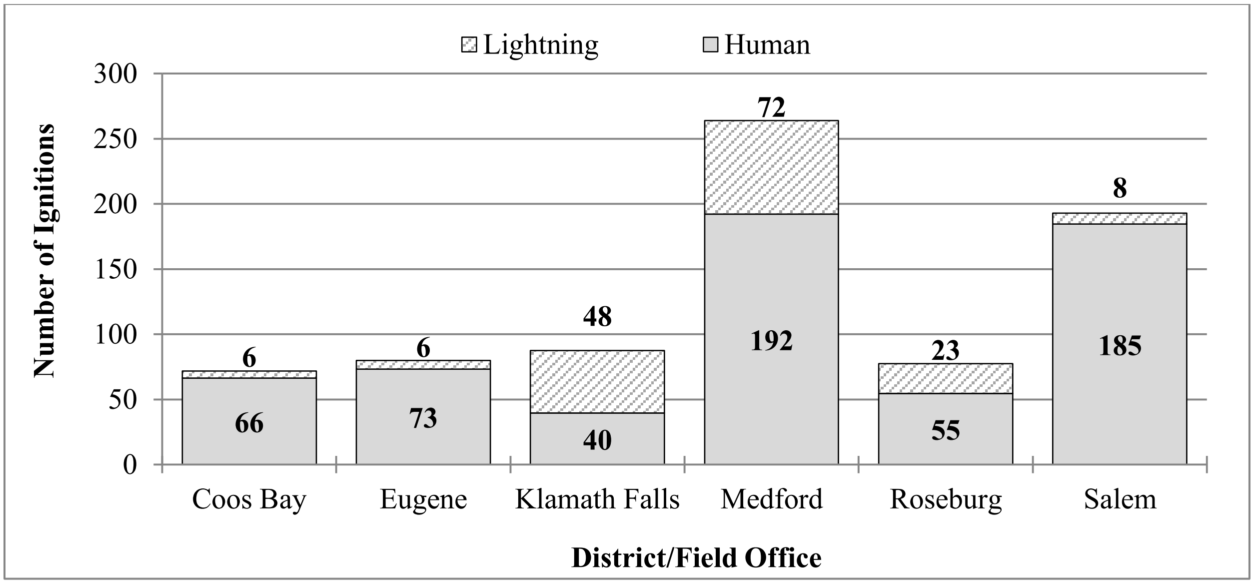


Figure 3-22. Average annual number and cause of ignitions (1984–2013) within the planning area
Source: Oregon Department of Forestry ignition data[44]

While fire regime groups represent historic conditions, the prevailing climatic patterns (hot, dry summers) influencing fire frequency and fire potential still exist in southern portions of the planning area, along with sufficient sources of both naturally and human-caused ignitions (**Figure 3-22**). Depending on fuel conditions, lightning from storms can start numerous wildfires in dry receptive fuels.

In the recent past, these multiple ignition events have on occasion overwhelmed suppression resources and have been a significant factor in the development of large wildfires within the southern portion of the planning area (notable years include 1987, 2002, 2013, and 2014). Currently, the vast majority (93 percent) of acres burned are within wildfire perimeters greater than 1,000 acres, even though these wildfires account for less than 1 percent of all ignitions (**Table 3-30**). These large fires tend to burn during more extreme fire weather conditions, when fire behavior and growth potential exceed or challenge suppression resource availability and capabilities (Planning Level 4 and 5; NIFC 2014). This pattern of fire on the landscape is contrary to historic patterns of frequent fires burning throughout the dry season under various weather conditions across the landscape.

Table 3-30. Wildfire ignitions within the planning area by acre size class categories, 1984–2013

Fire Size Class (Acres)	All Ignitions (Percent)	Total Acres Burned (Percent)
< 10	96%	1%
10-99	3%	2%
100-999	1%	4%
1,000+	< 1%	93%

Source: Oregon Department of Forestry ignition data

44 ODF ignition data likely underrepresents wildfire occurrence on BLM-administered lands within the Klamath Falls Field Office, as the Gerber Block located in the southeast portion of the field office is not under ODF protection.

In recent decades, the frequency of large wildfires and the annual acres burned have increased across the western states (Westerling *et al.* 2006) and in Oregon (USDI BLM 2013). Modeled projections indicate this trend will continue (Mote *et al.* 2014). Based on an analysis of fire start dates for wildfires greater than 1,000 acres, Westerling and others (2006) found that the fire season is already longer than it was in the 1980s by at least a month. With observed increase in mean summer temperatures and earlier snowmelt, some climate changes have already begun to manifest. These changes in climate strongly correlate with increasing wildfire size, large wildfire frequency, and longer wildfire durations (Westerling *et al.* 2006, Littell *et al.* 2010, Miller *et al.* 2012, see the Climate Change section in this chapter). These observed trends and forecasts suggest that wildfire will continue to be a major change agent affecting ecosystem structure and spatial distribution, further exacerbating the problems of fire exclusion and previous land management activities. In recent decades, there has been growing concern over cost and lasting effects of large wildfires (Ingalsbee and Raja 2015). In part, this prompted Congress to pass the 2009 FLAME Act (43 U.S.C. 1701). This Act directed the Secretary of Agriculture and the Secretary of the Interior to submit a joint strategy to address major wildland fire issues in the United States through the enhancement and development of fire-adapted communities, effective and efficient wildfire response, and resilient landscapes.

Recognition of both the spatial and temporal process and vegetative structure of fire regimes is necessary to promote resilience in frequent fire-adapted forests (Agee 2002, Jain *et al.* 2012). In fire-adapted ecosystems, fire on the landscape can clearly provide benefit to fire-dependent species and promote rich biologically diverse successional stages and vegetation patterning (Agee 1993, Agee 2005, Odion *et al.* 2010, Swanson *et al.* 2011, DellaSala and Hanson 2015). In the absence of utilizing natural fire as a disturbance agent, management activities can serve as a partial surrogate to promote and maintain desired spatial and temporal structural and composition. Despite a presumed low probability that wildfires will intersect treatments (Rhodes and Baker 2008), recently, there has been a growing body of evidence throughout the western states (Martinson and Omi 2013, Ewell *et al.* 2015), Pacific northwest (Prichard *et al.* 2010, Shive *et al*. 2013, and Prichard *et al.* 2014), and in southwest Oregon (local observations) that they do. This evidence demonstrates that vegetation management, incorporating mechanical and prescribed fire treatments, has successfully moderated fire behavior and fire effects, even under extreme weather events (Prichard and Kennedy 2014), and has contributed toward more resilient future forest structure (Stevens-Rumann *et al.* 2013). During extreme fire weather events and plume-dominated fire behavior, even fuel profiles and vegetation structure representative of historic fire regimes may have a reduced likelihood of altering fire behavior (Lydersen *et al.* 2014), and treated areas may become less effective at altering fire behavior (Ewell *et al.* 2015), resulting in large areas of high severity. However, Kennedy and Johnson (2014) and Ewell *et al.* (2015) found that these types of treatments also improved fire management opportunities. These moderated vegetation structures, and thus moderated fire behavior under less than extreme fire weather conditions, may provide opportunities to utilize wildfire (North *et al.* 2015) to meet land use and resource objectives.

Issue 1

How would the alternatives affect fire resiliency in the fire-adapted dry forests at the landscape scale?

Summary of Analytical Methods

To measure dry forest fire resilience at the landscape scale, the BLM[45] quantified the departure of current vegetation structure and landscape composition patterns from a set of reference conditions that represent the historic range of variability (Barrett *et al.* 2010, Keane *et al.* 2009). In this approach, less departure

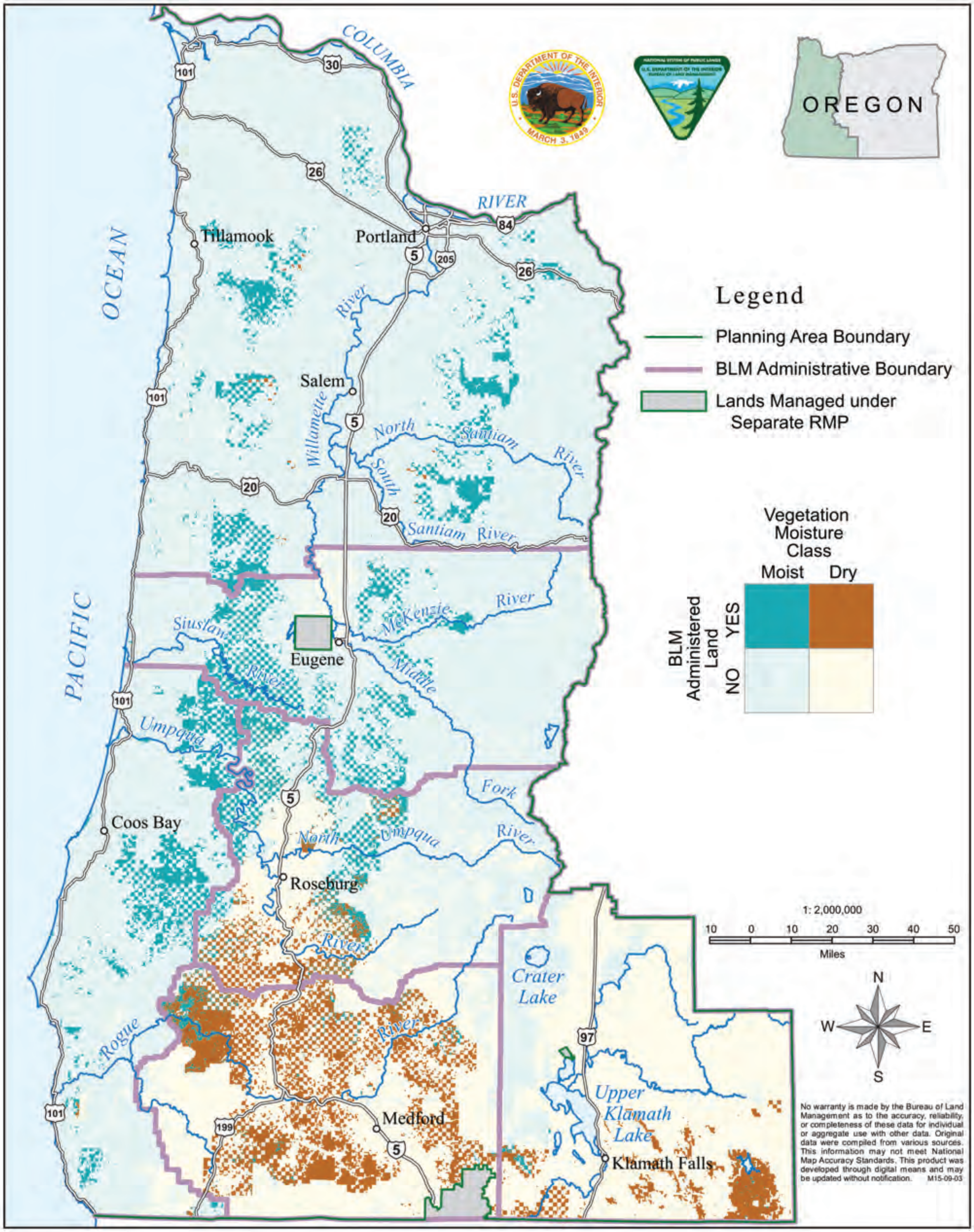
[45] Chris Zanger, Forest Analyst for The Nature Conservancy, conducted this analysis of landscape-scale fire resiliency under an agreement with the BLM.

from reference conditions represents greater fire resiliency. Historic conditions within the dry forests were more resilient to fire disturbance than current conditions, in large part, because frequent fire was present on the landscape (Hessburg and Agee 2003, Brown *et al.* 2004, North *et al.* 2009).

In this analysis, the BLM quantified how the seral stage distribution would vary in 50 years for each alternative and the Proposed RMP, relative to the reference condition. This analytic process built upon the conceptual framework of the LANDFIRE Fire Regime Condition Class concept (Schmidt *et al*. 2002, Barrett *et al.* 2010). The LANDFIRE Fire Regime Condition Class conceptual framework assumes that, given natural disturbance processes (e.g., historic fire regime), a biophysical setting will have a sustainable range of variation in the proportion of each successional stage for a given landscape (Barrett *et al*. 2010). This reference condition—the percentage of a biophysical setting in each seral stage—does not represent a specific historical date, but instead approximates an equilibrium condition, or ecological reference condition, based upon the natural biological and physical processes. While a variety of perspectives exist regarding historic vegetation reference conditions and natural range of variability (Strittholt *et al.* 2006, Colombaroli and Gavin 2010, Baker 2011, and Dipaolo and Hosten 2015), this analysis utilizes LANDFIRE biophysical settings which provide comprehensive reference conditions for all seral-states and have been developed based on literature review, local data, and expert estimates.

Four primary data inputs provided the foundation for this assessment of successional stage departure:

1. A classification and map of forested biophysical settings to identify dry forest and moist forest (ILAP Potential Vegetation Types; **Map 3-2**)
2. A reference condition for the natural range of variability for each biophysical setting (LANDFIRE BPS 2008, Rollins 2009, Ryan and Opperman 2013)
3. A delineation of landscape units for each biophysical setting (i.e., the dry forest within the administrative boundaries of the Klamath Falls Field Office, and Medford and Roseburg Districts) (**Appendix H**)
4. A spatial delineation of forest structure and composition for current and future conditions, under all alternatives and the Proposed RMP (**Appendix H**). These classifications are based on structure and do not infer an ecologically intact seral-state.



Map 3-2: Moist and Dry Vegetation within the Planning Area

The BLM used the Integrated Landscape Assessment Project (ILAP) Potential Vegetation Type spatial data, which approximate an aggregation of plant associations and Plant Association Groups, to classify forests within the planning area into moist and dry forest categories, based on Franklin and Johnson (2012). U.S. Forest Service Region 6 Ecologists reviewed the initial categorizations of moist and dry Plant Association Groups, and BLM district staff refined the data, based on local knowledge of the ground. Using the refined ILAP Potential Vegetation Type 30-meter spatial data, the BLM categorized as 'dry' any Forest Operations Inventory polygons that had more that 50 percent of its area within a dry Potential Vegetation Type.

The BLM recognizes that vegetation types result from complicated relationships among, climate, topography, soils, and disturbance regimes. In addition, while vegetation types typically occur along moisture gradients, they do fall into broad relative moisture categories of moist and dry, particularly at the scale of the planning area. This discrete classification into moist or dry recognizes general differences in disturbance regimes, succession, and species composition, and as such, relevant management objectives and direction. The BLM acknowledges that several other vegetation classification schemes exist (e.g., LANDFIRE 2010, Ecological Systems Classification (Comer *et al.* 2003), National Gap Analysis Program (Jennings 2000), and The National Vegetation Classification System (Anderson *et al.* 1998, FGDC 2008), however, these classification schemes do not group forests into broad moisture categories (e.g., moist and dry) relevant to management decisions, objectives, and direction. For the purposes of this analysis, the BLM uses the classification scheme described above, which is further detailed in **Appendix C**.

This analysis presents effects on landscape-scale fire resiliency that includes land management on BLM-administered lands and non-BLM-administered lands. The analysis area is the dry forest area within the western portion of the Klamath Falls Field Office, and the Medford and Roseburg Districts. Each of these three administrative areas constituted a landscape for the purpose of this analysis. The BLM-administered lands comprise 28 percent of the analysis area. The BLM also refers to this area as the interior/south portion of the decision area. These three administrative units encompass the majority of the dry forest landscape within the planning area (**Map 3-2**). Although the Coos Bay District has a large portion (39 percent) of lands classified as fire regime I within the district boundary (**Table 3-29**), the overwhelming majority of the BLM-administered lands in the Coos Bay District are classified as moist forest (**Figure 3-23**). Therefore, lands within the Coos Bay District are not included in this analysis. The Coos Bay, Eugene, and Salem Districts comprise the moist or coastal/north portion of the decision area.

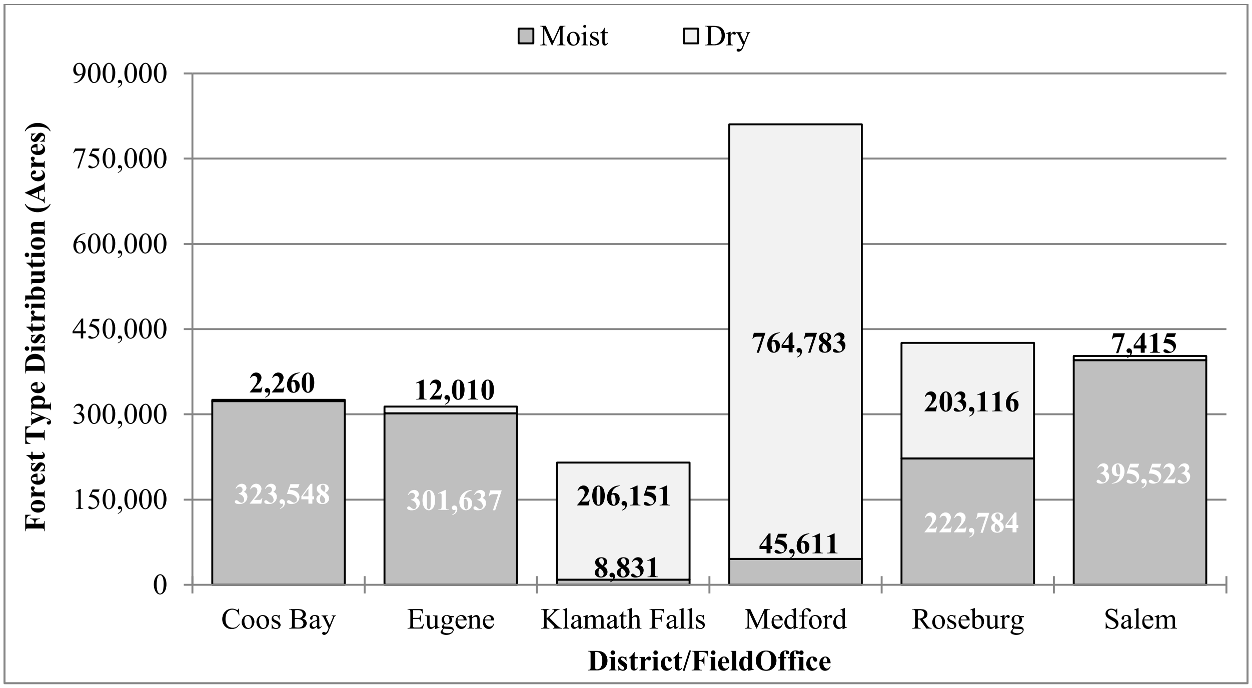


Figure 3-23. Forest type (moist and dry) distribution on BLM-administered lands

In this analysis, the BLM created a cross-walk between the structural stages used in the Woodstock model (**Appendix C**) and the five seral stages used in the LANDFIRE Fire Regime Condition Class conceptual framework: early seral, mid-seral closed, mid-seral open, late-seral closed, and late-seral open (**Appendix H**). Although necessary to produce data suitable for this analytical methodology, the crosswalk from structural stages to seral stages may have resulted in the misclassification of some stands.

The vegetation growth Woodstock model is not able to depict precisely or accurately the within-stand heterogeneity that would result from the management approach in the Uneven-aged Timber Area. Under the action alternatives, the Uneven Aged Timber Area makes up most or all of the Harvest Land Base within this analysis area. Implementation of the management direction in the Uneven-aged Timber Area would likely result in a mix of open and closed stand conditions. This analysis likely represents this fine-scale heterogeneity as closed stand conditions. Therefore, this analysis likely overestimated the extent of mid-seral closed (and, to a lesser extent, late-seral closed) stand conditions that would result from management in the Uneven-aged Timber Area, and potentially underestimated the extent of mid-seral open (and late-seral open stand conditions). However, given the small percentage of the overall dry forest landscape in Uneven-aged Timber Area in any of the alternatives or the Proposed RMP, these errors would not alter the overall trend and magnitude of changes over time at the scale of this analysis.

The BLM assumed that changes in seral stage distribution in the moist forest portions within the Klamath Falls Field Office, and the Medford and Roseburg Districts would not be as relevant to landscape-scale fire resilience, because of the difference in fire severity and frequency associated with fire regimes in those vegetation types.

For the purpose of this analysis, the BLM assumed that the future distribution of forest structure conditions on non-BLM-administered lands would continue to reflect the current distribution of forest structure conditions. The assumption that the future distribution of forest structure conditions on non-BLM-administered lands would continue to reflect the current distribution of forest structure conditions is consistent with the assumption used in the analysis of forest structure and spatial pattern in the 2008 FEIS, which describes the limitations on analyzing future changes on non-BLM-administered lands and is incorporated here by reference (USDI BLM 2008, pp. 532–536).

The BLM acknowledges that the distribution and spatial arrangement of seral stages would change in the future, but lacks information to make specific projections of how successional stages relevant to this analysis of fire resiliency would change over time on non-BLM-administered lands. Seral stage is a key component of this this analysis, and the BLM lacks information on stand attributes on non-BLM-administered lands that are directly relevant to this analysis. Holding seral stages constant on non-BLM-administered lands provides a reasonable benchmark to determine relative differences in how the management of BLM-administered lands would contribute towards the larger landscape resilience within the analysis period.

This analysis evaluated the departure, relative to a reference condition, of each vegetation type, for each seral stage, in each of the three administrative units. Presenting all of these results together would produce an analysis of bewildering complexity. For example, summing all vegetation types within an administrative unit would show simultaneous overabundance and deficits in each seral stage, because some vegetation types would be overabundant in that seral stage, while other vegetation types would be deficit. Therefore, this analysis focused on the two most common vegetation types in the analysis area: the Douglas-fir/dry and Douglas-fir/moist vegetation types, which account for most (74 percent) of the analysis area (**Table 3-31**).

Table 3-31. Amount of dry forested vegetation types in the interior/south portion of the planning area included in departure analysis

Vegetation Types	**All Interior/South Dry Forest**	
	(Percent)	**(Acres)**
Douglas-fir - Dry	41%	1,336,438
Douglas-fir - Moist	33%	1,090,723
Tan oak - Douglas-fir - Ultramafic	8%	277,579
Douglas-fir - White oak	8%	250,616
Shasta red fir - Moist	5%	157,989
Ponderosa pine - Lodgepole pine	2%	66,714
Jeffery Pine	2%	59,152
Western hemlock - Moist	1%	20,192
Mixed Conifer - Warm/Dry	< 1%	15,833
Ponderosa pine - Xeric	< 1%	8,776
Lodgepole pine	< 1%	443
Oregon white oak - Ponderosa pine	< 1%	43
Total Dry Forest Acres in Analysis Area	**100%**	**3,284,497**

The results of this analysis do not include vegetation changes resulting from non-commercial hazardous fuels work, which would likely contribute toward decreasing acres in the mid-closed seral stage similarly among all alternatives and the Proposed RMP.

Appendix H provides detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales in this analysis.

The Douglas-fir/dry vegetation type shows similar general patterns both currently and in the future for all three administrative units. Therefore, this discussion sums the results for all three administrative units.

Currently, the Douglas-fir/dry vegetation type has a slight overabundance of early seral[46] and a substantial overabundance of mid-seral closed forest (**Figure 3-24**). As stated in the methods, the BLM used forest structure to develop seral stage classifications, and these classifications may not represent an ecologically intact state. The Douglas-fir/dry vegetation type has a slight deficit of mid-seral open forest[47] and late-seral closed forest, and a substantial deficit of late-seral open forest.

[46] Incorporation of the 2013 and 2014 wildfires into the starting condition (see the Analytical Methodologies and Assumptions section of this chapter) increased the over-abundant early seral acreage by approximately 3,000 acres for the current condition. Directly attributed to the wildfires, these acres are assumed to be ecologically functioning complex early seral habitat, which is markedly different from heavily managed early seral forest conditions (DellaSala and Hanson 2015). **Figure 3-24** does not depict this slight overabundance.

[47] In contrast to the Medford and Roseburg Districts, the Klamath Falls Field Office has a slight overabundance of mid-seral open forest (approximately 3,000 acres), both currently and in the future under each alternative and the Proposed RMP. **Figure 3-24** does not depict this slight overabundance.

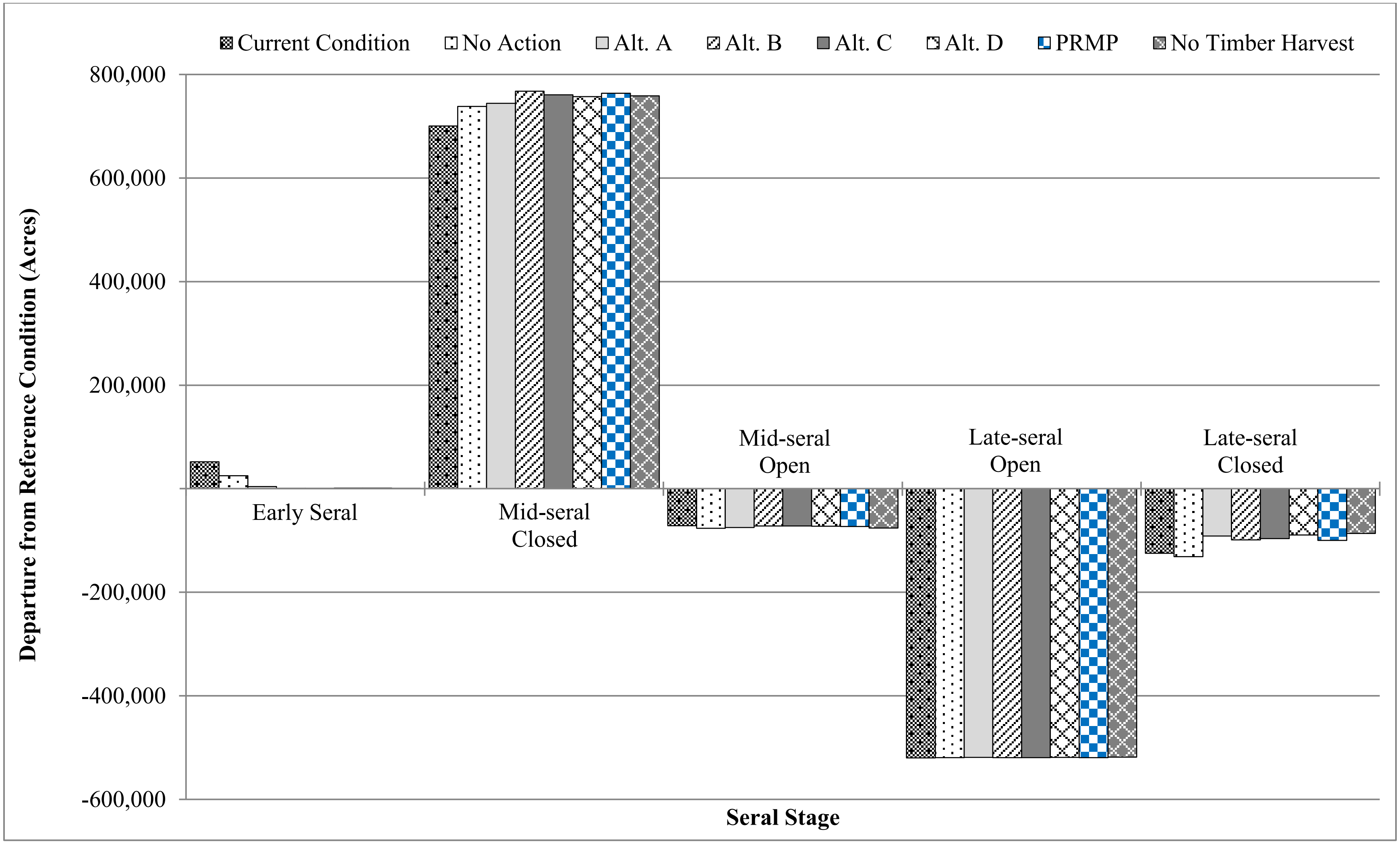


Figure 3-24. Departure from reference conditions in the Douglas-fir/dry vegetation type by seral stage
Note: This includes the current conditions, the alternatives, the Proposed RMP, and the No Timber Harvest reference analysis in 2063.[48]

48 In contrast to the Klamath Falls Field Office and Roseburg District, Alternatives B, C, and D, the Proposed RMP, and the No Timber Harvest reference analysis would result in a deficit of early seral forest (3,100–6,400 acres) on the Medford District in 50 years. **Figure 3-24** does not depict this deficit.

In 50 years, conditions in the Douglas-fir/dry vegetation type under the No Timber Harvest reference analysis and all alternatives and the Proposed RMP would generally result in continued departure from reference conditions (**Figure 3-24**).

The alternatives and the Proposed RMP would result in only modest shifts in the seral stage distribution on the BLM-administered lands. There would be continued overabundance of mid-seral closed forest conditions. The action alternatives, the Proposed RMP, and the No Timber Harvest reference analysis would result in slight improvements in the early seral departure for the Klamath Falls Field Office and Roseburg District, and late-seral closed departure for the entire interior/south. Under any scenario, there would be no change to the late-seral open forest departure. Because the BLM-administered lands constitute only a small portion of the analysis area, these modest shifts would not result in any substantial change in the overall landscape condition in the Douglas-fir/dry vegetation type. Under all alternatives, the Proposed RMP, and the No Timber Harvest reference analysis, the landscape condition in the Douglas-fir/dry vegetation type would continue to be shaped by an substantial overabundance of mid-seral closed forest and a large deficit of late-seral open forest.

The Douglas-fir/moist vegetation type has differing patterns both currently and in the future for the three administrative units. Therefore, this discussion presents the results for the three administrative units separately.

Currently within the Klamath Falls Field Office, the amount of Douglas-fir/moist early seral vegetation is within the natural range of variability of the reference condition, hence, there are no bars associated with this seral-state (**Figure 3-25**). There is a substantial overabundance of mid-seral closed forest and slight overabundance of mid-seral open forest (**Figure 3-25**). The Douglas-fir/moist vegetation type is also slightly deficit of late-seral closed forest and substantially deficit of late-seral open forest.

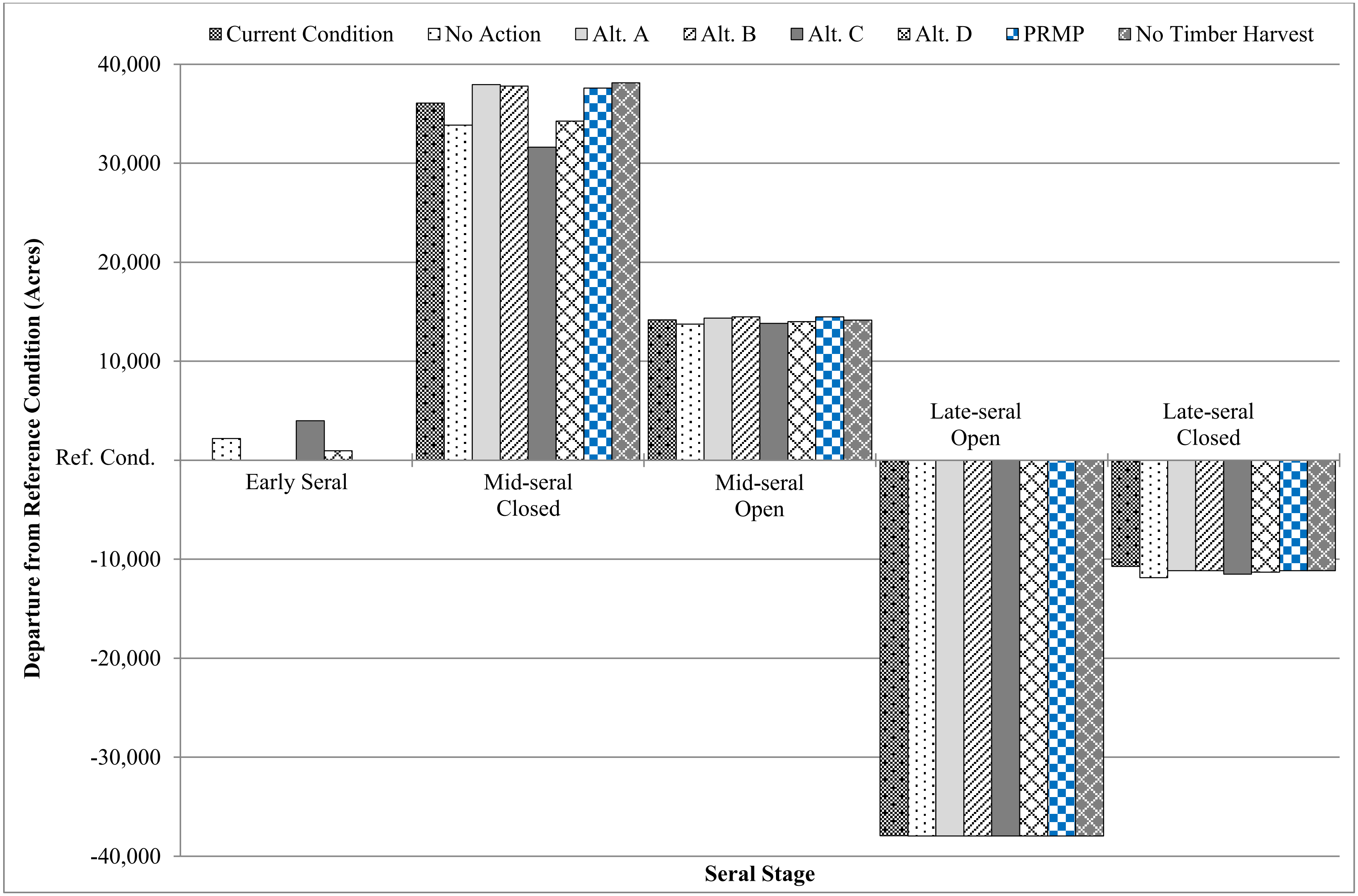


Figure 3-25. Departure from reference conditions in the Douglas-fir/moist vegetation type by seral stage for the Klamath Falls Field Office

Note: This includes the current conditions, the alternatives and the Proposed RMP, and the No Timber Harvest reference analysis in 2063.

In 50 years, all alternatives, the Proposed RMP, and the No Timber Harvest reference analysis would result in only modest shifts of seral stage distribution on BLM-administered lands in the Klamath Falls Field Office. The No Action alternative and Alternatives C and D would slightly reduce the overabundance of mid-seral closed forest, from current conditions. The No Action alternative and Alternatives C and D would result in a sight overabundance of early seral acreage. For all other seral stages, conditions in the Douglas-fir/moist vegetation type under any alternative, the Proposed RMP, and the No Timber Harvest reference analysis would result in essentially no change to current departure from reference conditions.

Currently within the Medford District, the Douglas-fir/moist vegetation type is slightly deficit in early seral and mid-seral open forest (**Figure 3-26**). There is a substantial overabundance of mid-seral closed forest and slight overabundance of late-seral closed forest. The Douglas-fir/moist vegetation type has a sizeable deficit of late-seral open forest.

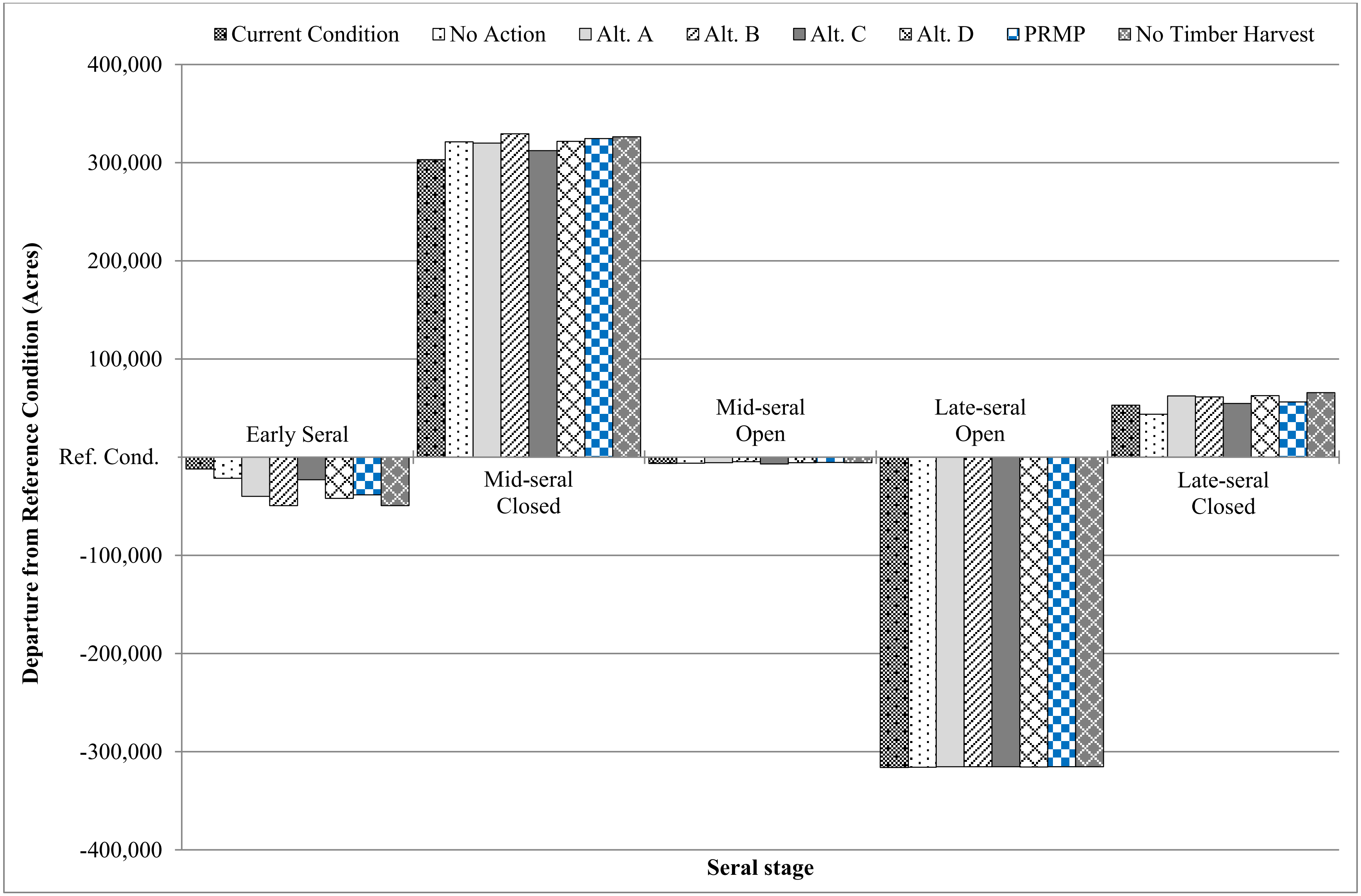


Figure 3-26. Departure from reference conditions in the Douglas-fir/moist vegetation type by seral stage for the Medford District

Note: This includes the current conditions, the alternatives and the Proposed RMP, and the No Timber Harvest reference analysis in 2063.

In 50 years, conditions in the Douglas-fir/moist vegetation type in the Medford District under any alternative, and the Proposed RMP, and the No Timber Harvest reference analysis would generally result in continued departure from reference conditions (**Figure 3-26**) and result in only modest shifts, if any, in seral stage distribution. Again, the Douglas-fir/moist vegetation type would continue to be shaped by an overabundance of mid-seral closed forest and a deficit of late-seral open forest.

Currently within the Roseburg District, the Douglas-fir/moist vegetation type has a slight overabundance of early seral and late-seral closed forest and slight deficit in mid-seral open forest (**Figure 3-27**). Again, there is a substantial overabundance of mid-seral closed forest and a sizeable deficit in late-seral open forest.

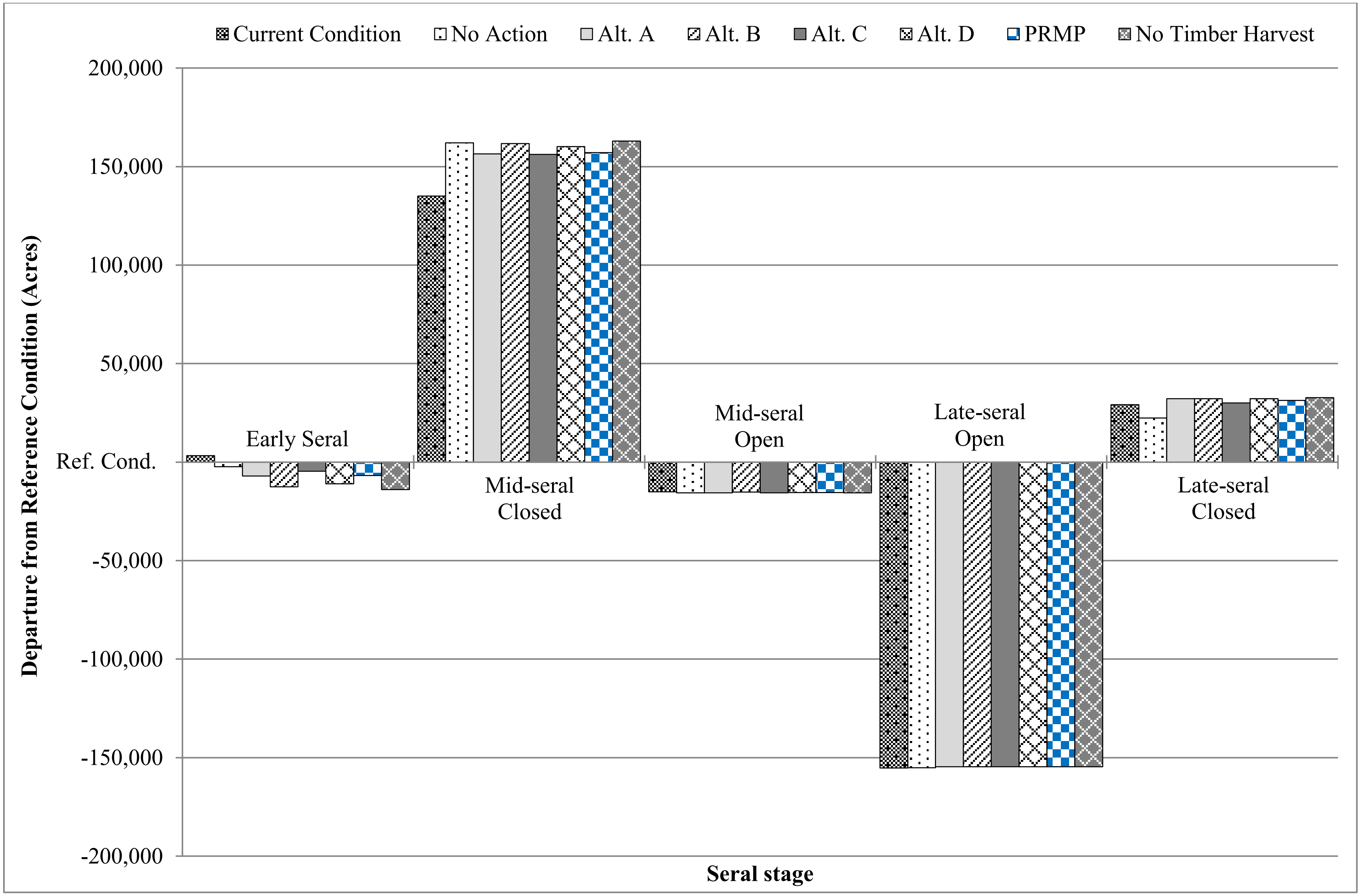


Figure 3-27. Departure from reference conditions in the Douglas-fir/moist vegetation type by seral stage for the Roseburg District

Note: This includes the current conditions, the alternatives and the Proposed RMP, and the No Timber Harvest reference analysis in 2063.

Again, in 50 years, conditions in the Douglas-fir/moist vegetation type in the Roseburg District under any alternative, the Proposed RMP, and the No Timber Harvest reference analysis would generally result in continued departure from reference conditions. There would be a shift in departure of early seral acres from a slight overabundance in the current condition to a slight deficit under all alternatives, the Proposed RMP, and the No Timber Harvest reference analysis. There would be little change from current departure in both the mid-seral closed and late-seral open forest under any alternative and the Proposed RMP.

Similar to the Douglas-fir/dry vegetation type, in 50 years, conditions in the Douglas-fir/moist vegetation type under any alternative, the Proposed RMP, and the No Timber Harvest reference analysis would generally result in continued departure from reference conditions (**Figure 3-25**, **Figure 3-26**, and **Figure 3-27**). The alternatives and the Proposed RMP would result in only modest shifts in the seral stage distribution on the BLM-administered lands, and thus the overall landscape condition in the Douglas-fir/moist vegetation type. Under all alternatives, the Proposed RMP, and the No Timber Harvest reference analysis, the landscape condition in the Douglas-fir/moist vegetation type would continue to be shaped by an overabundance of mid-seral closed forest and a deficit of late-seral open forest.

While objectives associated with the Harvest Land Base and Late Successional Reserve land use allocations in the interior/south coincide with the development of complex and heterogeneous seral stage landscape distribution, aligned with low- and mixed-severity ecosystems (**Appendix B**), in both the Douglas-fir/dry and Douglas-fir/moist vegetation types, the differing BLM management under the alternatives and the Proposed RMP would result in little change in the departure from reference conditions over time, for several reasons. First, the BLM-administered lands represent a small portion of the analysis area. Second, under all alternatives and the Proposed RMP, the BLM would allocate only a small portion of the BLM-administered lands to the Harvest Land Base, in which the BLM would implement the most active management capable of shifting seral stages. Management within reserve allocations would be unlikely to shift seral stages substantially, given the reserve land use allocation objectives. Finally, the 50-year analysis period may be too short in length to show substantial shifts in seral stages (e.g., for development of mid-seral closed forests into late-seral open forests).

In summary, the landscape would remain departed from reference conditions similarly under any alternative or the Proposed RMP, with a continued overabundance of mid-seral closed forest and a deficit of late-seral open forest. Changes in seral stage distribution on BLM-administered lands would account for only small shifts in the landscape departure under any alternative or the Proposed RMP.

Issue 2

How would the alternatives affect fire resistance in the fire-adapted dry forests at the stand level?

Summary of Analytical Methods

Resistance refers to the capacity for an ecosystem to resist the impacts of disturbances without undergoing significant change. For example, wildfire can burn through a resistant forest without substantially altering its structure, composition, or function (Franklin *et al.* 2013).

In this analysis, the BLM assigned forest structural stages (**Appendix C**) to a relative ranking of resistance to stand-replacement fire (**Table 3-32**). These categories range from Low/Moderate fire resistance (i.e., greater tendency of a stand-replacement fire) to High fire resistance (i.e., less probability of a stand-replacement fire). Mixed fire resistance indicates the potential to exhibit the full range of resistance categories (High to Low) (**Appendix H**).

Table 3-32. Resistance to stand-replacement fire by structural stage

Structural Stages	Subdivisions	Resistance to Stand Replacement Fire
Early Successional	with Structural Legacies	Moderate
	without Structural Legacies	Moderate
Stand Establishment	with Structural Legacies	Moderate
	without Structural Legacies	Low
Young Stands – High Density	with Structural Legacies	Low
	without Structural Legacies	Low
Young Stands – Low Density	with Structural Legacies	Moderate
	without Structural Legacies	Moderate
Mature	Single-layered Canopy	High
	Multi-layered Canopy	Mixed
Structurally-complex	Developed Structurally-complex	Mixed
	Existing Old Forest	Mixed
	Existing Very Old Forest	Mixed

While the structural stage classification does not specifically account for surface fuel loading, the BLM assumed that vegetation community structure is an important factor affecting potential fire behavior, post-fire effects, and fire resistance, particularly to crown fire (Jain and Graham 2007), which has the largest immediate and long-term ecological effects (Graham *et al.* 2004). In the frequent fire-adapted dry forest, fire resistant stand structure reduces the likelihood of atypical large-scale crown fires (Agee and Skinner 2005, Jain *et al.* 2012, Franklin *et al.* 2013). In general, stands with higher fire resistance have reduced surface fuel loading, lower tree density, large diameter trees of fire-resistant species, increased height to live crown (Brown *et al.* 2004, Peterson *et al.* 2005, USDI BLM 2008), and discontinuous horizontal and vertical fuels.

This analysis does not account for the complex interaction among fuels (including vertical and horizontal composition and moisture), topography (e.g., slope, topographic position, elevation, and aspect), and weather (e.g., wind, temperature, relative humidity, fuel moisture, and drought) that influence fire behavior, resultant burn severity, and fire effects (Andrews and Rothermel 1982, Scott and Reindhardt 2001) and the specific conditions related to crown fire initiation and spread (Van Wagner 1977). As fire weather indices increase throughout the summer, resistance to stand-replacement fire decreases. Weather events and climatic conditions, including drought, have the potential to result in unexpected and extreme fire behavior, and subject every structure class to high-severity fire. Nevertheless, at this scale of analysis with the data available, the assignment of structural stages to a relative ranking of stand-level resistance provides a robust and consistent basis for comparing the effects of the alternatives and the Proposed RMP.

The analysis area is the dry forest area within the interior/south: the Klamath Falls Field Office, and the Medford and Roseburg Districts, as described in Issue 1. The BLM quantified the acreage of BLM-administered lands in the dry forest in the Klamath Falls Field Office, and the Medford and Roseburg Districts in each fire resistance categories for each alternative and the Proposed RMP over 50 years.

The results of this analysis do not include effects from non-commercial hazardous fuels work, which would contribute toward improving fire resistance similarly among all alternatives and the Proposed RMP.

Appendix H provides detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales.

Affected Environment and Environmental Consequences

Currently, about half of the BLM-administered lands in dry forest have relatively Moderate or Low fire resistance (i.e., greater potential of a stand-replacement fire). Approximately 5 percent of the BLM-administered lands in dry forest currently have High fire resistance (i.e., less potential of a stand-replacement fire) (**Figure 3-28**). The remaining acres are in a Mixed fire resistance.

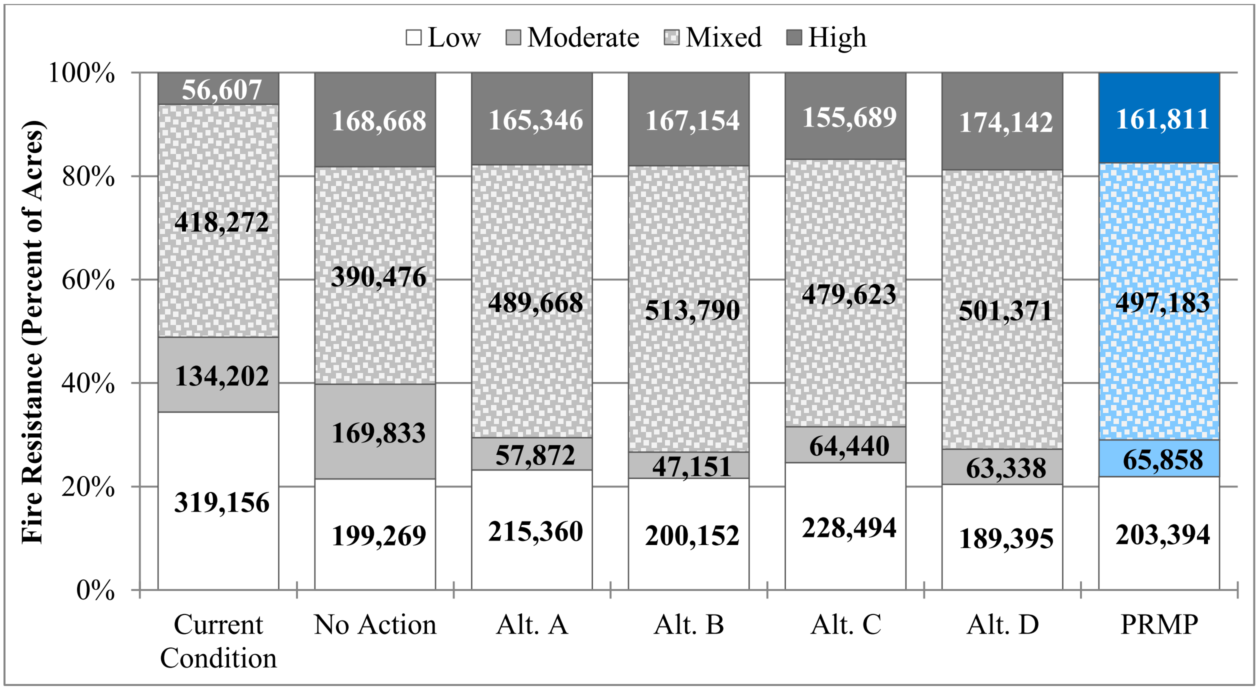


Figure 3-28. Stand-level fire resistance categories in the dry forest in the interior/south for the current condition and in 50 years

In 50 years, all alternatives and the Proposed RMP would result in an increase in stand-level fire resistance across the dry forest and would reduce the acres of Moderate or Low fire resistance and increase the acres of High fire resistance, relative to current conditions across the dry forest. The No Action alternative would result in the least reduction in the acreage of Moderate or Low fire resistance. Although results among the action alternatives and the Proposed RMP are very similar, Alternatives B and D would result in the largest reduction in the acreage of Low or Moderate fire resistance, followed by the Proposed RMP and then Alternatives A and C.

The effects of the alternatives and the Proposed RMP on stand-level fire resistance in both the Medford and Roseburg Districts in 50 years would approximate the effects across the dry forest (**Figure 3-29** and **Figure 3-30**). Differences would be more evident for the Klamath Falls Field Office (**Figure 3-31**), where Alternatives A and B, and the Proposed RMP would result in the most pronounced reduction of Low and Moderate fire resistance conditions and the largest increase in Mixed and High fire resistance acres. The No Action alternative would result in a slight increase in the acreage of both High and Moderate fire resistance from current conditions, and, consequently only a slight reduction in the acreage of Low fire resistance. Alternative D would result in only a slight increase in High and Mixed fire resistance conditions, and little reduction in Low and Moderate fire resistance. Alternative C would result in no increase in the acreage of High fire resistance and less increase in the acreage of Mixed fire resistance than the other alternatives and the Proposed RMP.

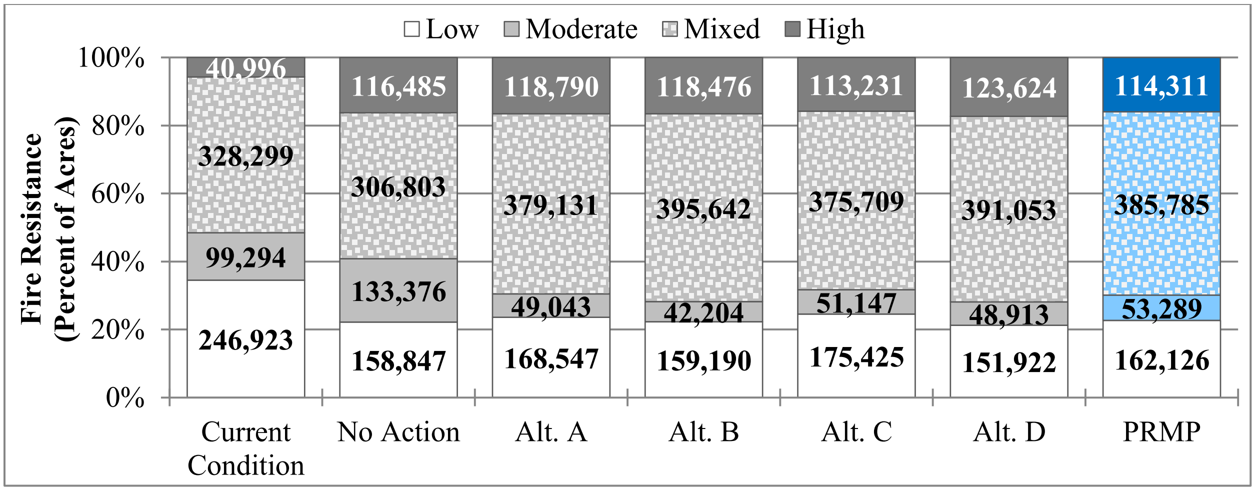


Figure 3-29. Stand-level fire resistance categories in the dry forest in the Medford District for the current condition and in 50 years

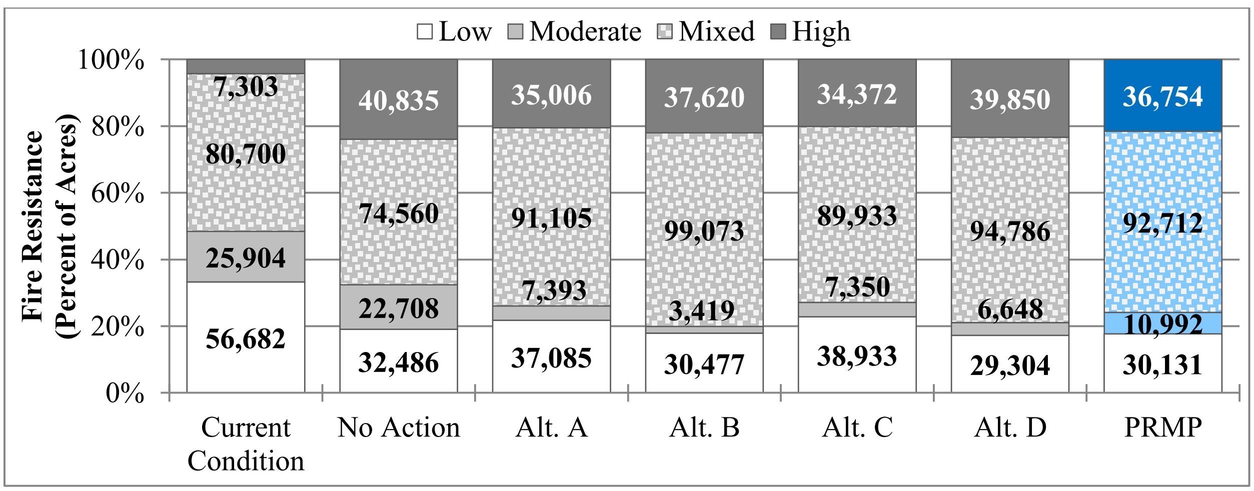


Figure 3-30. Stand-level fire resistance categories in the dry forest in the Roseburg District for the current condition and in 50 years

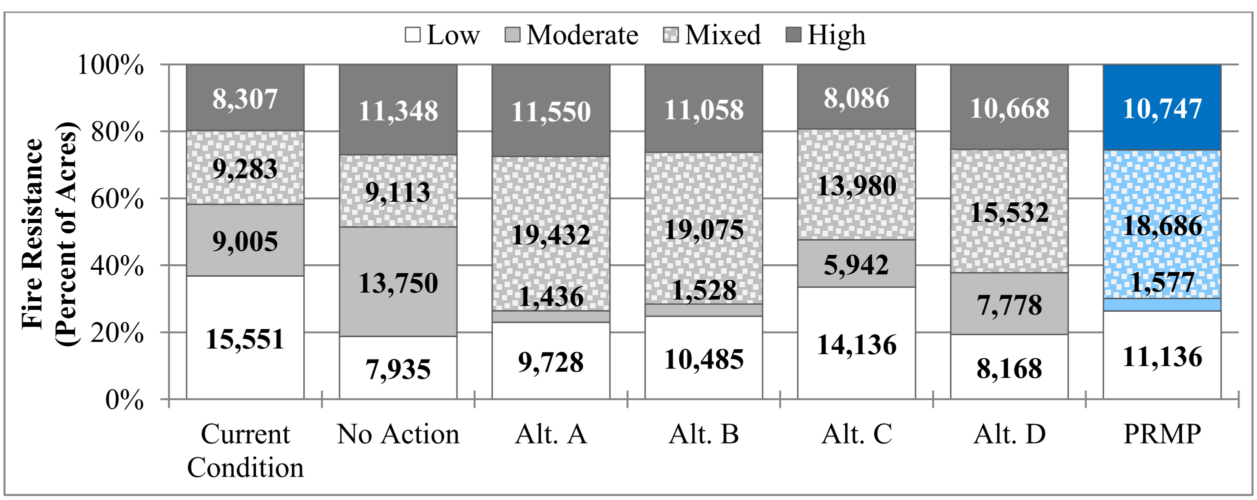


Figure 3-31. Stand-level fire resistance categories in the dry forest in the Klamath Falls Field Office for the current condition and in 50 years

The alternatives and the Proposed RMP differ in the extent and location of both the Harvest Land Base and the Late-Successional Reserve (**Figure 3-32**). The associated changes in vegetation, due to different extents and management direction within the Harvest Land Base among the alternatives and the Proposed RMP, would influence the overall patterns of stand-level fire resistance, rather than changes occurring within the reserves.

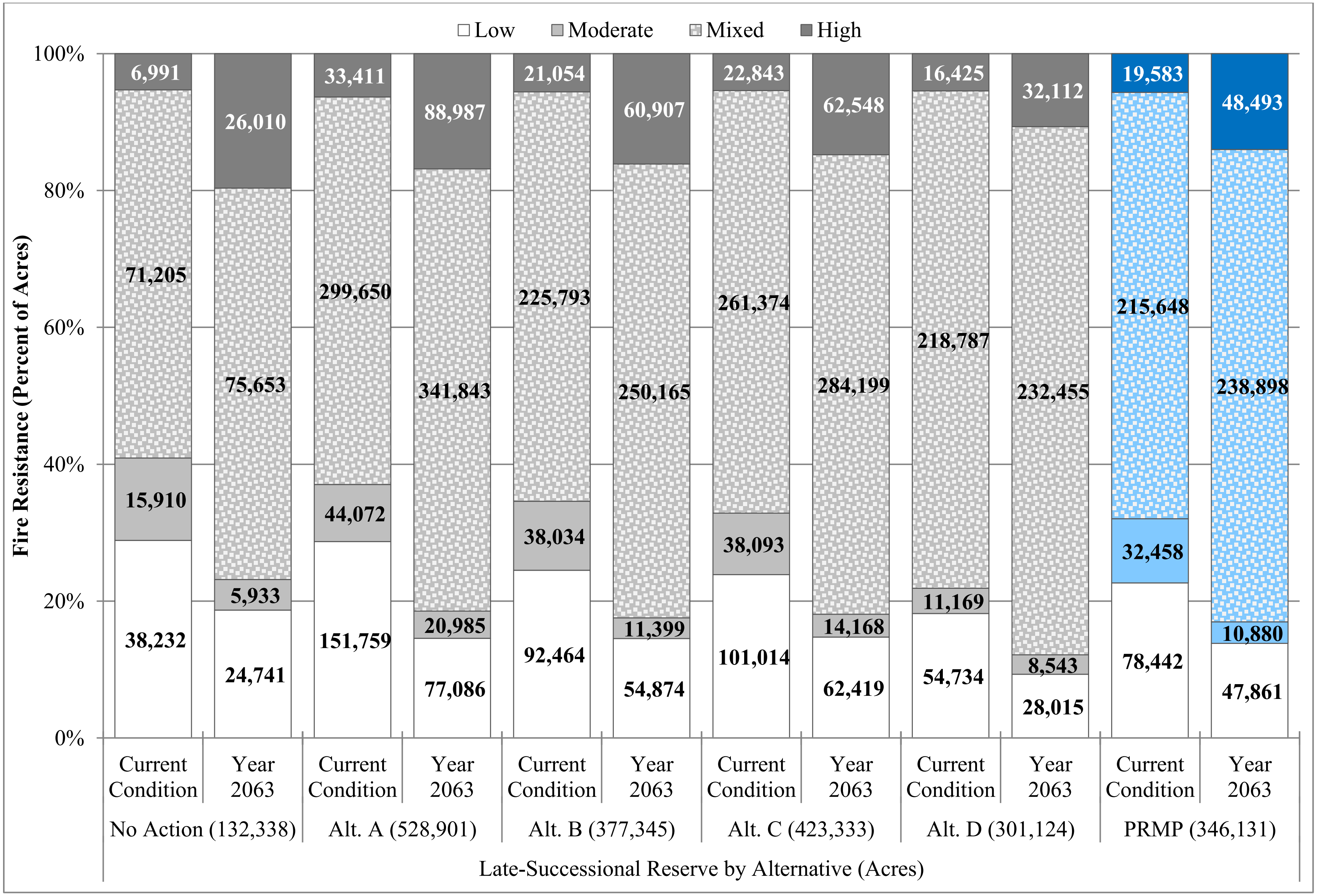


Figure 3-32. Stand-level fire resistance categories in the Late-Successional Reserve in the dry forest in the interior/south for the current condition and in 50 years

Even though the alternatives and the Proposed RMP differ substantially in the extent and location of the Late-Successional Reserve in the dry forest, current fire resistance within the Late-Successional Reserve is similar (**Figure 3-32**). Additionally, all alternatives and the Proposed RMP would similarly reduce the acreage in the low or moderate fire resistance categories within the Late-Successional Reserve after 50 years, thus not influencing the overall patterns of change within the dry forest. However, within the Harvest Land Base, there would be greater variation in the patterns of change in stand-level fire resistance over time, and this would drive the differences among the alternatives and the Proposed RMP across the dry forest overall (**Figure 3-33**). In large part, the lack of difference among alternatives and the Proposed RMP for the dry forest in the interior/south is due to the abundance of acres in the Mixed fire resistance category (**Figure 3-28**), especially in the Late-Successional Reserve (**Figure 3-32**). The Mixed fire resistance category has the potential to exhibit the full range of resistance categories (High to Low), discussed in further detail in **Appendix H**.

The BLM assumed that the restoration approach taken in the Late-Successional Reserve in the dry forest would include stand density reductions, cultivation of large trees with old-growth characteristics, introductions of heterogeneity into increasingly uniform stands, and treatments to reduce fire risk adjacent to high-value habitat. However, treatments in the Late-Successional Reserve – Dry land use allocation may not be a priority; guarantee of treatment occurrence is tenuous. The Proposed RMP includes management direction that directs the application of selection harvest or commercial thinning treatments on 21,500 eligible acres within the Late-Successional Reserve – Dry land use allocation per decade (**Appendix B**), and would afford reasonable certainty of actions occurring on approximately 12 percent of this land use allocation each decade.

Within the Harvest Land Base, the current stand-level fire resistance conditions differ among the alternatives and the Proposed RMP due to the differing extents and locations of the Harvest Land Base (**Figure 3-33**). The No Action alternative has the largest Harvest Land Base (i.e., Matrix and Adaptive Management Areas) and the smallest proportion (52 percent) currently in Low or Moderate fire resistance. While the size of the Harvest Land Base is relatively similar among Alternatives B, C, and D, and the Proposed RMP, the Proposed RMP has the smallest Harvest Land Base with Alternative D having the largest Harvest Land Base within the dry forest. Among these alternatives and the Proposed RMP, approximately 60 percent of the Harvest Land Base acreage is currently in Low or Moderate fire resistance. Alternative A has the smallest Harvest Land Base and the largest proportion (75 percent) in Low or Moderate fire resistance.

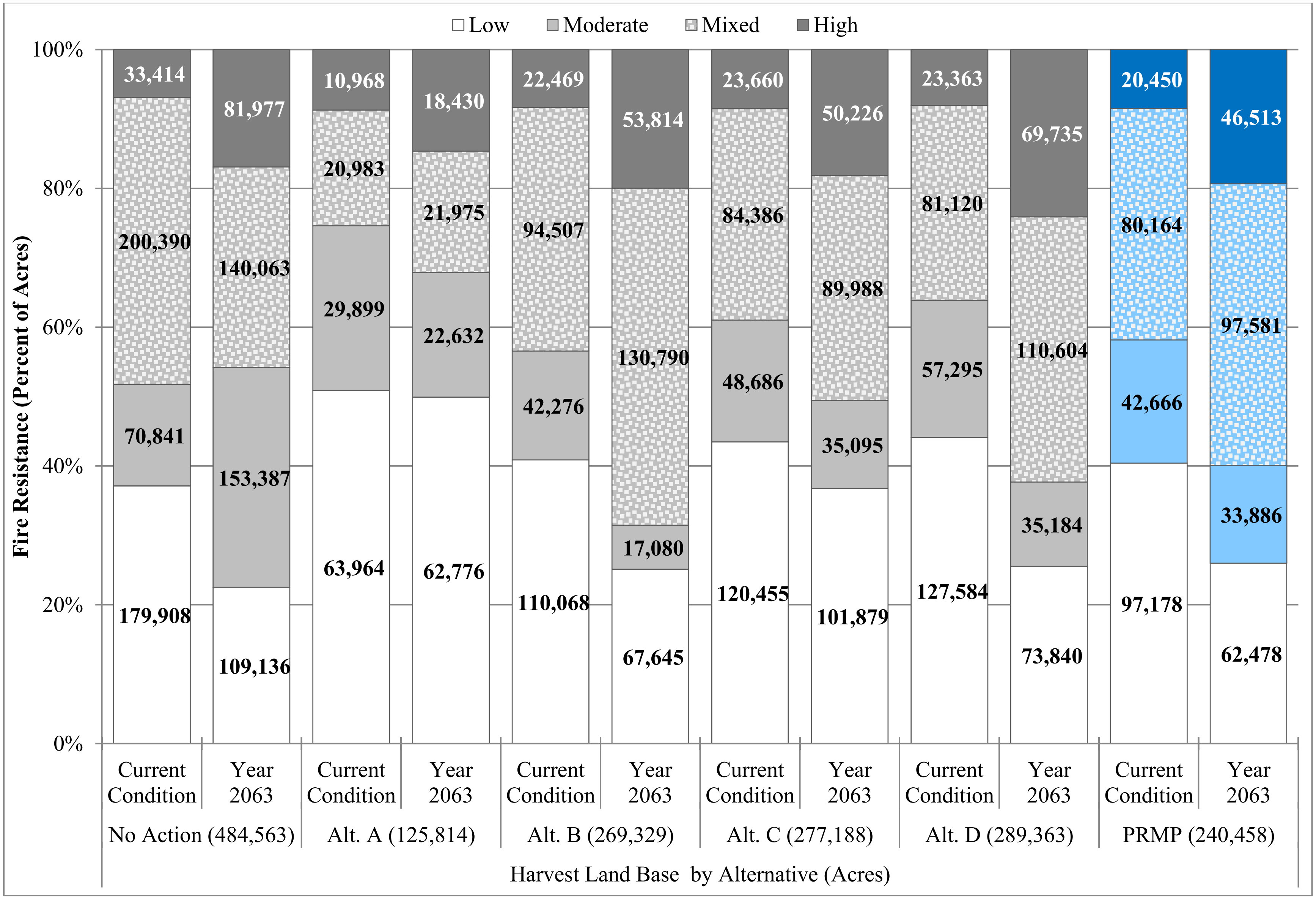


Figure 3-33. Stand-level fire resistance categories in the Harvest Land Base in the dry forest in the interior/south for the current condition and in 50 years

In 50 years, all of the action alternatives and the Proposed RMP would reduce the proportion of the Harvest Land Base in Low or Moderate fire resistance (**Figure 3-33**). Alternative A would reduce this proportion by 7 percent, Alternative C would result in a decrease of 12 percent, and Alternatives B and D would result in the largest decrease (25 and 26 percent, respectively) in the proportion of the Harvest Land Base in Low or Moderate fire resistance. The Proposed RMP would decrease the acres of Low and Moderate fire resistance by 18 percent. In contrast, the No Action alternative would slightly increase the proportion of the Harvest Land Base in Moderate fire resistance, while decreasing the proportion of Low fire resistance in 50 years.

Alternative B, followed by Alternative D and the Proposed RMP, would result in the largest proportions of High and Mixed fire resistance within the dry forest Harvest Land Base in 50 years. The results for each district approximate the same trends as the entire dry forest Harvest Land Base (**Appendix H**).

The differences among alternatives and the Proposed RMP, in stand-level fire resistance within the Harvest Land Base, largely would result from the type of management and associated management direction.

The Harvest Land Base within the dry forest for the interior/south in Alternatives A and C is comprised of both the High Intensity Timber Area and the Uneven-aged Timber Area (**Table 3-33**). A larger proportion of the Harvest Land Base in Alternative A is in the High Intensity Timber Area, which would result in only a slight improvement in stand-level fire resistance in the Harvest Land Base, relative to the current condition. Alternative C has a larger Harvest Land Base with more acres in both the High Intensity Timber Area and the Uneven-aged Timber Area than Alternative A. A larger proportion of the Harvest Land Base in Alternative C is in the Uneven-aged Timber Area which would improve overall stand-level fire resistance slightly more than Alternative A.

Table 3-33. Harvest Land Base allocations in the dry forest in the interior/south

Alternative/ Proposed RMP	Harvest Land Base Allocations	Area (Acres)
No Action	Matrix/AMA	**484,563**
Alt. A	High Intensity Timber Area	71,474
	Uneven-aged Timber Area	54,340
	Total	**125,814**
Alt. B	Uneven-aged Timber Area	269,329
	Total	**269,329**
Alt. C	High Intensity Timber Area	92,588
	Uneven-aged Timber Area	184,528
	Total	**277,188**
Alt. D	Moderate Intensity Timber Area	31,258
	Uneven-aged Timber Area	62,214
	Owl Habitat Timber Area	195,891
	Total	**289,363**
PRMP	Moderate Intensity Timber Area	8,575
	Low Intensity Timber Area	32,513
	Uneven-aged Timber Area	199,370
	Total	**240,458**

The High Intensity Timber Area includes management such as thinning and regeneration harvest with no retention and rapid reforestation on a relatively short rotation. This management approach would result in continuous horizontal and vertical fuel profiles of reduced stand-level fire resistance, more prone to support high-severity fire (Odion 2004, Thompson *et al.* 2007). Although mixed-severity fire regimes would have historically included patches of high-severity fire, there currently exists an overabundance of young and closed conditions in need of mechanical treatment or wildland fire disturbance (Haugo *et al.* 2015). Large areas of no retention are not representative of the prevailing vegetative patterns and structure associated with frequent fire, low-severity or mixed-severity fire regimes (Taylor and Skinner 2003, Larson and Churchill 2012).

In Alternative B, all of the dry forest Harvest Land Base in the interior/south is Uneven-aged Timber Area. Alternative D has most of the Harvest Land Base in the Uneven-aged Timber area or Owl Habitat Timber Area. The Proposed RMP has most of the Harvest Land Base in the Uneven-aged Timber Area. Alternatives B and D would result in the largest decrease in Low and Moderate fire resistance, relative to current conditions, followed by the Proposed RMP.

The management approach in the Uneven-aged Timber Area includes reducing stand densities and promoting or enhancing heterogeneity and large tree growth, through a combination of silviculture treatments, harvest, and prescribed fire. Management in the Owl Habitat Timber Area includes both lighter thinning and uneven-aged management. Both of these management scenarios would result in the largest reduction of low and moderate stand-level fire resistance and the largest increase in the mixed- and high-fire resistance acres. These mixed- and higher-fire resistance stands would result in more discontinuous fuel profiles and a greater resistance to a stand-replacement fire. Additionally, discontinuous fuels tend to reduce the complexities associated with implementation of prescribed fire (Jain *et al.* 2012), presenting more opportunities to apply fire on the landscape and maintain fire-resistant stand conditions.

The Uneven-aged Timber Area management direction also provides the latitude to increase within and between-stand heterogeneity in response to topographic and vegetative complexity (Hessburg *et al.* 2015), as well as create strategic landscape conditions that provide fire management opportunities. (**Appendix B**). The increased spatial heterogeneity at multiple scales, and disruption of fuel continuity, can alter potential fire behavior (Finney 2001) and may create conditions in which wildfire can occur without detrimental consequences, reducing impacts to highly valued resources, including timber and wildlife habitat (Jain *et al.* 2012). Particularly in stands that are not currently structurally-complex, the creation of small openings and heterogeneous (patchy) stand composition will move vegetation patterns and fuel loadings and arrangements toward conditions comparable to low- and mixed-severity fire regimes (Agee 2002). These conditions may also provide opportunities for effective fire management, including the ability to utilize wildfire to meet land use and resource objectives consistent with management direction (**Appendix B**). However, due to the configuration of BLM-administered lands within the larger landscape, particularly their proximity to residential areas, the ability to use wildfire may have limited application. Prescribed fire would likely account for the majority of managed fire under any alternative or the Proposed RMP.

Alternative D has a little more than 30,000 acres of the Harvest Land Base in the Moderate Intensity Timber Area, while the Proposed RMP has 8,575 acres in this sub-allocation. The Moderate Intensity Timber Area includes thinning and regeneration harvest with 5–15 percent basal area retention, longer rotations, and rapid natural or artificial reforestation of species appropriate to the site. This management approach would result in more continuous horizontal and vertical fuel profiles and reduced stand-level fire resistance. However, the Moderate Intensity Timber Area constitutes only about 11 percent of the dry forest Harvest Land Base under Alternative D and 4 percent in the Proposed RMP diminishing its influence on overall stand-level fire resistance in the interior/south. The Harvest Land Base sub-allocations in the Proposed RMP direct some level of retention of certain large trees (**Appendix B**), which are important fire-resistant structures.

In summary, all alternatives and the Proposed RMP would reduce the acres of moderate or low fire resistance and increase the acres of high fire resistance, relative to current conditions across the dry forest in the interior/south. Although the alternatives and the Proposed RMP would differ only slightly across the dry forest, those differences reflect the varied extent and patterns resulting from management within the Harvest Land Base. The effects of some alternatives and the Proposed RMP, evident within the Harvest Land Base, are less evident at the entire extent of the dry forest, due to the small Harvest Land Base relative to a larger Late-Successional Reserve system.

Issue 3

How would the alternatives affect fire hazard within close proximity to developed areas?

Summary of Analytical Methods

In this analysis, the BLM evaluated stand-level fire hazard within close proximity to developed areas.

In this analysis, the BLM assumed that a one-mile buffer around the West Wide Wildfire Risk Assessment Wildland Development Areas data layer (WWRA 2013) represents the geographic scope of possible immediate risks to the public and firefighter safety within close proximity to communities located within the Wildland Urban Interface (WUI)[49] across the planning area. The Oregon Department of Forestry, on behalf of the Council of Western State Foresters and the Western Forestry Leadership Coalition, completed the West Wide Wildfire Risk Assessment in 2013. This assessment quantified the magnitude of the current wildland fire problem in the west and established a baseline for planning mitigation activities and monitoring change over time. The Wildland Development Areas data layer provides a delineation of where people live in the wildland, classifying a minimum of 1 structure per 40 acres as a developed area. The magnitude of human-caused ignitions that occur there illustrates the substantial exposure and demand on fire suppression resources within close proximity to developed areas and risk to life and property (**Figure 3-34**).

[49] The Healthy Forest Restoration Act (2003) identifies WUI as an area within or adjacent to structures and other human development that meet or intermingle with undeveloped wildland.

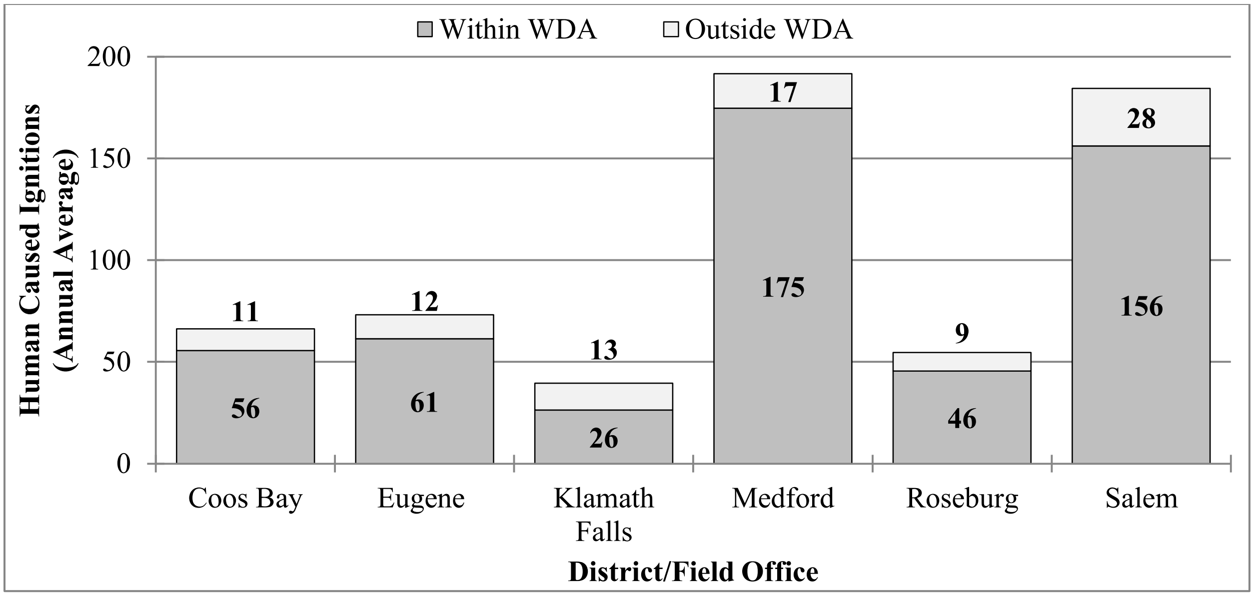


Figure 3-34. Average annual number of human-caused ignitions in proximity to Wildland Development Areas, 1984–2013
Source: Oregon Department of Forestry ignition data

The BLM assigned forest structural stages (**Appendix C**) to a relative ranking of stand-level fire hazard (**Table 3-34**). These categories range from high to moderate fire hazard (i.e., relatively difficult to control) to Low fire hazard (i.e., relatively easy to control). Mixed fire hazard indicates the potential to exhibit the full range of hazard categories (High to Low)). Fire hazard refers to the ease of ignition, potential fire behavior, and resistance to control of the fuel complex, defined by the volume and arrangement of several strata, including surface, ladder, and canopy fuels (Calkin *et al.* 2010). Fire behavior has a direct effect on fire severity, mortality, suppression tactics, and the initiation of crown fire, which presents the greatest resistance to control and the largest potential to threaten wildland urban interfaces (Graham *et al.* 2004).

Table 3-34. Stand-level fire hazard ratings by structural stage

Structural Stages	Subdivisions	Fire Hazard
Early Successional	with Structural Legacies	Moderate
	without Structural Legacies	Moderate
Stand Establishment	with Structural Legacies	High
	without Structural Legacies	High
Young Stands – High Density	with Structural Legacies	High
	without Structural Legacies	High
Young Stands – Low Density	with Structural Legacies	Moderate
	without Structural Legacies	Moderate
Mature	Single-Layered Canopy	Low
	Multi-Layered Canopy	Mixed
Structurally-complex	Developed Structurally-complex	Mixed
	Existing Old Forest	Mixed
	Existing Very Old Forest	Mixed

The BLM assumed that broad descriptions of forest vegetation conditions reflect relative stand-level fire hazard, based on general assumptions regarding the fuel profile and the probable fire behavior within that structural stage classification. The BLM quantified the acreage of forested BLM-administered lands in each fire hazard category for each alternative and the Proposed RMP over the course of 50 years within a 1-mile buffer of the Wide Wildfire Risk Assessment Wildland Development Areas data layer (WWRA 2013).

Similar to the analytical methods for stand-level fire resistance, this analysis does not account for the complex interaction among fuels (including vertical and horizontal composition and moisture), topography (e.g., slope, topographic position, elevation, and aspect), and weather (e.g., wind, temperature, relative humidity, fuel moisture, and drought) that influence fire behavior, resultant burn severity, and fire effects (Andrews and Rothermel 1982 and Scott and Reindhardt 2001).

The results of this analysis do not include effects from non-commercial hazardous fuels work, which would contribute toward reducing fire hazard similarly among all alternatives and the Proposed RMP, and be less likely to result in structural stage shifts.

Appendix H provides detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales.

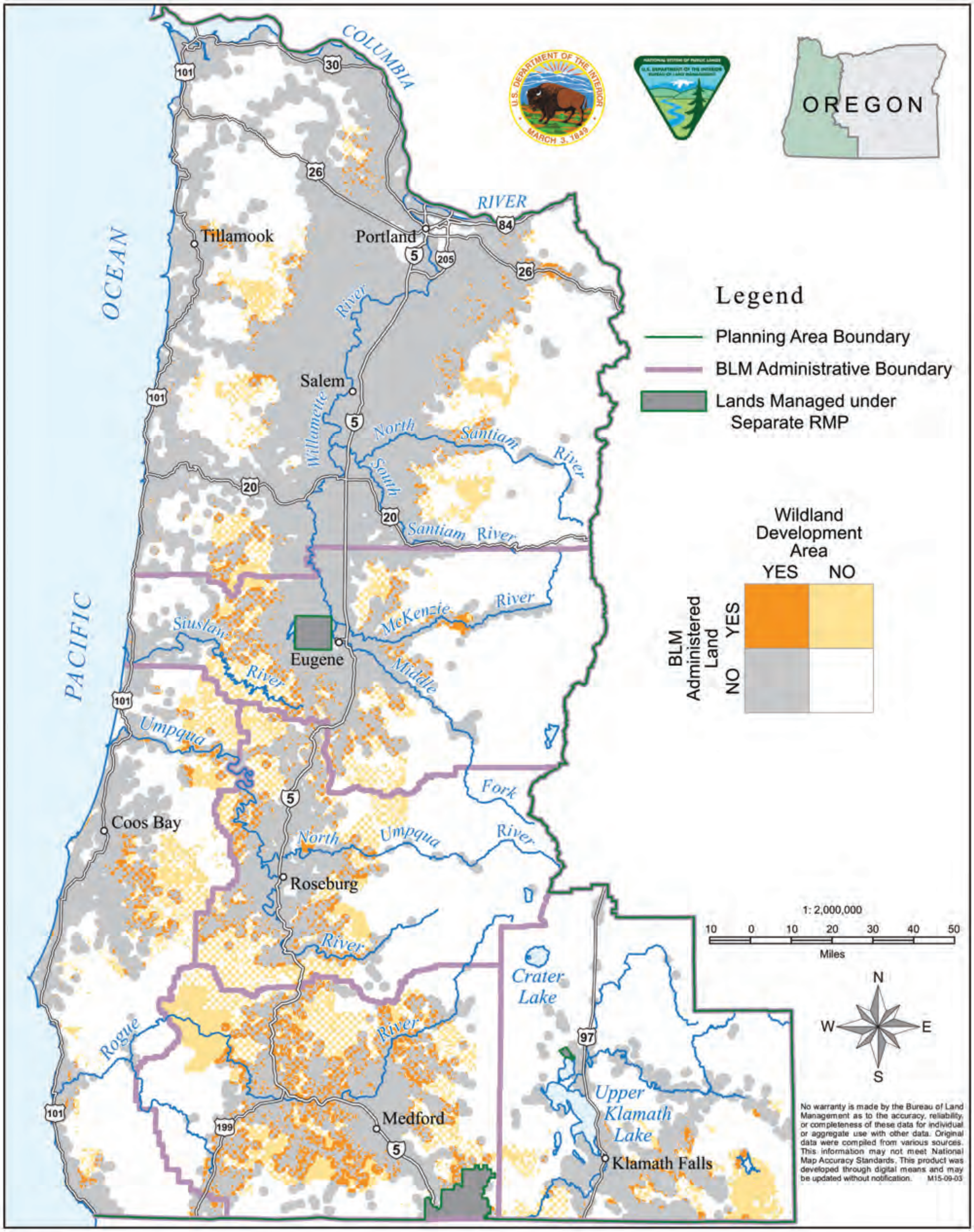
Background

Managing fire hazard in the western United States is becoming an increasingly complex challenge. Wildland fuels continue to build, drought conditions persist, human development spreads, budgets fluctuate, and fire suppression costs increase. New home construction steadily increased within wildland areas in Oregon between 1990 and 2008 (Stein *et al.* 2013, Brown *et al.* 2014), and this trend is likely to continue in the future, given expected increases in Oregon's population (OR OEA 2012).

Much of the planning area has a checkerboard pattern of ownership, with square mile sections alternating between private and BLM-administered lands. The BLM-administered lands in the planning area are typically located in the foothills and mountains surrounding inhabited valley bottomlands and are closely intermixed with small towns, rural residential areas, and private and industrial forests. This is an area commonly referred to as the Wildland Urban Interface (WUI). These lands all have different land use objectives and boundaries that wildfire does not recognize. Additionally, this complex multi-jurisdictional landscape increases the inherent complexities of fuel reduction efforts, particularly prescribed burning, and fire management operations, including managing wildfires to meet resource and land use objectives due to the risk of affecting adjacent lands.

The Healthy Forest Restoration Act (2003) provides the latitude to Community Wildfire Protection Plans (CWPP) to refine their WUI boundary, based on vegetation conditions, topography, and geographic features, including infrastructure, where strategic fuel reduction can reduce risks from large, severe wildfires and promote fire-adapted communities. Additionally, CWPPs may incorporate areas near communities that have important economic, social, cultural, visual, and ecological values in the delineation of their WUI boundary (CWPP Handbook 2004). Collaborating partners, including the BLM, use Community Wildfire Protection Plans and WUI boundaries for local coordination, prioritization, and implementation of landscape-level fuel treatments. These plans often contain fine-scale analysis that provide a robust investigation of ways to prioritize fire risk mitigation around locally identified and vetted highly valued resources and assets (e.g., Metlen *et al.* 2015), and aid in the identification of strategically defensible fuel breaks for wildland fire management.

Between 18 and 44 percent of BLM-administered lands are within 1 mile of Wildland Development Areas (**Map 3-3**). The Eugene and Medford Districts have the largest proportion, 41 and 44 percent, respectively. The Medford District has more than three times the acreage of any other district within close proximity to developed areas. A quarter of BLM-administered lands within Coos Bay (25 percent), slightly more than one third of Roseburg BLM-administered lands (31 percent), and nearly one third of Salem BLM-administered lands (28 percent) are within close proximity to wildland development areas. The Klamath Falls Field Office has the smallest proportion (18 percent) of BLM-administered lands within 1 mile of Wildland Development Areas. For many districts, the footprint of Wildland Development Areas buffered by 1 mile is a considerably smaller extent than the CWPP WUI boundaries.



Map 3-3: Wildland Developed Areas within the Planning Area

The vast majority of BLM-administered lands burned by wildfire are in the interior/south (**Table 3-35**). In the past decade, less than 5 percent of the acres burned in the decision area were in the coastal/north.

Table 3-35. Total acres burned by wildfires within the planning area, 1984–2013

10-year Interval	Coastal/North (Acres)	Interior/South (Acres)
1984–1993	23,476	138,612
1994–2003	12,938	583,724*
2004–2013	6,601	163,352

* Includes the 499,945-acre Biscuit wildfire
Source: Oregon Department of Forestry ignition data

Between 1984 and 2013, human-caused ignitions were the source of most wildfires for nearly all districts within the planning area (**Figure 3-22**). The vast majority of all human-caused ignitions occurred within close proximity to developed areas (**Figure 3-34**). Increased development of homes in the WUI, trail systems, dispersed campsites, recreation, and major travel corridors all serve to increase the risk of human-caused fires.

During this period, the Oregon Department of Forestry has provided fire prevention and protection services on BLM-administered lands in the planning area under the Western Oregon Fire Protection Services contract. Firefighting resources across the planning area have been highly effective at minimizing acres burned for most wildfires, keeping 96 percent of all ignitions to less than 10 acres in size (**Table 3-30**). However, extreme fire weather conditions still present problems for control.

Affected Environment and Environmental Consequences

Currently, almost half of all forested, BLM-administered lands within close proximity to Wildland Development Areas have High to Moderate stand-level fire hazard (i.e., fires are relatively difficult to control). In the coastal/north, approximately 20 percent of forested, BLM-administered lands within close proximity to Wildland Development Areas have Low stand-level fire hazard (i.e., fires are relatively easy to control) (**Figure 3-35**). In the interior/south, only 5 percent of forested, BLM-administered lands within close proximity to Wildland Development Areas have Low stand-level fire hazard (**Figure 3-36**).

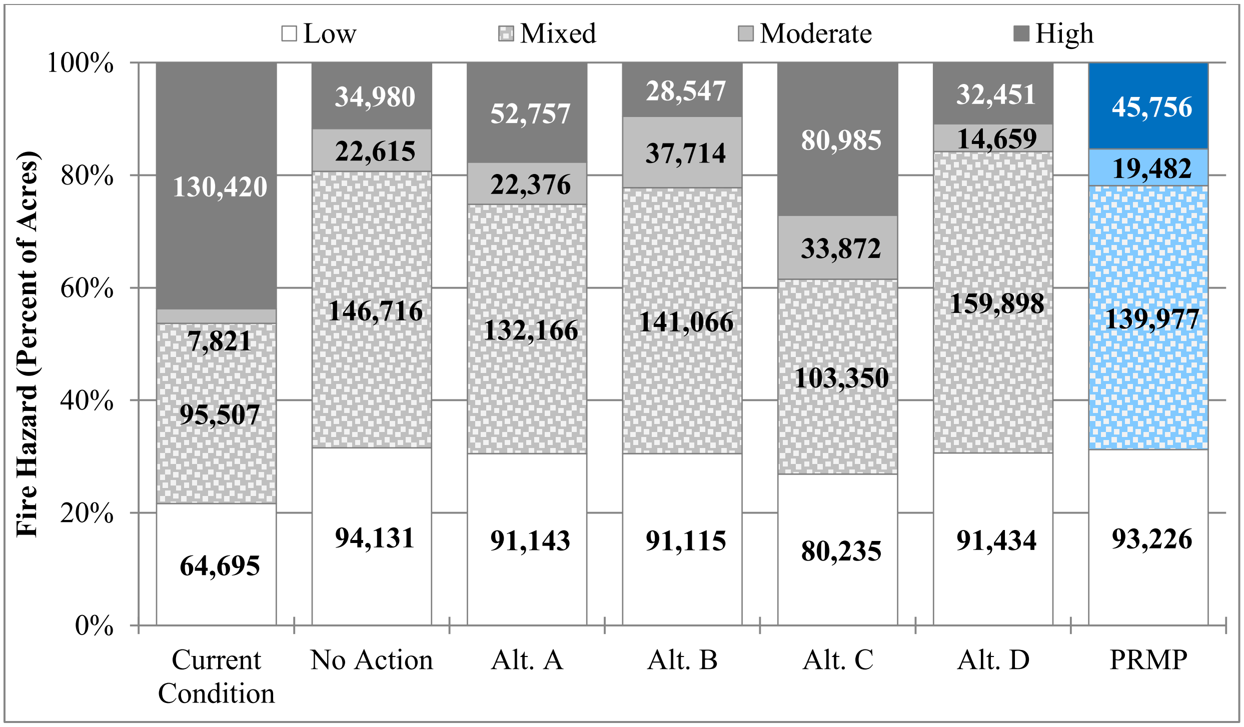


Figure 3-35. Stand-level fire hazard for all BLM-administered lands in the coastal/north within the WUI by current condition and in 2063

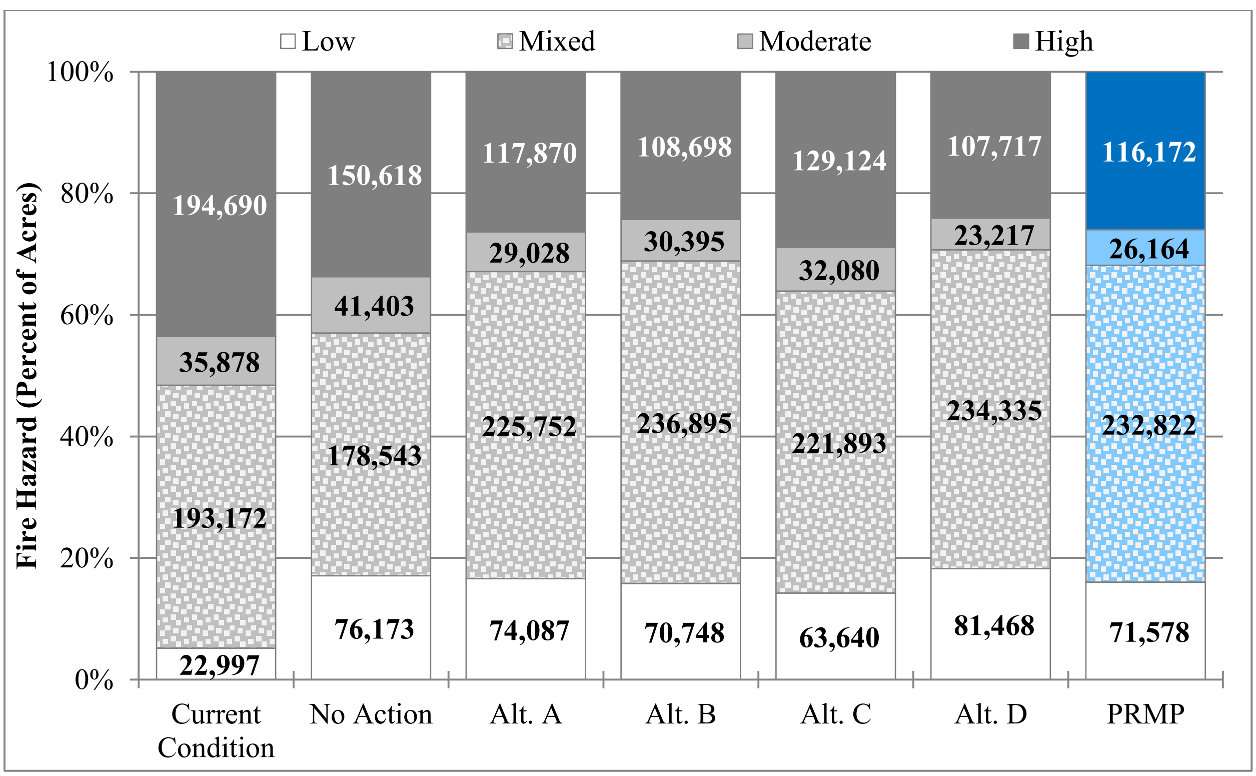


Figure 3-36. Stand-level fire hazard for all BLM-administered lands in the interior/south within the WUI, by current condition and in 2063

In 50 years, all alternatives and the Proposed RMP would result in a decrease of stand-level fire hazard for the 298,441-forested acres within close proximity to Wildland Development Areas (WWRA 2013) in the coastal/north (**Figure 3-35**). All alternatives and the Proposed RMP would reduce the acres of Moderate or High fire hazard and increase the acres of Low hazard, relative to current conditions. Alternative C would result in the least reduction of High or Moderate hazard acreage. The No Action alternative and Alternative D would result in the largest reduction in the acreage of Moderate or High fire hazard, closely followed by Alternatives A and B, and the Proposed RMP. The effects of the alternatives and the Proposed RMP on stand-level fire hazard for individual districts in 50 years would approximate the effects across the entire coastal/north portion of the planning area (**Appendix H**).

In 50 years, all alternatives and the Proposed RMP would result in a decrease in stand-level fire hazard for the 446,737-forested acres within close proximity to developed areas in the interior/south (**Figure 3-36**). All alternatives and the Proposed RMP would reduce the acres of Moderate or High fire hazard and increase the acres of Low hazard, relative to current conditions. The No Action alternative and Alternative C would result in the least reduction of High or Moderate hazard acreage. Alternatives A, B, and D, and the Proposed RMP would reduce Moderate or High fire hazard within close proximity to Wildland Development Areas (WWRA 2013) similarly and to a greater extent than Alternative C or the No Action alternative. The effects of the alternatives and the Proposed RMP on stand-level fire hazard for individual districts in 50 years would approximate the effects across the entire interior/south portion of the planning area (**Appendix H**).

As concluded in Issue 2, all alternatives and the Proposed RMP would have similar effects on fire hazard within the Late-Successional Reserve and the patterns of change would not differ (**Appendix H**). In addition, the extent of the Harvest Land Base under each alternative and the Proposed RMP and the associated changes in vegetation due to differing management direction would influence the overall patterns in stand-level fire hazard, rather than changes within the reserves. However, the relatively small extent of the Harvest Land Base minimizes changes in fire hazard patterns at the scale of all Wildland Development Areas.

In the coastal/north, the alternatives and the Proposed RMP differ in the extent and location of the Harvest Land Base. However, the current fire hazard conditions are relatively similar within close proximity to Wildland Development Areas among the alternatives and the Proposed RMP (**Figure 3-37**). All alternatives and the Proposed RMP have between 50 and 60 percent of the acreage in High or Moderate fire hazard. Alternative C has the largest acreage of Harvest Land Base within proximity to Wildland Development Areas. Alternative C has the largest amount of Harvest Land Base within close proximity to developed areas. The amount of Harvest Land Base within proximity to Wildland Development Areas is relatively similar among the No Action alternative and Alternatives B and D. Alternative A and the Proposed RMP have the smallest acreage of Harvest Land Base within proximity to Wildland Developed Areas.

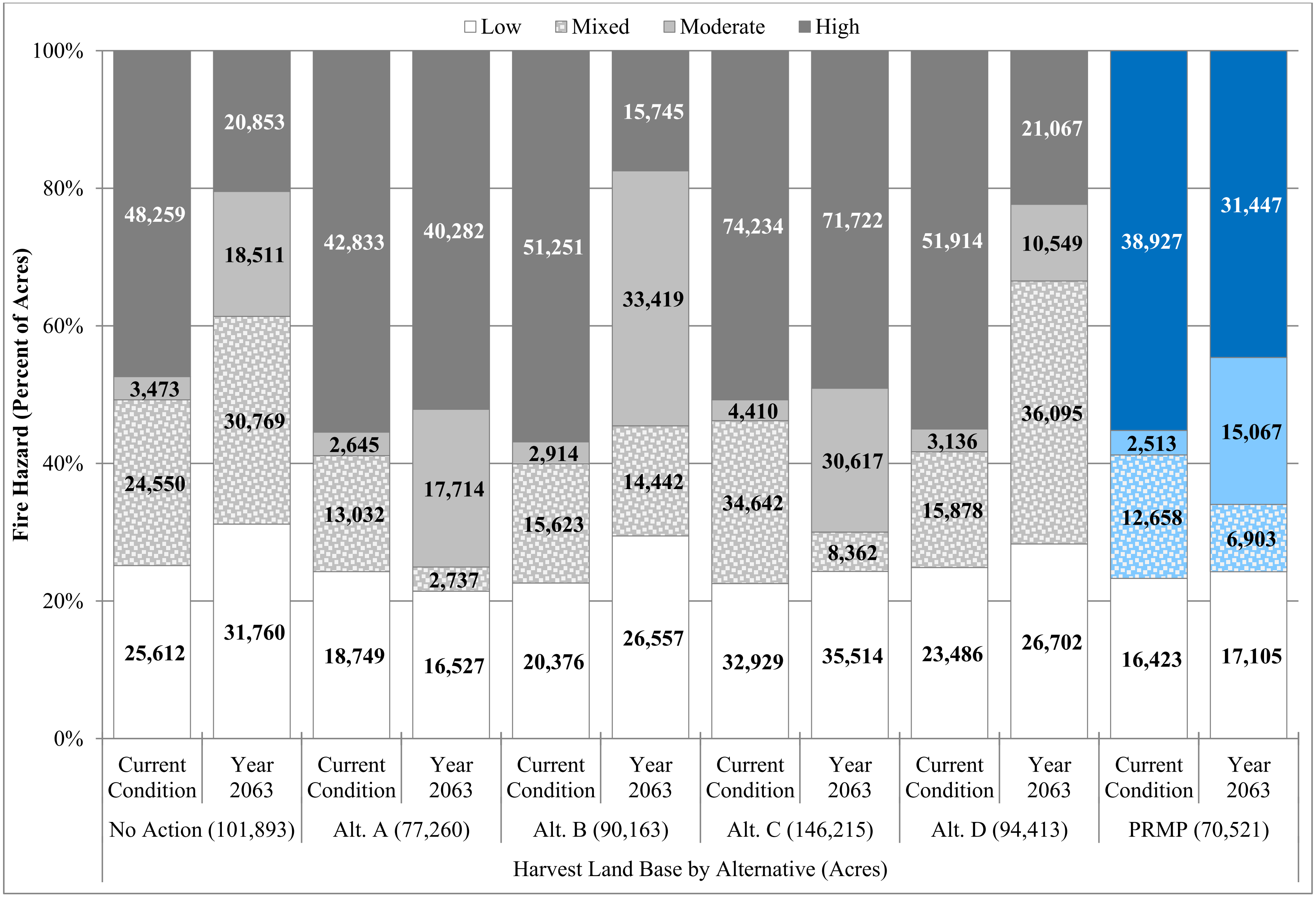


Figure 3-37. Stand-level fire hazard for the Harvest Land Base in the coastal/north within the WUI by current condition and in 2063

In 50 years, the No Action alternative and Alternatives B, C, and D, and the Proposed RMP would vary slightly increase the proportion of low hazard acres in the Harvest Land Base, relative to the current condition in the coastal/north (**Figure 3-37**). Within the Harvest Land Base, Alternative D would decrease the proportion of High and Moderate hazard by 25 percent, and the No Action alternative would result in a decrease of 12 percent. Alternative B would decrease the proportion of High hazard by 39 percent, and increase Moderate hazard by 34 percent, resulting in a slight (6 percent) net decrease of acreage in High or Moderate hazard within the Harvest Land Base. Similarly, Alternative A and C would only slightly decrease the proportion of High hazard and increase moderate hazard, resulting in a net increase (16 percent) of acreage in High or Moderate hazard within the Harvest Land Base. The Proposed RMP would slightly decrease the proportion of High hazard, and increase Moderate hazard, resulting in a slight (7 percent) net increase of acreage in High or Moderate hazard within the Harvest Land Base.

For the interior/south, the alternatives and the Proposed RMP also differ in the extent and location of the Harvest Land Base, and the current conditions of fire hazard differ (**Figure 3-38**). The No Action alternative has the largest Harvest Land Base (i.e., Matrix and Adaptive Management Areas) and the smallest proportion (53 percent) currently in High or Moderate fire hazard. The size of the Harvest Land Base is relatively similar in Alternatives B, C, and D, and the Proposed RMP, and approximately 60 percent of the acreage is in High or Moderate fire hazard. Alternative A has the smallest Harvest Land Base and the largest proportion (75 percent) in High or Moderate fire hazard.

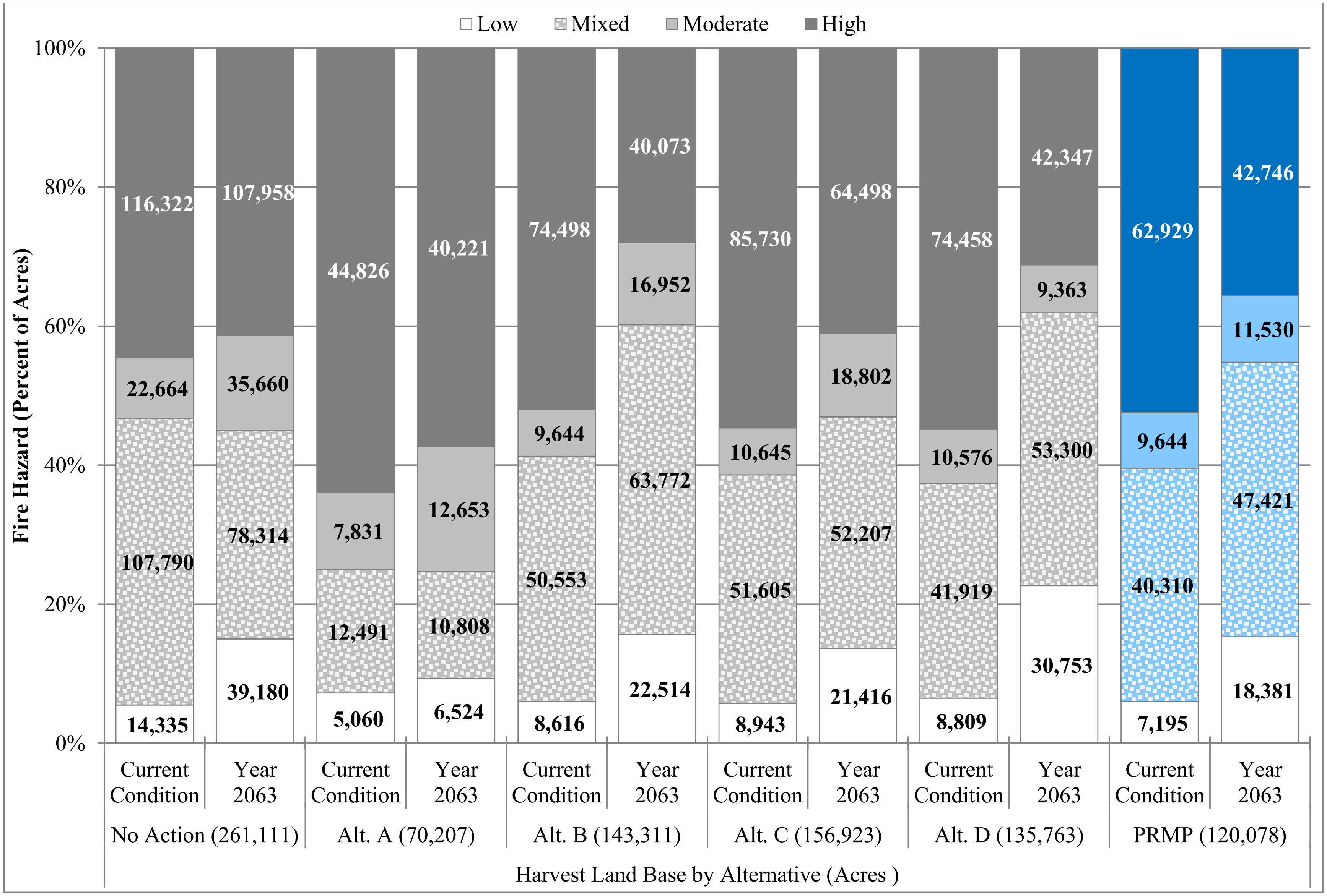


Figure 3-38. Stand-level fire hazard for the Harvest Land Base in the interior/south within the WUI by current condition and in 2063

In 50 years, all alternatives and the Proposed RMP would slightly increase the proportion of Low hazard acres, relative to the current condition in the Harvest Land Base in the interior/south (**Figure 3-38**). Alternative D would decrease the proportion of High and Moderate hazard by 25 percent, Alternative B would result in a decrease of 19 percent, and the Proposed RMP a decrease of 15 percent. Alternative C would only slightly decrease (8 percent) the proportion of High and Moderate hazard. The No Action alternative would result in slight increase in High and Moderate hazard acreage within close proximity to Wildland Development Areas, while there would be no change in Alternative A.

In summary, all alternatives and the Proposed RMP would increase the acres of Low hazard, relative to current conditions, on all BLM-administered lands within close proximity to Wildland Development Areas. Alternatives A and C, and the Proposed RMP would increase the total combined acres in High or Moderate fire hazard, and the No Action alternative and Alternatives B and D would reduce the total combined acres in High or Moderate fire hazard relative to current conditions on all BLM-administered lands within close proximity to Wildland Development Areas. However, among all the alternatives and the Proposed RMP, the differences are slight and largely reflect the different extents and varied patterns resulting from management within the Harvest Land Base. The BLM's management within the planning area is unable to provide more than slight variation to fire hazards within the planning area due to the checkerboard pattern of the landscape within the planning area and the small Harvest Land Base relative to a larger Late-Successional Reserve. The Harvest Land Base effects on fire hazard patterns are diminished at the scale of all BLM-administered Lands within Wildland Development Areas, particularly in the coastal/north.

Issue 4

How would the alternatives affect the number of acres at risk from residual activity fuels associated with timber management?

Summary of Analytical Methods

In this analysis, the BLM determined the potential fire risk associated with residual activity fuels resulting from timber management activities, treatment locations relative to Wildland Development Areas (WWRA 2013), and the Wildland Fire Potential (USDA FS and FMI 2012) for all BLM-administered lands within the decision area.

Fire risk describes the likelihood, susceptibility, and intensity for wildfire and adverse effects to human values. In this analysis, the BLM assumed that Wildland Development Areas are a highly valued resource, the Wildland Fire Potential describes the likelihood for wildfire, and activity fuel loading has the potential to increase fire intensity.

In addition to proximal location of treatments to developed areas, the Wildland Fire Potential (USDA FS FMI 2013) is an important factor in determining the risk from residual fuel loading. The Wildland Fire Potential depicts the relative probability of experiencing extreme fire behavior with torching and crowning, and the potential for wildfire that would be difficult for suppression resources to contain during weather conditions favorable for fire growth. This data is based on past fire occurrence, 2008 fuels data from LANDFIRE, and 2012 estimates of wildfire likelihood and intensity from the large fire simulator (Finney *et al*. 2011). The interior/south has more acreage in the Very High and High Wildland Fire Potential categories than the coastal/north, closely resembling the distribution of moist and dry vegetation (**Table 3-36** and **Figure 3-39)**.

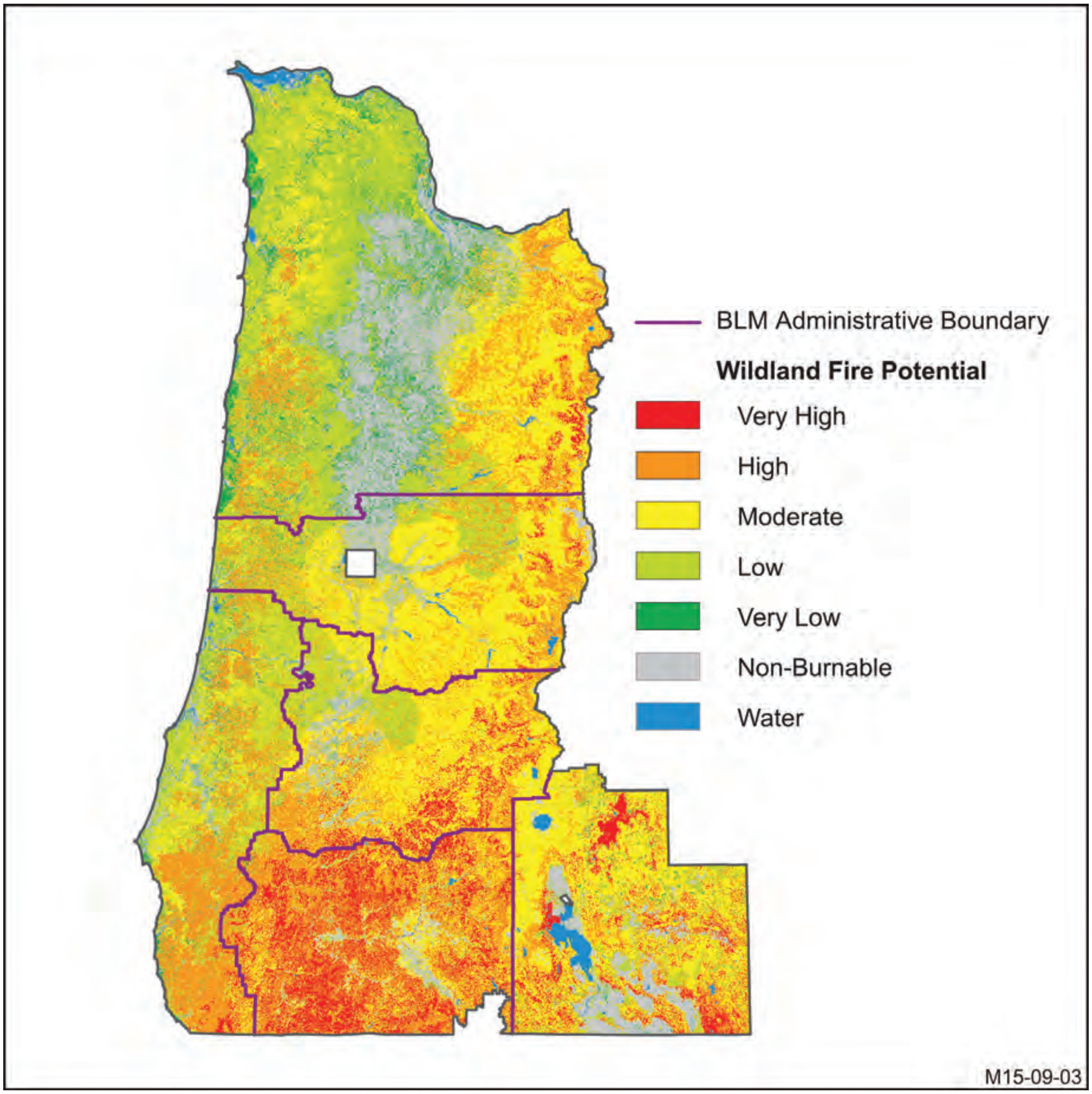


Figure 3-39. Wildland Fire Potential for BLM-administered lands in the planning area

Table 3-36. Wildland Fire Potential acres for BLM-administered lands in the planning area

Wildland Fire Potential	Interior/South (Acres)	Coastal/North (Acres)
Very Low/Low	154,398	377,879
Moderate	385,572	450,944
High	499,709	205,162
Very High	399,605	1,675

In this analysis, the BLM determined a relative weighting of residual activity fuel that would remain following timber management activities (**Table 3-37**), based on the management type and intensity. Timber harvest prescriptions that remove greater basal area from stands leave more surface fuels. This increase in surface fuels has the potential to result in higher rates of spread and greater flame lengths in the event of a wildfire (Weatherspoon and Skinner 1995, Raymond and Peterson 2005, Prichard *et al.* 2010), increasing the risk to firefighters and public safety (Graham *et al.* 1999 and 2004). Many different treatments can accomplish surface fuel reduction, including prescribed fire, biomass removal, and mechanical mastication or manipulation.

Table 3-37. Relative weighting of residual surface fuel loading by timber management type and intensity

Timber Management Type (Intensity)	Residual Fuel Load (Weighted Value)
Selection (Moderate/Light)	2
Thinning	2
Thinning with No Extraction	3
Selection (Heavy)	3
Pre-commercial Thinning	3
Two-age (Light)	3
Clearcut/Two-age (Heavy/Moderate)	4

The weighting represents the probable amount of fuel loading based on the retention associated with the timber management type, where less retention has more residual fuel loading. Clearcut harvest would occur in the High Intensity Timber Area in Alternatives A and C. Heavy and moderate two-age regeneration harvest would occur in the Matrix in the No Action alternative and the Medium Intensity Timber Area in Alternatives B and D. Light two-age regeneration harvest would occur in the Low Intensity Timber Area in Alternative B. Heavy selection harvest would generally occur in the Uneven-Aged Timber Area in all action alternatives and the Proposed RMP. Moderate selection harvest would generally occur in the Owl Habitat Timber Area in Alternative D. Light selection harvest would occur in reserves in all alternatives and the Proposed RMP. Thinning and pre-commercial thinning would occur throughout the Harvest Land Base in all alternatives and the Proposed RMP. These harvest intensities are rough generalizations used as analytical assumptions, but are not intended to replace or supplement management direction in each alternative or the Proposed RMP.

Additional factors influence the need and ability to mitigate residual fuel loading, such as stand structure, yarding method, harvest unit size, biomass utilization, topographic position, road proximity, soil composition, fuel decomposition rates, fuel compaction, airshed restrictions, and weather conditions. However, the BLM cannot accurately forecast these site-specific and market-driven variables for analysis and modeling at this scale.

The BLM determined the relative risk of residual fuel (**Table 3-38**) based on the weighted combination of Wildland Fire Potential (USDA FS FMI 2013), treatment location relative to the zone within 1 mile of Wildland Development areas (WWRA 2013), and the probable residual activity fuel loading associated with timber management activities. The BLM assigned a weight of 1 to areas beyond 1 mile of development areas and a weight of 2 to areas within 1 mile of wildland development areas. Wildland Fire Potential weights followed the classification scheme (e.g., Very Low/Low = 1 and High = 4). The BLM assigned weights to the harvest activities based on probable residual fuel loading relative to proportional basal area removed (**Table 3-37**). The BLM derived a risk matrix by multiplying these weighted variables and grouping them numerically into four categories. The BLM quantified the average decade total acreage within each risk category over 50 years for each of the alternatives and the Proposed RMP. The BLM evaluated the effects on the relative risk posed from residual activity fuel loading associated with management activities throughout the decision area.

Table 3-38. Risk category based on predicted residual activity fuel following harvest, proximal location to Wildland Development Areas, and Wildland Fire Potential

Wildland Fire Potential	Proximity to Development Areas (WWRA WDA)*	Residual Activity Fuel from Timber Management Activities		
		Low	Moderate	High
Very Low/Low	Outlying	Low	Low	Low
	Within	Low	Low	Low
Moderate	Outlying	Low	Low	Low
	Within	Low	Moderate	Moderate
High	Outlying	Low	Moderate	Moderate
	Within	Moderate	High	High
Very High	Outlying	Low	Moderate	Moderate
	Within	Moderate	High	Very High

* Source: Wildland Development Areas (WWRA 2013) and Wildland Fire Potential (USDA FS FMI 2013)

Background

Historically, the BLM has treated a portion of residual activity fuels following timber management activities for both site preparation and hazardous fuels reduction purposes. The BLM incorporated these assumptions into the modeling as a reasonable expectation of future levels of treatments (**Appendix C**). The treatment of slash from pre-commercial thinning is highly dependent on the residual stand structure, topographic location, and cost/benefit trade-offs of hazard reduction.

Affected Environment and Environmental Consequences

The current fire risk based on Wildland Fire Potential and proximity to WUI, for BLM-administered lands follows a similar pattern to the moist and dry forest distribution across offices (**Table 3-39**). The coastal/north has over 60 percent of BLM-administered lands in the Low risk category. Most of the remaining acres in the coastal/north are at Moderate risk. In the interior/south, nearly half of all BLM-administered lands are at Moderate risk. Nearly a quarter of this area is in the Very High (10 percent) and High (13 percent) risk categories.

Table 3-39. Current fire risk categories for BLM-administered lands

Planning Area Region	Low Risk		Moderate Risk		High Risk		Very High Risk	
	(Acres)	(Percent)	(Acres)	(Percent)	(Acres)	(Percent)	(Acres)	(Percent)
Coastal/North	675,325	66%	295,099	29%	56,926	6%	1,432	< 1%
Interior/South	407,824	28%	684,619	48%	192,465	13%	147,642	10%

Over 50 years, the alternatives and the Proposed RMP would differ substantially in the acreage of timber management activities, and, consequently, the acreage with residual activity fuels. Alternative A would have the fewest average acres of timber management activities per decade in both the coastal/north and interior/south. Alternative C would result in the highest average acres of timber management activities per decade in the coastal/north, and Alternative B would have the highest average acres of timber management activities per decade in the interior/south (**Figure 3-40** and **Figure 3-41**).

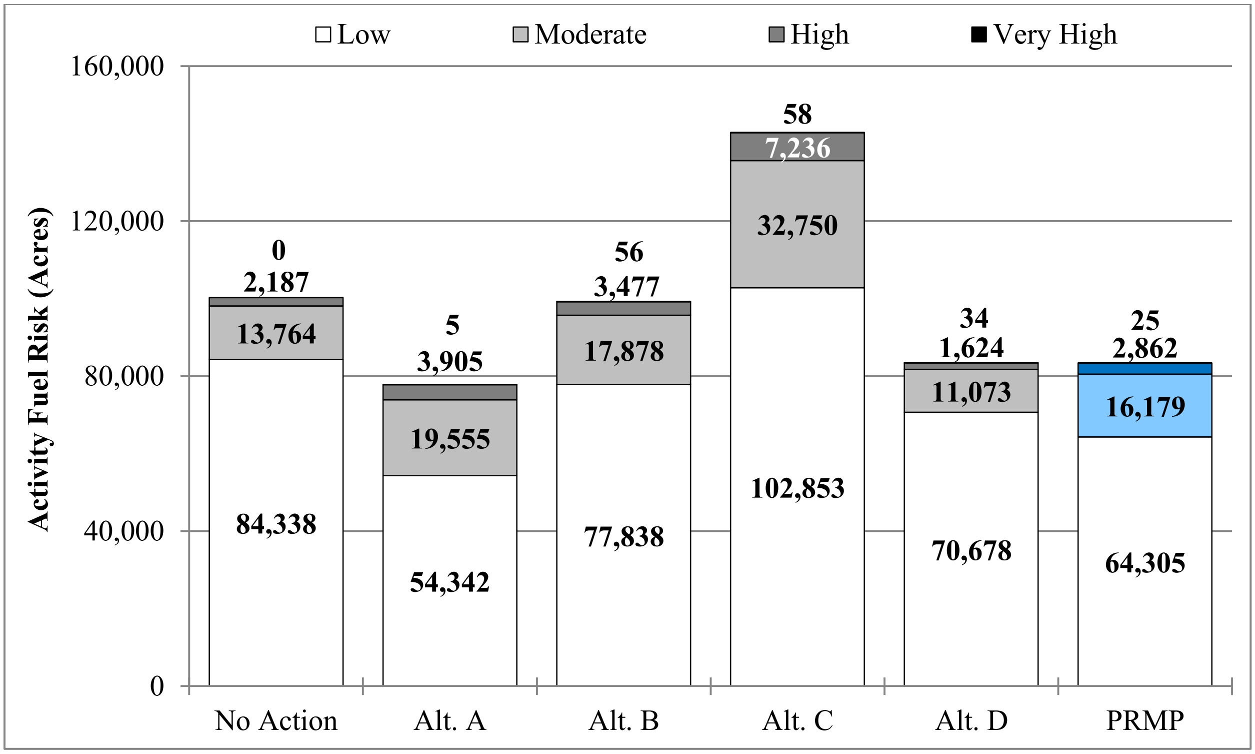


Figure 3-40. Activity fuel risk categories for BLM-administered lands in the coastal/north, decadal average 2013–2063

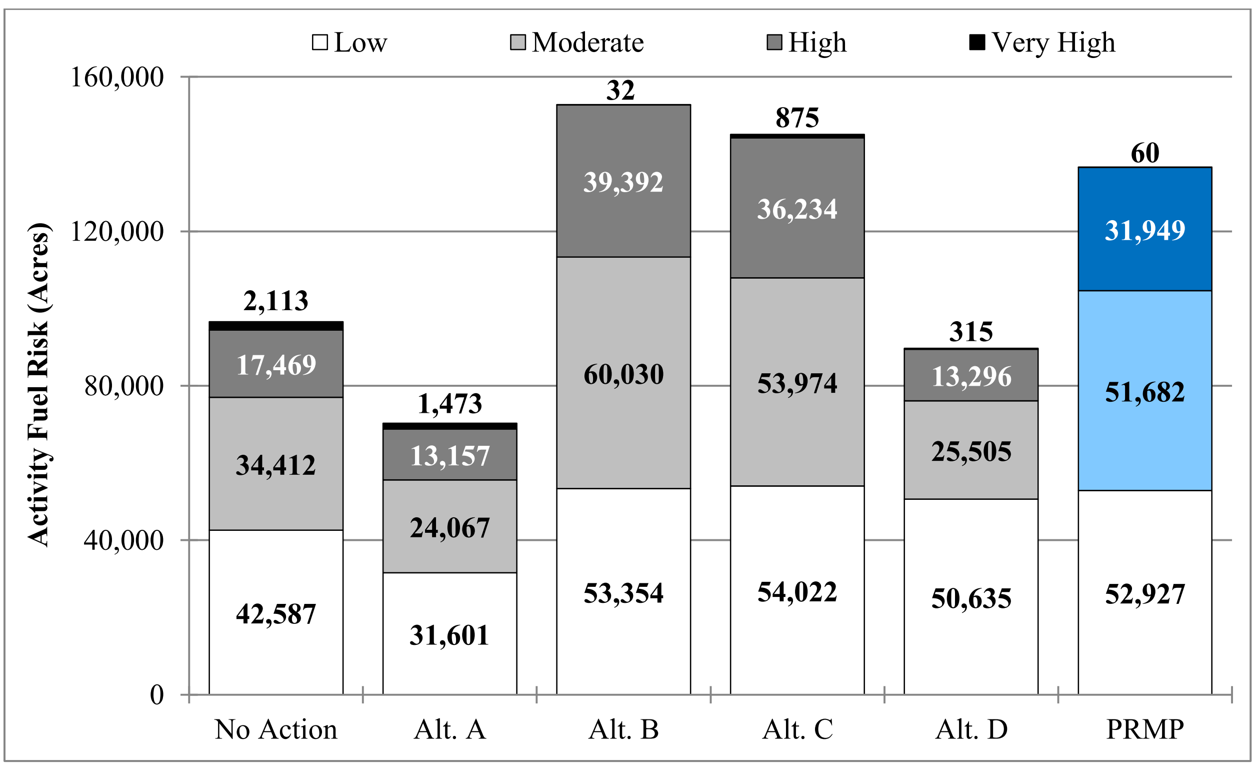


Figure 3-41. Activity fuel risk categories for BLM-administered lands in the interior/south, decadal average 2013–2063

For the coastal/north, the majority of managed acres would be at Low risk from residual activity fuel under all alternatives and the Proposed RMP (**Figure 3-40**). Alternative C would result in the most acres of Moderate and High risk for the coastal/north. Alternative D would result in the fewest average acres per decade of Moderate and High residual fuel risk for the coastal/north. Alternatives A and B and the Proposed RMP would result in similar amounts of Moderate and High residual fuel risk acreage between Alternative C and D. Alternative C would result in the largest amount of Low risk acreage per decade in the coastal/north.

In the interior/south, over the course of 50 years, both Alternatives B and C, followed by the Proposed RMP, would result in the most acres of Moderate and High risk from residual activity fuel. Alternatives A and D would result in the fewest average acres per decade of Moderate and High residual fuel risk (**Figure 3-41**). Alternatives B, C, D, and the Proposed RMP would result in the largest amount of Low risk acreage. The No Action alternative and Alternative A would create a very small amount of acres in very high risk.

The size of the Harvest Land Base and the timber management type and intensity are factors influencing the amount of acres in each risk category by alternative and the Proposed RMP. For example, alternatives or the Proposed RMP that would have the largest amount of timber harvest and pre-commercial thinning per decade, would also have the most acres in Moderate and High risk activity fuel categories. This is true of Alternative C in both the coastal/north and interior/south, and Alternative B and the Proposed RMP in the interior/south. While Alternative A has the smallest Harvest Land Base, a larger portion of it is the High Intensity Timber Area. Consequently, Alternative A would have amounts of Moderate and High risk similar to alternatives and the Proposed RMP with a larger Harvest Land Base, but less intensive harvest management.

By generating residual activity fuels, timber management activities would have the potential to add to the current fire risk if not adequately treated (Agee 1993, Weatherspoon and Skinner 1995, Raymond and Peterson 2005). The acres in residual fuel risk categories provide an estimate of potential future work needed to reduce the risk associated with activity fuels. A variety of follow-up treatments could mitigate most residual activity fuel, depending on the risk and amount of remaining fuel. Depending on the residual stand structure, allocating resources to mitigate the activity fuel loading, particularly through prescribed burning, could result in some level of post-treatment mortality to the residual stand. This could have the effects of reducing the risk and developing stand structural diversity. Alternatively, mitigation of activity fuels might not reduce the hazard or could result in unacceptable levels of tree mortality. In some cases, the Wildland Fire Potential would be minor, and treating activity fuels may not be necessary to reduce risk. For example, under Alternative A, trees cut for restoration thinning in the Late-Successional Reserve in the moist forest would remain on-site. This situation would likely result in low risk, given the districts with greater proportions of moist forest have lower Wildland fire Potential (**Figure 3-23** and **Figure 3-39**).

Coupling the activity fuel risk with stand-level hazard or resistance (see Issues 2 and 3) illustrates the costs and benefits of doing the work to mitigate the risk. For example, in the interior/south, Alternatives B and C, and the Proposed RMP would result in similar amounts of Moderate and High risk residual activity fuel acres. Treatment of activity fuel in Alternative C would clearly reduce a portion of the risk, but the remaining stand structure would be less fire resistant and of higher fire hazard than in Alternative B or the Proposed RMP. Treatment of residual activity fuels in Alternative B and the Proposed RMP may provide a greater overall benefit in reducing risk within the planning area, and the remaining stand structure would be more fire resistant and of lower fire hazard than in Alternative C. In addition, in the interior/south, Alternative D would have the fewest acres in High or Moderate activity fuel risk, as well as improvement in stand-level fire resistance and hazard. This combination might also provide increased stand-level fire resistance and lower risk activity fuel loading. For the coastal/north, Alternative C would have the largest residual fuel load risk and the highest relative stand-level hazard. For the coastal/north, the No Action alternative, Alternatives B and D, and the Proposed RMP would have lower amounts of both activity fuel risk and stand-level hazard ratings.

In summary, the size of the Harvest Land Base and the timber management type and intensity influence the amount of acres in each risk category by alternative and the Proposed RMP. The acreage in activity fuel risk categories provides an estimate of potential future work needed to reduce the risk associated with activity fuels. Alternative C for the entire decision area, and Alternative B and the Proposed RMP in the southern portion would result in the greatest need for treatment of activity fuel to reduce risk. Coupling the stand-level fire hazard and resistance results with the activity fuel risk helps to illustrate the cost/benefit of doing work to mitigate the risk.

Issues Considered but not Analyzed in Detail

How would the alternatives affect the implementation and effectiveness of hazardous fuels treatments?

All of the alternatives and the Proposed RMP have similar management objectives and management direction regarding non-commercial natural hazardous fuels reduction treatments. Therefore, the BLM assumed in this analysis that similar types and amounts of treatments that have occurred over the past decade would continue in the future under any of the alternatives and the Proposed RMP (**Table 3-40**), despite substantial year-to-year variation in acres treated. For example, acres of under-burning may increase and acres of hand pile burning decrease, as programs shift into the maintenance of previously-treated non-commercial hazardous fuels units.

Table 3-40. Non-commercial natural hazardous fuels treatment acres by treatment type, 2003–2012

District/ Field Office	Biomass Removal (Acres)	Hand Pile and Burn (Acres)	Machine Pile and Burn (Acres)	Mechanical Manual[50] (Acres)	Mechanical Mastication (Acres)	Underburn/ Broadcast Burn (Acres)
Coos Bay	1,161	595	63	122	1,680	1,092
Eugene	-	192	1	10,354	813	15
Klamath Falls	5,443	4,163	17,071	4,592	2,198	9,371
Medford	1,190	62,497	-	15,032	3,161	22,064
Roseburg	-	422	-	2,313	-	3,235
Salem	-	438	-	3,733	280	-

Increasing landscape-level fire resilience and stand-level fire resistance and decreasing stand-level fire hazard would increase the effectiveness of hazardous fuels treatments. To the extent that changes in landscape-level fire resilience, stand-level fire resistance, stand-level fire hazard, and residual activity fuel loading influence the effectiveness of hazardous fuels treatments, the previous issues in this section describe the effects of these factors. However, it is not possible at this scale of analysis with the data available to describe specifically how such changes together would alter the effectiveness of hazardous fuels treatments or to consider how differing combinations of outcomes would alter the effectiveness of hazardous fuels treatments (e.g., increased stand-level fire resistance within a landscape of decreased fire resilience). Therefore, it is not possible to determine any specific change in the effectiveness of hazardous fuels treatments resulting from the alternatives and the Proposed RMP.

[50] Mechanical manual includes thinning, mowing, chipping, lop and scatter, etc. See **Glossary** for additional treatment descriptions.

How would the alternatives affect wildfire response?

There is no accurate way to predict the exact location and timing of wildfires. However, treatments that reduce flame lengths and decrease the probability of crown fire potential would minimize risk to wildland firefighters and the public, and provide more effective fire management opportunities, including safe engagement of suppression resources. These treatments would also increase the potential to utilize all fire management tools, including utilizing wildfires to meet resource objectives. The previous issues in this section describe effects to landscape-level fire resilience, stand-level fire resistance, stand-level fire hazard, and residual activity fuel loading. To the extent that changes in landscape-level fire resilience, stand-level fire resistance, stand-level fire hazard, and residual activity fuel loading potentially influence wildfire response, the previous issues in this section describe the effects these factors. The full range of wildfire response tactics would be available under all alternatives and the Proposed RMP. Maintenance of fire management related infrastructure would not change among alternatives and the Proposed RMP. The ability to conduct salvage harvest in the Late Successional Reserve for purposes of protecting human health and safety within the dry forest would be available under all alternatives and the Proposed RMP. Because these factors would not differ, there is no reasonable basis on which to identify a difference in the effect of the alternatives and the Proposed RMP on wildfire response at this scale of analysis, beyond the effects to landscape-level fire resilience, stand-level fire resistance, and stand-level fire hazard already described above.

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Fisheries

Key Points

- All alternatives and the Proposed RMP would increase the potential large wood and small functional wood contribution to streams relative to the current conditions over time.
- Sediment production from road construction and operation would increase by less than 1 percent under all alternatives and the Proposed RMP, and the effects to fish would not differ by alternative. These effects to fish would be short-term and localized and could result from increases in turbidity or deposition of fines in the stream channel substrates affecting habitat in the short term.
- Under the No Action alternative, and Alternatives A and D, and the Proposed RMP, less than 0.5 percent of all perennial and fish-bearing stream reaches in the decision area would be susceptible to shade reductions that could affect stream temperature if the BLM applies thinning in the outer zone of the Riparian Reserve based on current conditions. Under Alternative B and C, approximately 5 percent of all perennial and fish-bearing reaches in the decision area would be susceptible to shade reductions that could affect stream temperature if the BLM applies thinning in the outer zone of the Riparian Reserve based on current conditions. Short-term and indirect non-lethal effects from minor increases in stream temperature could include reduced growth rates, a reduction in juvenile survival, or a reduction in reproductive success.

Summary of Notable Changes from the Draft RMP/EIS

The BLM has expanded the discussion of fish species other than anadromous salmonids and has added an appendix (**Appendix I**), which includes a list of the Bureau Sensitive and Bureau Strategic fish species and maps of the designated critical habitat for ESA-listed anadromous salmonid fish. The BLM has also added explanation that the effects to Essential Fish Habitat designated under the Magnuson-Stevens Fishery Conservation and Management Act would be similar to the effects to designated critical habitat.

Background

Threatened and endangered anadromous fish species in the planning area include:

- Lower Columbia River chinook salmon
- Lower Columbia River coho salmon
- Lower Columbia River steelhead trout
- Columbia River chum salmon
- Upper Willamette River chinook salmon
- Upper Willamette River steelhead trout
- Southern Oregon/Northern California coho salmon
- Oregon Coast coho salmon
- North American green sturgeon
- Pacific eulachon (smelt)

In 2011, National Marine Fisheries Service conducted a formal status review of ESA-listed anadromous salmon and steelhead. The analysis and summaries of that review are incorporated here by reference (USDC NMFS 2011). Oregon Coast coho salmon and Southern Oregon/Northern California Coho salmon were not included in that analysis. Of the six anadromous salmon and steelhead in the planning area that were analyzed in that review, none warranted a change in the biological risk category from the previous review in 2005. The Lower Columbia coho has a biological risk assessment of in danger of extinction, and the remaining five species are likely to become endangered.

The National Marine Fisheries Service has designated critical habitat for seven of the eight ESA-listed anadromous salmonid species within the planning area (**Table 3-41** and **Appendix I**). Critical habitat is not mapped for Southern Oregon/Northern California Coho salmon; however, steelhead trout distribution provides a surrogate. The National Marine Fisheries Service has published recovery plans for Lower Columbia River chinook, Lower Columbia River steelhead, Lower Columbia River coho, Upper Willamette chinook, Upper Willamette steelhead, and Southern Oregon Northern California coho salmon (USDC NMFS 2011, 2013, and 2014) and has developed a Proposed ESA Recovery Plan for the Oregon Coast coho salmon (USDC NMFS 2015). The U.S. Fish and Wildlife Service has published recovery plans for bull trout (USDI FWS 2014) and the Lost River sucker and shortnose sucker (USDI FWS 2013).

Recovery plans for ESA-listed fish include the identification of limiting factors for each recovery unit and include recommendations for recovery actions. Limiting factors for the eight anadromous salmonid species include temperature, spawning and rearing habitat, and off-channel habitat.

Table 3-41. Federal Register notices for listing status, critical habitat designation, and ESA protective regulation for ESA-listed anadromous fish in the planning area.

<table>
<tr><th>Species</th><th>Listing Status</th><th>Critical Habitat</th><th>Protective Regulation</th></tr>
<tr><td>Lower Columbia River chinook salmon</td><td rowspan="3">June 28, 2005;
70 FR 37160</td><td rowspan="5">September 02, 2005;
70 FR 52630</td><td rowspan="7">June 28, 2005;
70 FR 37160</td></tr>
<tr><td>Upper Willamette River chinook salmon</td></tr>
<tr><td>Columbia River chum salmon</td></tr>
<tr><td>Lower Columbia River steelhead trout</td><td rowspan="2">January 05, 2006;
71 FR 834</td></tr>
<tr><td>Upper Willamette River steelhead trout</td></tr>
<tr><td>Lower Columbia River coho salmon</td><td rowspan="2">June 28, 2005;
70 FR 37160</td><td>January 14, 2013;
78 FR 2726</td></tr>
<tr><td>Southern Oregon/Northern California coho salmon</td><td>May 05, 1999;
64 FR 24049</td></tr>
<tr><td>Oregon Coast coho salmon</td><td>June 20, 2011;
76 FR 35755</td><td colspan="2">February 11, 2008; 73 FR 7816</td></tr>
<tr><td>Pacific eulachon</td><td>March 18, 2010;
75 FR 13012</td><td>October 20, 2011;
76 FR 65324</td><td>June 28, 2005;
70 FR 37160</td></tr>
</table>

Threatened or endangered resident fish species in the planning area include:

- Bull trout
- Lost River sucker
- Shortnose sucker

The amount of critical habitat for ESA-listed non-salmonid fish species or resident salmonid fish species on BLM-administered lands is less than 5 percent of all critical habitat for fish in the decision area (**Table 3-42**). A total of 3.6 miles of bull trout (*Salvelinus confluentus*) critical habitat occur on BLM-administered lands within the Coastal and Klamath recovery units, comprising less than 0.1 percent of bull trout critical habitat. The reintroduction of bull trout in the Clackamas River constitutes a nonessential experimental population and does not have any adjacent BLM-administered lands. Bull trout require colder temperatures and tolerate fine sediment less than most other salmonids in the planning area, and are therefore more sensitive to changes in temperature and sediment. Despite this greater sensitivity, bull trout are affected by the same key ecological processes as the ESA-listed anadromous salmonids in the decision area, allowing them to be analyzed together at this scale of analysis.

Table 3-42. ESA-listed fish species (other than anadromous salmonids) with miles and percent of critical habitat on BLM-administered lands.

Species	Critical Habitat (Miles)	Critical Habitat on BLM-administered Lands in the Planning Area (Miles)	Critical Habitat on BLM-administered Lands in the Planning Area (Percent)
Bull trout (*Salvelinus confluentus*)	4,954	3.6	< 0.1%
Shortnose sucker (*Chasmistes brevirostris*)	135	9.0	6.6%
Lost River sucker (*Deltistes luxatus*)	145	-	-
Pacific eulachon (*Thaleichthys pacificus*)	335	0.12	< 0.1%
Green sturgeon (*Acipenser medirostris*)	1,107	0.07	< 0.1%

The southern distinct population segment (DPS)[51] of green sturgeon (*Acipenser medirostris*) occurs in lower reaches of coastal rivers and estuaries and has limited interaction with BLM-administered lands. Critical habitat for green sturgeon extends in to the lower Columbia River, Nehalem Bay, Yaquina Bay, Winchester Bay, and Coos Bay. The only interaction between green sturgeon critical habitat and BLM-administered lands is a boat ramp on the Coos Bay District.

Similarly, the southern DPS of Pacific eulachon (*Thaleichthys pacificus*) is limited to ocean and lower estuary use and the interaction with BLM-administered lands is very limited. Critical habitat for eulachon extends in to the lower Umpqua River and Tenmile Creek along the Oregon coast. Less than 0.1 percent of the critical habitat for each species is adjacent to BLM-administered lands (**Table 3-42**).

Because of the very limited distribution of the southern DPS of green sturgeon and the southern DPS of Pacific eulachon in the decision area, the BLM would have very limited ability to affect these fish through land management actions. There is no reasonable basis upon which the BLM could predict any difference in these potential effects among the action alternatives, the No Action alternative, or the Proposed RMP on the southern DPS of green sturgeon and the southern DPS of Pacific eulachon or their critical habitat. Any effects on the southern DPS of green sturgeon and the southern DPS of Pacific eulachon or their critical habitat would result from very limited site-specific implementation actions within or affecting the very limited distribution of the southern DPS of green sturgeon and the southern DPS of Pacific eulachon in the decision area. The BLM cannot forecast any such possible effects at this scale of analysis, and would address any such effects in project-specific analyses.

In addition to fish species listed under the Endangered Species Act, the BLM has designated Bureau Sensitive and Bureau Strategic fish species in the decision area. There are ten Bureau Sensitive fish species, evolutionarily significant units (ESUs), or distinct population segments (DPSs) within the decision area and one Bureau Strategic fish species. **Appendix I** lists these species, ESUs, or DPSs. Based on BLM Manual 6840, the BLM shall address Bureau Sensitive species and their habitats in land use plans and shall implement measures to conserve these species and their habitats, to promote their conservation, and reduce the likelihood and need for these species to be listed under the Endangered

[51] A distinct population segment (DPS) is a discrete population of a species and the smallest portion of a vertebrate species that can be protected under the Endangered Species Act.

Species Act. Bureau Strategic species are not special status for management purposes (IM-OR-2015-028). The only requirement for this group of species is that information for species sites located during any survey efforts shall be entered into the BLM corporate database. The BLM updates its Special Status Species list on a regular schedule, when state heritage programs publish new rankings or when other information indicates a need. The life history and habitat usage of these Bureau Sensitive and Bureau Strategic fish species are sufficiently similar to ESA-listed fish species to allow them to be analyzed together.

Pacific lamprey (*Entosphenus tridentatus*), though not an ESA-listed species, is a Bureau Sensitive species and is an important fish for Tribes within the planning area. The Pacific lamprey was historically an abundant food source and played an important role in the daily lives of Tribal members. Though complete and accurate counts throughout the range do not exist, anecdotal information suggests the population of Pacific lamprey is declining across its range, from Washington to California (Luzier *et al.* 2009). In 2012, the BLM, along with other states, Federal agencies, and tribes, entered into a conservation agreement for Pacific lamprey with the U.S. Fish and Wildlife Service. The agreement identified 11 regional management units, including the Coastal Oregon Regional Management Unit, which encompasses Pacific lamprey populations in the planning area. Pacific lamprey life history and habitat usage is sufficiently similar to ESA-listed fish species in the decision area to allow them to be analyzed together.

Columbia River chum salmon and Oregon chub, although occurring in the planning area, are not present in streams adjacent to BLM-administered lands, and thus have little to no potential to be affected by BLM management actions. Additionally, the U.S. Fish and Wildlife Service recently removed the Oregon chub from the list of threatened and endangered species because of improvements in the species' status (80 FR 9126).

Several other non-salmonid fish species occur in a relatively small percentage of streams on BLM-administered lands (**Table 3-42**). These populations, based on the very low interaction with BLM-administered lands, have very little potential to be affected by BLM management actions.

Although a wide variety of other anadromous and resident fish species occur within the planning area, they share similar life histories and habitat requirements. These fish species all spawn in rivers or streams, utilizing clean gravel substrates free of fine sediment, and juveniles spend at least a portion of their lives rearing in pool or off-channel habitat, created primarily by large wood and boulders. For this analysis, the habitat requirements are sufficiently similar to be analyzed together.

Under section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act, the BLM must analyze the effects to Essential Fish Habitat for coho and chinook salmon. Across the decision area, designated critical habitat for ESA-listed species encompasses the vast majority of designated Essential Fish Habitat, and, for the purposes of this analysis, effects on designated Essential Fish Habitat would be similar to the effects on designated critical habitat.

Large wood, stream temperature, sediment, and water flow have the greatest influence on aquatic habitat and the ability of aquatic habitat to support fish populations in the planning area. The abundance and survival of salmonids in the planning area is often closely linked to the abundance of large woody debris in stream channels. The Analysis of the Management Situation (USDI BLM 2013, pp. 32–36) and the 2008 FEIS (USDI BLM 2008, pp. 372–390) provide more detailed explanations of the influence of key ecological processes on fish habitat and fish populations, and those discussions are incorporated here by reference.

The BLM has implemented in-stream fish habitat restoration projects on about 230 miles of fish-bearing streams on BLM-administered lands and on adjacent private lands. This accounts for about 7 percent of fish-bearing streams in the decision area and about 1 percent of all fish-bearing streams in the planning area. The BLM has thinned 17,461 acres forest stands within the Riparian Reserve in the decision area since 1995. This accounts for approximately 2 percent of the 927,721 acres within the Riparian Reserve under the 1995 RMPs. The BLM has implemented much smaller acreages of other silvicultural treatments within the Riparian Reserve, including approximately 1,000 acres of hardwood conversion within the Riparian Reserve since 1995 (USDI BLM Annual Program Summaries 2005–2013). The BLM has removed or replaced 544 stream crossings within the planning area between 1995 and 2012 to allow passage for all life stages of fish at a range of flows (USDI BLM 2008, pp. 390–392; USDI BLM Annual Program Summaries 2005–2007; USDI BLM Aquatic Restoration Biological Opinion II Reporting 2008 to 2012, unpublished). These include removal or replacement of stream crossings on BLM-administered lands or removal or replacement of stream crossings on adjacent private lands in which the BLM worked cooperatively with adjacent landowners and the removal or replacement benefited fish passage on BLM-administered lands.

Under all alternatives and the Proposed RMP, the BLM would continue to remove or replace fish barriers. The rate of removal or replacement would be contingent on funding levels and the ability of the BLM to work cooperatively with adjacent landowners; the BLM has no reasonable basis on which to forecast a difference in funding or opportunities for cooperative work with other landowners. Therefore, the BLM has no reasonable basis for forecasting any difference among the alternatives or Proposed RMP in the amount or rate of removal or replacement of fish barriers. Management direction in all alternatives and the Proposed RMP direct the BLM, when replacing barrier culverts, to install crossings that provide fish passage at a range of flows. For these reasons, the number of crossings and miles of fish habitat opened and the resultant effects on fish habitat would be similar among all alternatives and the Proposed RMP.

Since the adoption of the Northwest Forest Plan, there has been a robust debate about effective riparian management strategies for conservation and recovery of ESA-listed fish. Some reviews have argued that active management in riparian forests results in short-term adverse effects on fish habitat and water quality, and have proposed increased restrictions on active management within the Riparian Reserve to maximize stream shading and the total number of trees available for recruitment to streams (e.g., Frissell *et al*. 2014 and Pollock and Beechie 2014). Other reviews have argued that a reliance of passive restoration will compromise attainment of long-term ecological goals and have proposed more and varied active management approaches within the Riparian Reserve to create larger trees and more complex and diverse riparian forests (e.g., Reeves *et al*. in press).

Frissell *et al.* (2014) is an unpublished report to the Coast Range Association, which provides a collection of policy recommendations and critiques of administrative policies and legislative proposals. Some action alternatives are consistent with some of the recommendations in Frissell *et al.* (2014), such as the prohibiting commercial timber harvest within the Riparian Reserve, which is consistent with the design of Alternative A, and prohibiting livestock grazing in the Riparian Reserve, which is consistent with the design of Alternative D. However, the design of the action alternatives and the Proposed RMP are not consistent with some of the recommendations in Frissell *et al.* (2014), including expanding the size of the Riparian Reserve to protect stream temperature. These policy recommendations and critiques are reflected in the comments summarized in **Appendix W**, which include the BLM response to these recommendations. For those instances in which none of the alternatives or the Proposed RMP are consistent with these recommendations, **Appendix W** details the BLM's explanation of why such recommendations are contrary to the purpose and need for the RMP revision or are not supported by the analysis. Although Frissell *et al.* (2014) presents numerous citations to existing scientific information (many of which are also cited in this section and in the Hydrology section of this chapter), it does not present any new scientific information.

Issue 1

How do the alternatives vary in the contribution of large and small functional wood to fish-bearing and non-fish-bearing streams?

Summary of Analytical Methods

In this analysis, the BLM evaluated the effects of the alternatives and the Proposed RMP on the potential contribution of large and small functional wood to fish-bearing and non-fish-bearing streams at the watershed scale (Hydrologic Unit Code (HUC) 10).[52] The BLM conducted this analysis at the watershed scale, because at finer scales (e.g., individual stream reaches), the BLM would not be able to interpret how changes in the amount of wood available for delivery to streams would affect fish habitat or populations. Wood delivery to individual stream reaches is highly variable, episodic, and unpredictable. Additionally, anadromous fish travel through multiple watersheds along their migrations, and the effects on spawning or rearing habitat would only be discernible once fish reach streams suitable in size for spawning or rearing. This generally occurs in streams at the HUC 10 watershed scale.

The BLM analyzed the potential contribution of wood to streams over time, but did not attempt to model actual wood delivery to streams over time under each alternative and the Proposed RMP. Wood delivery to streams is influenced by myriad factors, including riparian stand conditions, individual tree processes, disturbance events, and geomorphic processes. Many of these influential factors are inherently unpredictable, and several would not be affected by the alternatives or the Proposed RMP. Instead, this analysis, like the 2008 FEIS, evaluated the potential contribution of wood to streams by assessing the condition of forest stands that could potentially deliver wood to streams. The alternatives and the Proposed RMP would directly and substantially affect the condition of these forest stands, and the BLM can more accurately forecast changes to forest stand condition than wood delivery to streams under the alternatives and the Proposed RMP.

The BLM analyzed the potential contribution of wood to streams over 100 years to provide a meaningful comparison of the effects of the alternatives and the Proposed RMP on fish habitat. Wood loading in streams is highly variable, and wood delivery is only one component. Breakdown of wood, large floods, and debris flows can alter the amount or effectiveness of large wood in the stream, and these processes can take place over large spatial scales. Therefore, analyzing the potential contribution of wood to streams over a shorter time period would not accurately compare the effects of alternatives and the Proposed RMP in their ability to affect in-stream fish habitat through wood delivery. The effects of land management to the landscape could take up to 100 years to show any discernable change in the amount or quality of fish habitat created by large or small functional wood.

The ability to analyze the effects of the alternatives and the Proposed RMP on potential wood delivery to streams is limited by several factors, including the data available at this scale of analysis on both stream reach and riparian stand conditions, uncertainties about the extent, location, and timing of riparian stand thinning under each alternative and the Proposed RMP, and the indirect connection between riparian stand conditions and wood amounts in streams. For example, data available at this scale of analysis is not sufficiently site-specific and detailed to evaluate whether the trees in a specific riparian stand are of sufficient size to provide stable instream habitat structure in the specific adjacent stream reach. Instead, the BLM must make generalizations and assumptions, to describe current riparian stand conditions, future riparian stand conditions, and stream conditions. In addition, riparian stand thinning under each

[52] Hydrologic Unit Codes (HUCs) are a U.S. Geological Survey classification based on a hierarchy of nested watersheds.

alternative and the Proposed RMP would affect riparian stand conditions and consequently the wood available for delivery to streams. However, forecasting the extent, specific location, and timing of riparian stand thinning required the BLM to make assumptions about a plausible scenario for implementation under each alternative and the Proposed RMP, adding uncertainty to the effects in any specific location. Finally, the analysis addressed the riparian stand conditions, which identified the wood available for delivery to streams, but actual delivery of wood to streams and consequently, the habitat structure in streams, depends on many factors in addition to riparian stand condition, including stochastic processes, which adds an additional layer of uncertainty to the effects in any specific location.

In this analysis, the BLM assumed that the analytical results in the 2008 FEIS for potential wood contribution provide an approximation of the effects of the alternatives in this analysis. The 2008 FEIS utilized a spatially explicit GIS model to estimate large and small wood delivery to BLM-administered and non-BLM-administered streams for all HUC 10 watersheds within the planning area. The 2008 FEIS analyzed potential large wood and small functional wood contribution to streams considering the effects of forest management and stand growth over time in portions of the landscape capable of delivering wood to streams. That analysis is incorporated here by reference (USDI BLM 2008, pp. 779–797). The Riparian Reserve land use allocation designs and management direction relevant to potential wood contribution for Alternatives B and C in this analysis are roughly comparable to the Riparian Management Area design and management direction in the 2008 Proposed RMP. The Riparian Reserve land use allocation designs and management direction for Alternatives A and D and the Proposed RMP are intermediate between the No Action alternative and the 2008 Proposed RMP. Thus, the analytical results from the 2008 FEIS for the potential wood contribution of the No Action alternative and the 2008 Proposed RMP bracket the effects that would occur under the alternatives and the Proposed RMP in this analysis.

In this analysis, the BLM evaluated the structural stage condition and several forest stand metrics within one site-potential tree height distance of streams. The BLM used one site-potential tree height distance of streams to approximate the area likely to deliver wood to streams. The BLM evaluated four stand metrics:

- The density of large trees (greater than 20” diameter breast height (DBH))
- The percentage of forest stand canopy cover in hardwoods (e.g., red alder and big leaf maple)
- The quadratic mean diameter (QMD) of trees (a weighted average of the size of trees in the stand)
- The number of trees per acre

These metrics provide a broad measure of the potential for forest stands to provide large wood and small functional wood to streams. The BLM used the results of these simpler analyses to validate the assumption that the results from the more complex analysis in the 2008 FEIS for potential wood contribution provides a reasonable approximation of the effects of the alternatives and the Proposed RMP in this analysis.

Background

Woody debris is an important channel-forming component in forested streams in the Pacific Northwest. Wood traps and stores gravel, generates scour that creates pool habitat, provides overhead cover, and protects banks by reducing stream energy. In headwater streams, small wood can retain fine sediment and prevent downstream transport to fish-bearing reaches. Conifer species persist the longest in stream channels. However, hardwood trees, such as red alder and big leaf maple, provide wood, as well as leaf litter, that serve as a nutrient base for macroinvertebrates, which in turn provide food for anadromous fish.

The size of wood that can provide stable structure and induce habitat change in a stream (i.e., functional wood) varies by channel width. Generally, wider streams require larger pieces of wood (Beechie *et al.*

2000, **Table 3-43**). Smaller pieces of wood can also be functional if the stream channel is narrow or if the smaller wood interacts with larger, stable debris jams. Some small instream wood that is not entrained in a debris jam is flushed from the system during high flows. The remaining large pieces of instream wood are depleted at an average rate of 1.5 percent per year (Murphy and Koski 1989). For most streams in the planning area, a 20" DBH tree can provide functional wood in the stream.

Table 3-43. Diameter of functional wood piece as it relates to width of active stream channel.

Width of Stream Channel (Feet)	Diameter of Functional Wood (Inches)
15	4.5
20	6.0
30	9.0
40	12.0
50	15.0
> 50	> 20.0

Trees closer to the stream have a higher probability of falling into the stream. Wood is delivered to stream channels generally from distances less than one site-potential tree height[53] in width from the edge of the active channel (Reeves *et al*. in press). Beyond a distance of one site-potential tree height from the stream, contribution of wood in the form of whole trees is rare and results from episodic debris flows and slope failures. These debris flows result from oversaturation of soils or unstable underlying geology, where large wood along with small wood, boulders, and other substrates can be delivered over longer distances. The 2008 FEIS analyzed land management alternatives using a wood model that accounted for the delivery of wood in the form of whole trees from a variety of sources (USDI BLM 2008, pp. 779–799). That analysis identified three primary sources of instream large wood: riparian tree fall, channel migration, and debris flows (USDI BLM 2008, pp. 376–384, 781–797).

In 2013, the Interagency Regional Executive Team released a series of technical summaries by a Science Review Team on the issue of the effects of riparian thinning and those analyses and findings are incorporated here by reference (Spies *et al.* 2013). The Science Review Team's findings are a compilation of empirical data, relevant studies, and recently modeled wood input. The Science Review Team found that up to 95 percent of instream wood comes from distances ranging from 82 to 148 feet from the edge of the stream bank (i.e., generally less than one site-potential tree height). The primary near-stream inputs of large wood are from tree mortality and bank erosion, along with landslides and debris flows.

Headwater streams that are prone to debris flow delivery can contribute a large proportion of in-stream wood downstream in fish-bearing stream reaches (Benda *et al.* 2003, Reeves *et al.* in press). In these streams, debris flows will capture wood and sediment from the debris flow area and deliver it to streams. May and Gresswell (2004) estimated debris flow recur at an interval of up to 357 years for headwater basins in the Oregon Coast Range.

Riparian tree mortality and subsequent recruitment to streams can represent the primary contribution of large wood in low-gradient meandering streams, while upslope and debris flow contributions can be greatest in higher gradient streams (Reeves *et al.* 2003, Bigelow 2007).

[53] Site-potential tree-heights generally range from 140 feet to 240 feet across the decision area, depending on site productivity.

During the last century, many streams were 'cleaned' of large wood to make the downstream transport of harvested logs more efficient. Without large wood to retain gravel and other woody material, many streams were scoured to bedrock and have correspondingly poor habitat for fish. Active restoration to offset the loss of habitat has involved the placement of logs and whole trees in addition to boulders into these bedrock channels. These restorative efforts persist for several decades as riparian stands develop that are capable of supplying long-term sources of wood to streams.

Past timber harvest of riparian stands has resulted in the replacement of structurally-complex stands (with large diameter trees) to young stands (with small diameter trees). These young riparian stands have a preponderance of smaller diameter trees resulting from high tree densities and competition, limiting the ability of these riparian stands to provide functional wood to streams. These young riparian stands are developing at higher densities than the stand conditions under which the existing structurally-complex stands developed (Tappeiner *et al.* 1997, Poage and Tappeiner 2002). The 2008 FEIS described the effects of past harvest on forest stands across the landscape and riparian forest stands specifically (USDI BLM 2008, pp. 202–212, 375–376), and those discussions are incorporated here by reference.

Monitoring results conclude that the ecological condition of approximately two-thirds of the watersheds in the Northwest Forest Plan area have improved in condition in the past two decades. One of the primary factors responsible for this improvement has been the increase in the number of large trees (greater than 20" DBH) within the Riparian Reserve (Reeves *et al.* 2006, Lanigan *et al.* 2012, Miller *et al.* 2015, Reeves *et al*. in press).

Affected Environment and Environmental Consequences

Currently, riparian stands that are within one site-potential tree height of streams average about 316 trees per acre, of which 19 trees per acre are greater than 20" DBH (**Figure 3-42**). Conifers in riparian stands have an average diameter of 8" quadratic mean diameter (QMD). Hardwood trees provide approximately 20 percent of riparian canopy cover. In general, current riparian stand conditions are denser, with smaller diameter trees, than riparian stands historically.

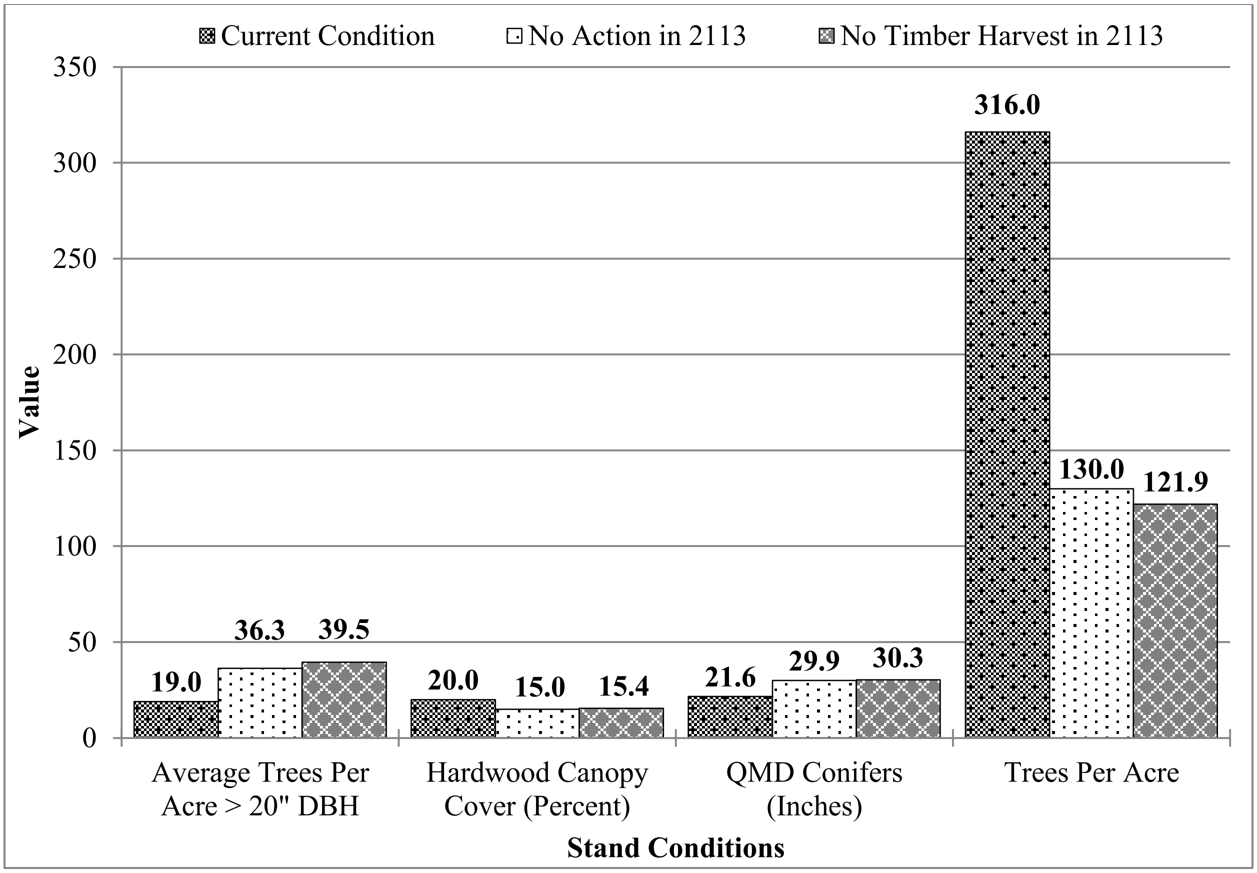

Figure 3-42. Stand conditions within one site-potential tree height for the current condition, the No Action alternative in 2113, and the No Timber Harvest reference analysis in 2113

Stands within one site-potential tree height currently have a relatively even distribution of structural stages with early successional having the least (**Table 3-44**, **Figure 3-43**). Over the next 100 years, the No Action alternative and the No Timber Harvest reference analysis would have a very similar distribution of Young, Mature, and Structurally-Complex stand types, because all stands within one site-potential tree height of streams would be within the Riparian Reserve under the No Action alternative and the BLM would not implement any regeneration harvest which would create new early successional stands.

Table 3-44. Acres in each structural stage for stands within one site-potential tree height from all streams for the current condition and in 2113

Alternative/ Proposed RMP	Early Successional (Acres)	Stand Establishment (Acres)	Young (Acres)	Mature (Acres)	Structurally-complex (Acres)
Current Condition	11,973	139,839	231,555	180,366	208,640
No Action	2	988	39,508	340,841	391,034
Alt. A	-	988	38,807	332,580	399,998
Alt. B	20,800	988	61,785	314,877	373,923
Alt. C	32,570	36,353	74,360	291,095	337,996
Alt. D	-	988	38,420	333,200	399,765
PRMP	1,206	2,148	40,506	335,475	393,038
No Timber Harvest	-	-	39,354	332,784	400,620

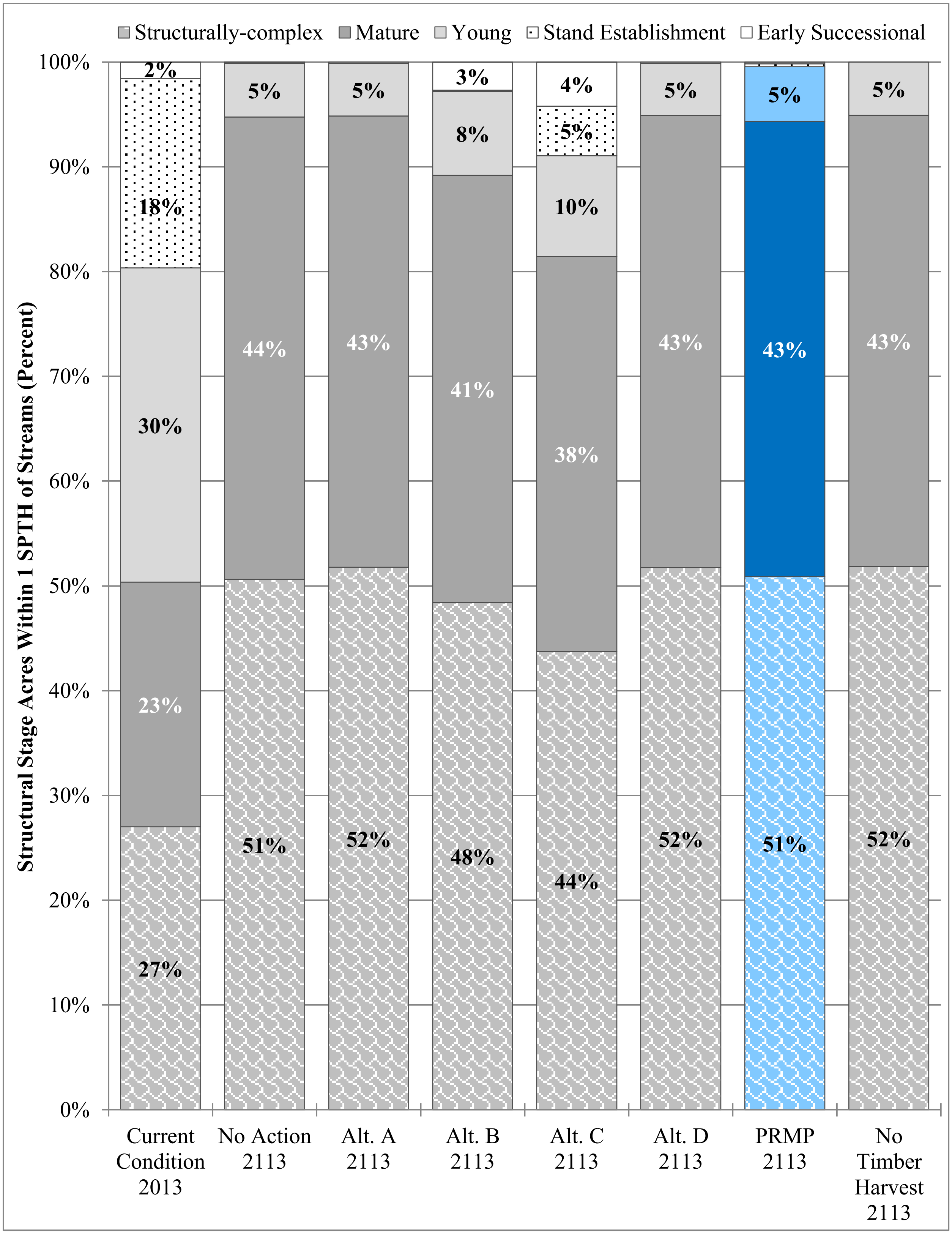

Figure 3-43. Relative proportion of structural stage acres under the current condition, the alternatives, the Proposed RMP, and the No Timber Harvest reference analysis in 2113 for stands within one site-potential tree height from all streams

All alternatives and the Proposed RMP would increase the potential large wood and small functional wood contribution to streams from the current conditions. There is no meaningful difference discernible at this scale of analysis among the alternatives and the Proposed RMP in their effect on overall potential wood contribution. The BLM based this conclusion on the analytical results in the 2008 FEIS for potential wood contribution, which provide an approximation of the effects of the alternatives in this analysis, as discussed above under analytical methods, and that analysis is incorporated here by reference (USDI BLM 2008, pp. 779–797). The 2008 FEIS found that the No Action alternative and 2008 Proposed RMP would have nearly identical effects on potential large wood and small functional wood contribution, and that the potential wood contribution would be only slightly lower than the No Timber Harvest reference analysis. Specifically, that analysis found that potential large wood contribution would increase from the current 5.4 pieces/mile/year to 8.0 pieces/mile/year under both the No Action alternative and the 2008 Proposed RMP and to 8.3 pieces/mile/year under the No Timber Harvest reference analysis in 100 years. Because the analytical results from the 2008 FEIS for the No Action alternative and the 2008 Proposed RMP bracket the effects that would occur under the alternatives and the Proposed RMP in this analysis, and the No Action alternative and 2008 Proposed RMP had indistinguishable effects on potential wood contribution, the alternatives and the Proposed RMP in this analysis would all have the same effects on overall potential wood contribution as those identified in the 2008 FEIS for the No Action alternative and 2008 Proposed RMP.

The relative proportion of structural stages within one site-potential tree height would be similar over time across all alternatives and the Proposed RMP (**Figure 3-43**, **Table 3-44**). The similar proportion of structural stages over time under all alternatives and the Proposed RMP is consistent with the analytical conclusion that the overall potential wood contribution from the alternatives would be similar. Under Alternatives B and C, a higher proportion of those stands within one site-potential tree height would be Early Successional and Stand Establishment. Alternative C has the least acres in the Mature and structurally-complex stand types (i.e., those stands with the most capability to grow and deliver large wood to streams).

All alternatives and the Proposed RMP would increase the number of trees per acre greater than 20 inches DBH near streams from the current condition (**Figure 3-44**). Alternatives A and D would result in a similar increase in the number of large trees near streams, slightly greater than the other alternatives, and only very slightly less than the No Timber Harvest reference analysis. The No Action alternative and Alternatives B and C would result in a smaller increase in the number of large trees near streams. In 20 years, the No Action alternative would result in the least increase in the number of large trees near streams, barely above current levels. In 100 years, Alternative C would result in the least increase in the number of large trees near streams (**Figure 3-45**).

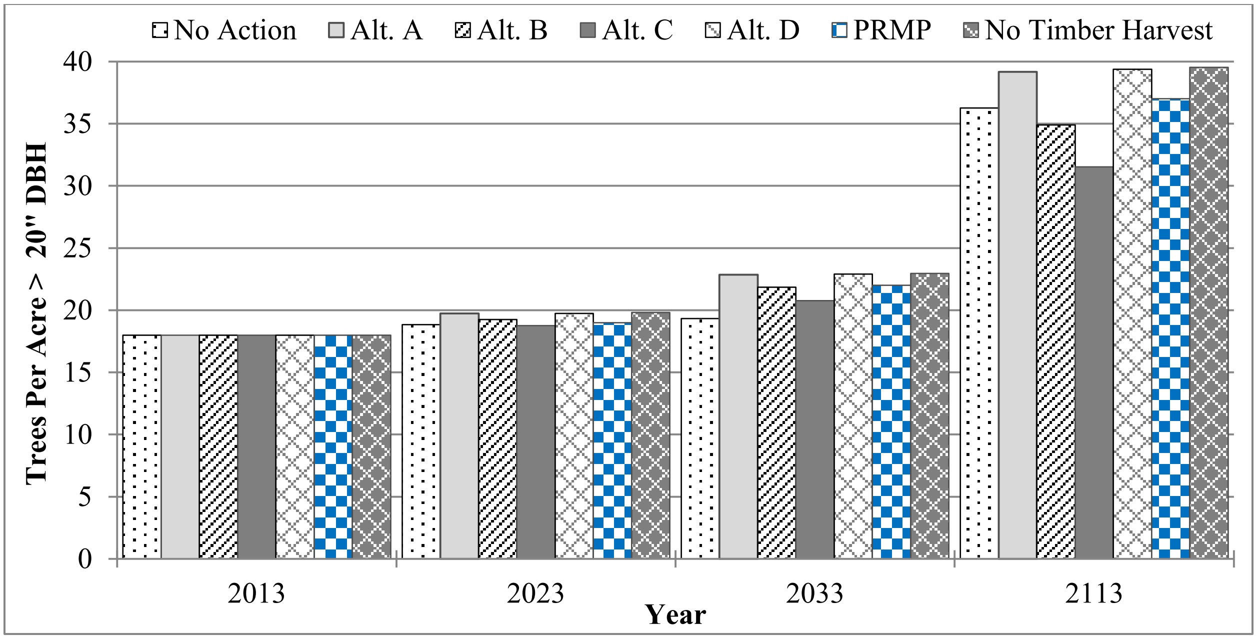

Figure 3-44. Trees per acre greater than 20” DBH within one site-potential tree height over time for all alternatives, the Proposed RMP, and the No Timber Harvest reference analysis

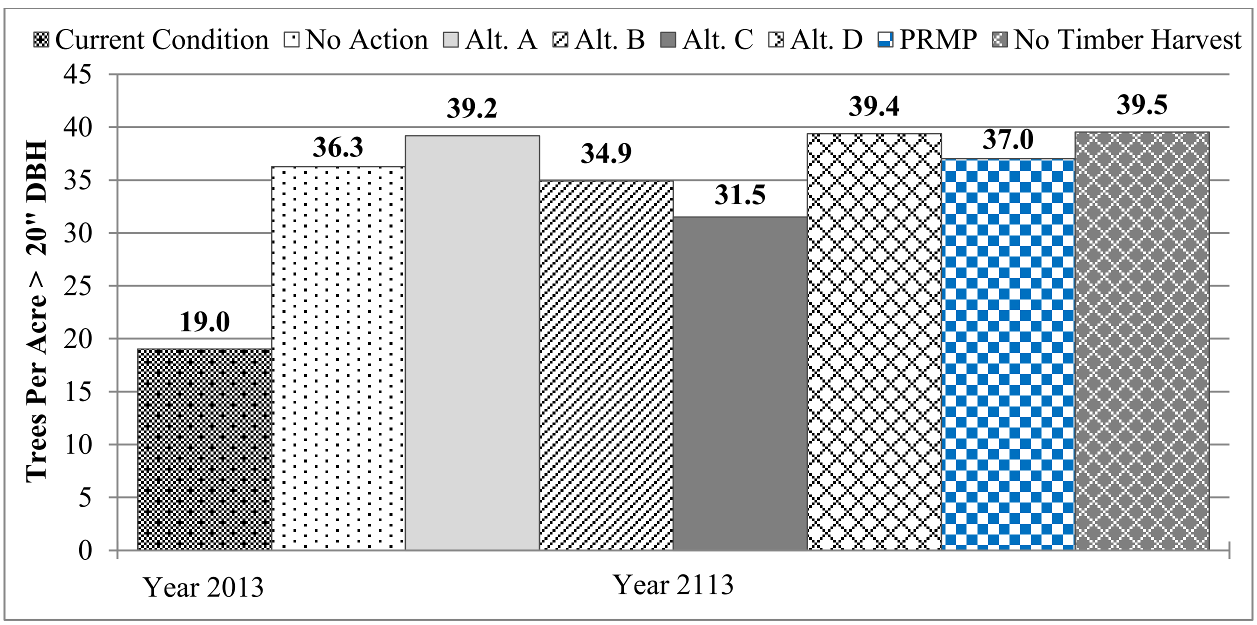

Figure 3-45. Trees per acre greater than 20” DBH for stands within one site-potential tree height of streams for the current condition in 2013, and the alternatives, the Proposed RMP, and the No Timber Harvest reference analysis in 2113

The Proposed RMP would increase the number of trees per acre greater than 20” DBH near streams more than the No Action alternative, Alternatives B and C, but slightly less than Alternatives A and D. As explained in the introduction to Chapter 3, the BLM updated baseline forest age and structural conditions resulting from 2013/2014 wildfires for the analysis of the Proposed RMP, which has resulted in changes to affected environment descriptions throughout this document, when compared to the Draft RMP/EIS.

Because of this updating of the baseline conditions, there is currently a slightly lower (5 percent) current average number of large trees near streams for the Proposed RMP than was analyzed for the action alternatives and No Action alternative. Therefore, this analysis may slightly underestimate the number of large trees near streams for the Proposed RMP compared to the results to the No Action alternative or the action alternatives. Given the very small relative differences among the alternatives and the Proposed RMP, this slight difference in starting conditions could result in a slight underestimate of the number of large trees near streams for the Proposed RMP throughout the analytical time period. Because of similarities in design, the Proposed RMP would have essentially identical effects as Alternatives A and D on the number of trees per acre greater than 20” DBH near streams in Class I and Class II subwatersheds (which constitute approximately 91 percent of the decision area excluding the east side of the Klamath Falls Field Office). In Class III subwatersheds, the Proposed RMP would have effects on the number of trees per acre greater than 20” DBH near streams intermediate between Alternatives A and D, and Alternatives B and C. Thus, while the number of large trees per acre near streams averaged across the decision area would be slightly lower under the Proposed RMP than under Alternatives A and D, it would actually only be lower in a small number of watersheds (< 10 percent of the decision area). In summary, the results shown in **Figure 3-45** display the relative outcomes for large trees near streams over time, but likely overstate the absolute magnitude of the difference in outcomes between Alternatives A and D and the Proposed RMP.

All alternatives and the Proposed RMP would result in a similar decrease in the percentage of canopy cover in hardwoods (**Figure 3-46**).

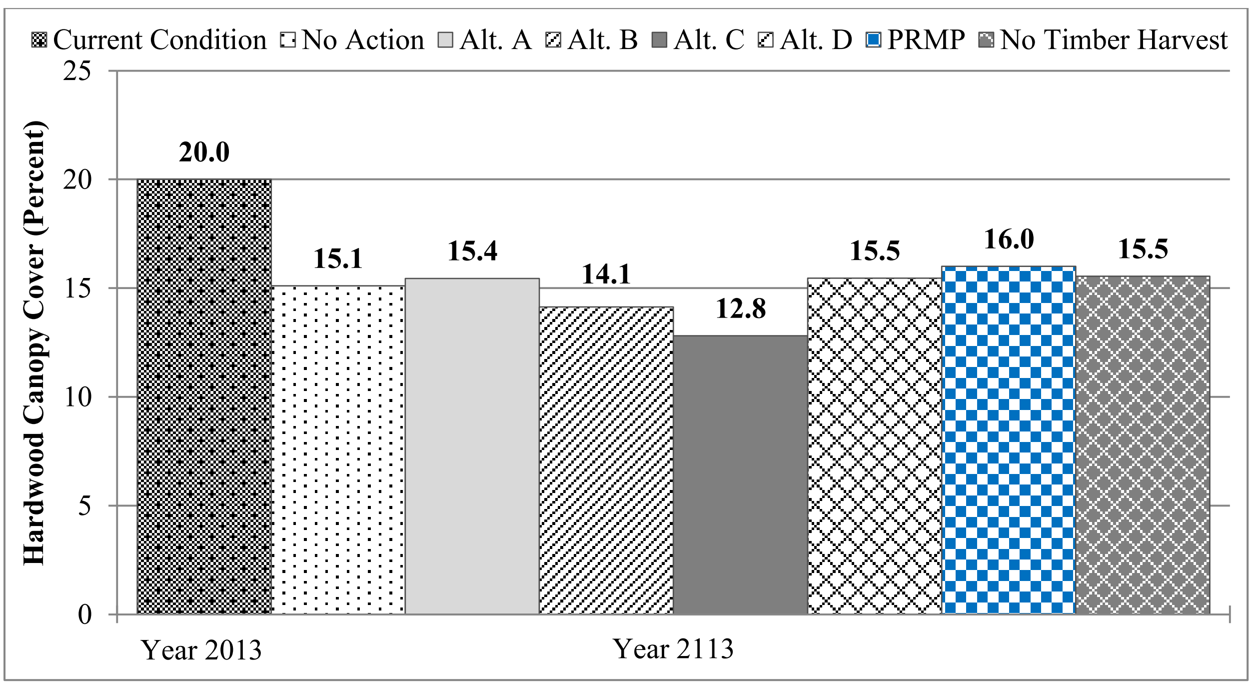

Figure 3-46. Percent hardwood canopy cover for stands within one site-potential tree height of streams for the current conditions in 2013 and in 2113

All alternatives and the Proposed RMP would increase the average diameter of trees in stands within one site-potential tree height of streams (**Figure 3-47**); that increase would be similar under the No Action alternative, and Alternatives A and D, and would be only very slightly less than the increase under the No Timber Harvest reference analysis. Alternative C and Alternative B would result in a smaller increase in the average diameter of trees in stands within one site-potential tree height of streams, reflecting the influence of timber harvest in portions of the Harvest Land Base that are outside of the Riparian Reserve along non-fish-bearing intermittent streams, but within one site-potential tree height of streams. As explained above for the number of large trees near streams, the results shown in **Figure 3-47** display the relative outcomes for the average diameter of trees near streams over time, but likely overstate the absolute magnitude of the difference in outcomes between Alternatives A and D and the Proposed RMP.

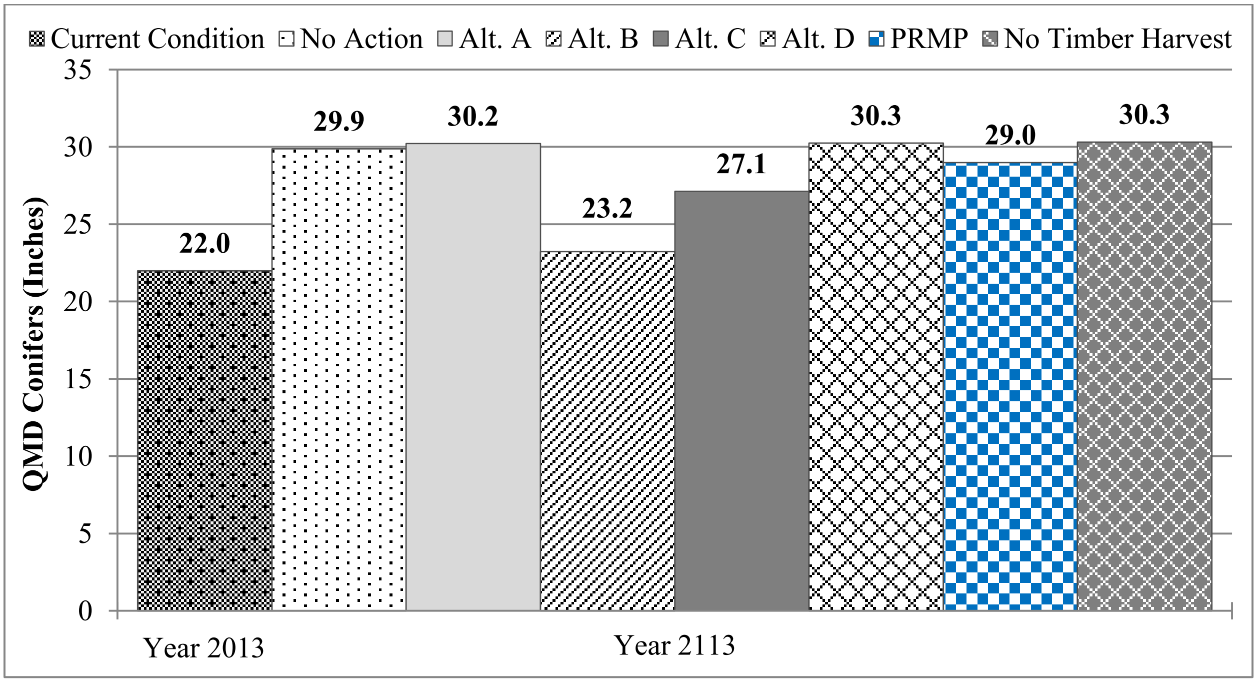

Figure 3-47. Quadratic mean diameter (QMD) of conifers for stands within one site-potential tree height of streams for the current condition in 2013, and in 2113

The trees per acre within one site-potential tree height of streams would decrease substantially from current conditions under all alternatives and the Proposed RMP (**Figure 3-48**); that decrease would be similar under Alternatives A and D and the Proposed RMP, and would be only very slightly less than the decrease under the No Timber Harvest reference analysis. The No Action alternative and Alternatives B and C would result in slightly less decrease in the density of trees in stands within one site-potential tree height of streams. As explained above for the number of large trees near streams, the results shown in **Figure 3-48** display the relative outcomes for total trees per acre near streams over time, but likely overstate the absolute magnitude of the difference in outcomes between Alternatives A and D and the Proposed RMP.

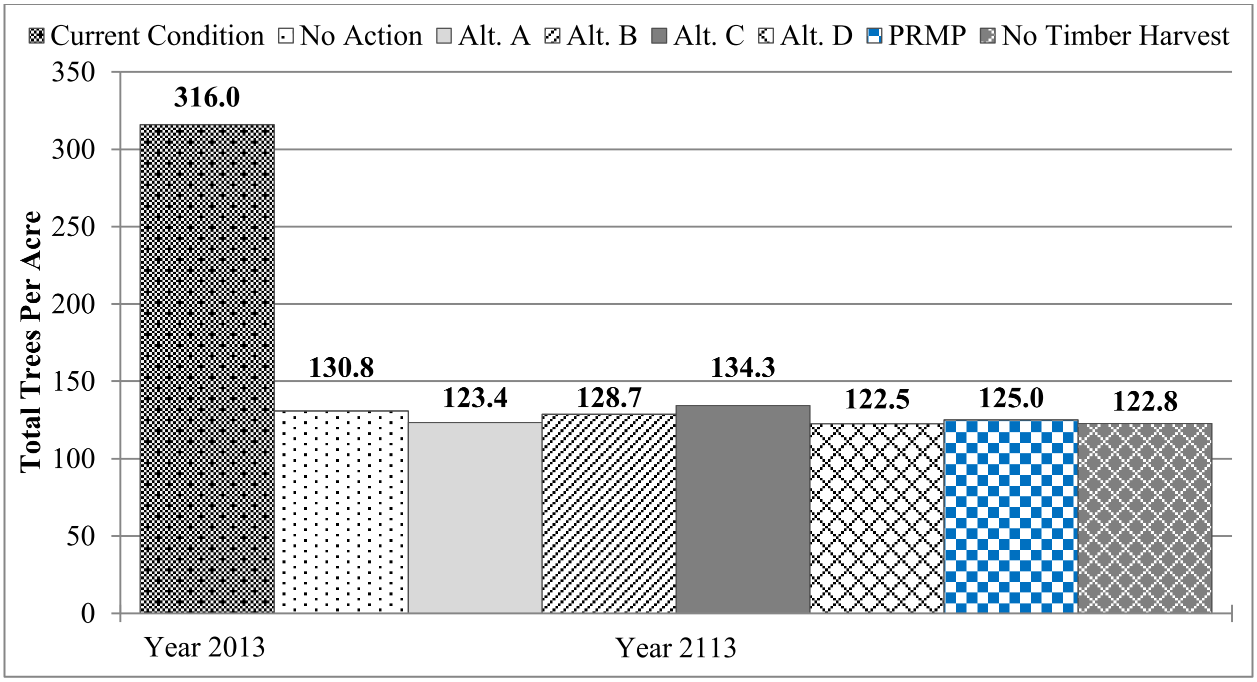

Figure 3-48. Total trees per acre for stands within one site-potential tree height of streams for the current condition in 2013, and in 2113

The similar trends for these stand metrics within one site-potential tree height of streams over time under all alternatives and the Proposed RMP is generally consistent with the analytical conclusion that the overall potential wood contribution from the alternatives would be similar. However, these stand metrics reveals some specific differences among the alternatives and the Proposed RMP in the potential to provide wood to streams.

There are differences in the design of the alternatives that may have differential effects on potential wood contribution that the BLM cannot quantitatively evaluate at this scale of analysis. Notably, the alternatives differ in Riparian Reserve widths, inner zone widths, and management direction for Riparian Reserve thinning.

Riparian Reserve Width

The No Action alternative has wider Riparian Reserve widths on fish-bearing streams than all action alternatives or the Proposed RMP. The No Action alternative and Alternatives A and D have wider Riparian Reserve widths on non-fish-bearing intermittent streams than Alternatives B and C. As a result, the No Action alternative and Alternatives A and D would include within the Riparian Reserve the largest proportion of the landscape capable of delivering wood to the stream. Alternative B would explicitly provide debris-flow-prone non-fish-bearing intermittent streams with a wider Riparian Reserve than other non-fish-bearing intermittent streams. The Riparian Reserve on these debris-flow-prone streams under Alternative B would be narrower than the Riparian Reserve under the No Action alternative and Alternatives A and D, but wider than under Alternative C. Under the Proposed RMP, Riparian Reserve widths in Class I and II watersheds would be the same as Alternatives A and D. In Class III subwatersheds under the Proposed RMP, the Riparian Reserve would be the same width on fish-bearing streams and perennial streams as Alternatives A, B, and D, but the same width on non-fish-bearing intermittent streams as Alternative C. In the various metrics shown above, these differences among the alternatives and the Proposed RMP in Riparian Reserve widths, results in only modest differences in potential wood contribution. It is possible that there would be circumstances in which there could be differences in wood delivery to streams not revealed by this analysis. For example:

- Substantial channel migration could move the stream closer to harvested stands outside of the Riparian Reserve. Under the action alternatives, which would measure the width of the Riparian Reserve from the edge of the active stream channel, this could reduce the potential wood contribution to the stream. This could however be offset in the short term by additional large wood recruited from channel migration. The Proposed RMP would measure the width of the Riparian Reserve from the ordinary high water line, including the channel migration zone for low gradient alluvial shifting channels, which would effectively widen the Riparian Reserve width on streams that would likely experience substantial channel migration compared to the action alternatives. This difference would reduce or eliminate the likelihood that substantial channel migration could move the stream closer to harvested stands outside of the Riparian Reserve under the Proposed RMP compared to the action alternatives.
- Tree fall on extremely steep slopes could result in delivery of wood to non-fish-bearing intermittent streams from beyond 50 feet from the stream. Under Alternatives B and C and in Class III subwatersheds under the Proposed RMP, this could result in fewer trees and smaller diameter wood delivered to some streams if the upslope area includes recently harvested stands outside the Riparian Reserve.
- Debris flows could exceed 100 feet in width. Under Alternative C and in Class III subwatersheds under the Proposed RMP, this could result in fewer trees and smaller diameter wood delivered to streams if the debris flow area along non-fish-bearing intermittent streams includes recently harvested stands outside the Riparian Reserve.

These examples represent exceptional or low-probability circumstances. Furthermore, actual wood loading on streams results from multiple factors and wood delivery from multiple sources, further lowering the probability that any of these exceptional circumstances would result in any discernible difference in actual wood loading in streams at the watershed scale.

Inner Zone Widths

All action alternatives and the Proposed RMP delineate an inner zone near streams in which stand thinning would not occur. Alternatives B and C generally delineate a smaller inner zone than Alternatives A and D and the Proposed RMP. The No Action alternative does not specify any such inner zone. The vegetation modeling of the No Action alternative in this analysis did make assumptions based on recent projects that Riparian Reserve stand thinning would not occur near streams. However, such assumptions about thinning under the No Action alternative are more uncertain than under the action alternatives or the Proposed RMP, given the absence of specific management direction for an inner zone under the No Action alternative. Over time, the wider inner zone along perennial and fish-bearing streams under Alternatives A and D and the Proposed RMP could result in some stands that are capable of delivering wood to streams developing without thinning and thus providing smaller wood available for delivery to streams. Alternatively, the narrower inner zone under Alternatives B and C could result in some stands that are capable of delivering wood to streams being thinned and having fewer trees available for delivery to streams. Identifying any such differences in the influence of differing inner zone widths on potential wood contribution would require stand-specific and stream-specific data coupled with modeling of a specific thinning prescription, which is not possible at this scale of analysis. Nevertheless, using the generalized stand and stream data available, and the modeling assumptions about the extent, location, and prescriptions for thinning, this analysis identified only modest differences in the effect of differing inner zone widths on potential wood contribution to streams.

Management Direction for Riparian Reserve Thinning

The No Action alternative would include thinning for a variety of broad-based ecological purposes, including the nine Aquatic Conservation Strategy objectives. Alternatives B and C and the Proposed RMP in Class II and III watersheds would direct thinning in the outer zone for a differing but comparable set of purposes, including increasing the diversity of riparian species and developing structurally-complex stands. Alternatives B and C, and the Proposed RMP direct that a portion of the trees in stand thinning in the outer zone would be directionally felled to the stream. The Proposed RMP would specifically require a portion of the stand from the inner zone to be felled toward the stream or require a portion of the stand in the outer zone to be made available for instream restoration in order to meet the tree tipping management direction. This would result in more large wood actively being placed in the stream to benefit fish habitat under the Proposed RMP than under the alternatives. Alternatives A and D and the Proposed RMP in Class I subwatersheds would direct thinning in the outer zone as needed for the purpose of ensuring that stands are able to provide stable wood to the stream. Alternative A would generally limit this thinning to non-commercial treatments (i.e., all cut trees would be left in the stand), except in the dry forest, where thinning would also occur as needed for fuels treatments. As with inner zone widths, the management direction under Alternatives A and D, and the Proposed RMP in Class I subwatersheds could result in some stands that are capable of delivering wood to streams developing without thinning and thus providing smaller wood available for delivery to streams. On the other hand, over time, the management direction under the No Action alternative, Alternatives B and C, and the Proposed RMP in Class II and III watersheds could result in some stands that are capable of delivering wood to streams being thinned and having fewer trees available for delivery to streams. As with inner zone widths, identifying any such differences in the influence of differing management direction for riparian thinning on potential wood contribution would require stand-specific and stream-specific data coupled with modeling of a specific thinning prescription, which is not possible at this scale of analysis. Nevertheless, using the generalized stand and stream data available, and the modeling assumptions about the extent, location, and prescriptions for thinning, this analysis identified only modest differences in the effect of differing management direction for thinning on potential wood contribution to streams.

Based on the condition of forest stands in the Riparian Reserve and the management direction in the alternatives, there is a limited acreage of Riparian Reserve stands in the decision area that would be thinned over the next five decades under all alternatives and the Proposed RMP (**Figure 3-49** and **Table 3-45**). The acreages in **Figure 3-49** and **Table 3-45** represent forecasts from the Vegetation Modeling based on modeling assumptions related to the availability of acres suitable for thinning in light of the management direction for each alternative and the Proposed RMP (see **Appendix C**). Because Riparian Reserve thinning under all alternatives and the Proposed RMP would be conducted only for specific stand management purposes and the need for such thinning would depend on stand-specific conditions, these forecasts of the amount and rate of Riparian Reserve thinning are highly approximate. In any decade, the No Action alternative would thin the most Riparian Reserve acres than any action alternative or the Proposed RMP. Alternative D would thin the fewest Riparian Reserve acres. The Proposed RMP would thin an intermediate number of acres of the Riparian Reserve per decade when compared to the No Action alternative and action alternatives.

All alternatives and the Proposed RMP would thin less than 4.2 percent of the Riparian Reserve in any one decade, and the Proposed RMP would thin less than 1.3 percent of the Riparian Reserve in any decade. In total, the Proposed RMP would thin 5.3 percent of the Riparian Reserve over a period of five decades. This very small amount of acres treated under all alternatives and the Proposed RMP supports the analytical conclusion that there would be only modest differences in the effect of differing management direction for thinning on potential wood contribution to streams.

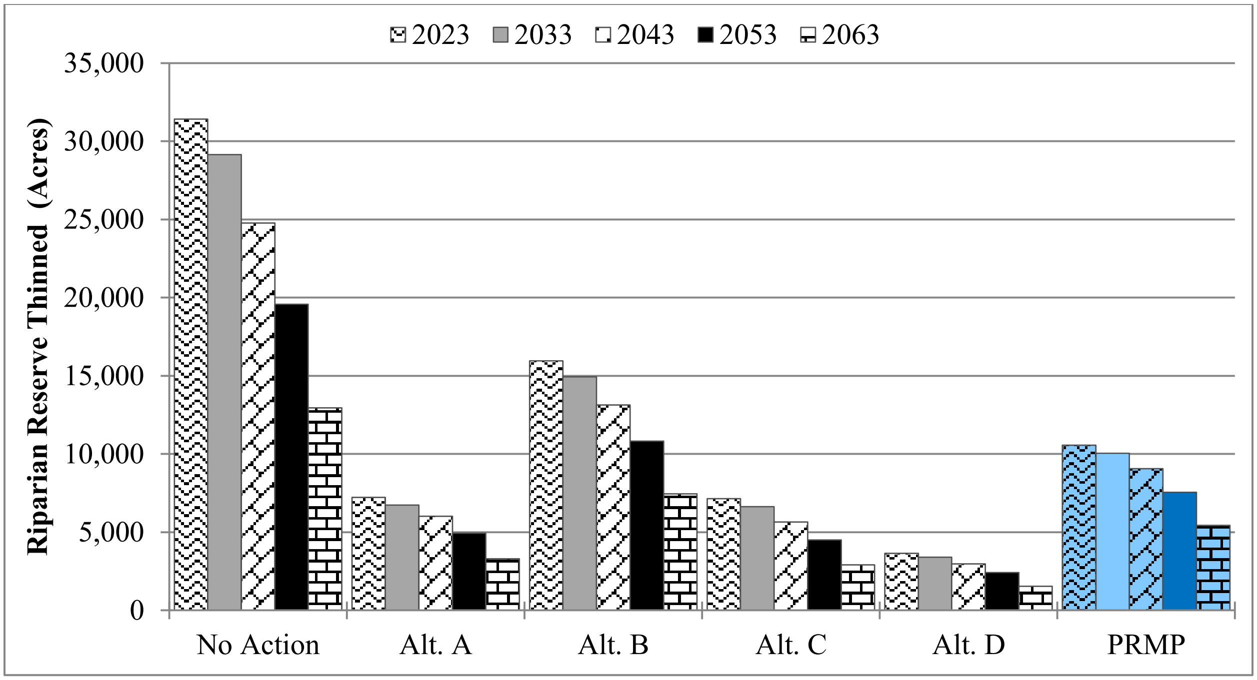

Figure 3-49. Thinning within the Riparian Reserve by decade
Note: Alternative A and the Proposed RMP include non-commercial and habitat enhancement thinning acres

Table 3-45. Thinning within the Riparian Reserve by decade

Decade	No Action (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	Alt. D (Acres)	PRMP (Acres)
2023	31,407	7,219	15,958	7,146	3,655	10,561
2033	29,137	6,731	14,933	6,630	3,405	10,036
2043	24,773	6,017	13,132	5,644	2,961	9,060
2053	19,578	4,944	10,816	4,497	2,424	7,543
2063	12,959	3,289	7,455	2,915	1,542	5,434

The tiered subwatershed approach in the Proposed RMP would result in more protection of Riparian Reserve adjacent to critical habitat and streams with high intrinsic potential. Management direction under the Proposed RMP for tree tipping from inner zones and making available logs or trees for restoration from the outer zone would result in a direct contribution of large wood to streams, in addition to the long-term protection afforded by retention of the no-harvest inner zone.

In summary, the analysis demonstrates only modest differences among the alternatives and the Proposed RMP in the potential wood delivery to streams over time. To the extent that this analysis is able to predict accurately the potential wood contribution, all alternatives and the Proposed RMP would increase the large wood and small functional wood contribution to streams over time. Increases in wood delivery to streams would improve fish habitat by creating deep pools, providing cover, and capturing sediment that provides spawning habitat. Such improvements in habitat would improve fish survival and production and, over time, would contribute to increases in fish populations. The 2008 FEIS described the effects of increasing wood delivery to streams on fish (USDI BLM 2008, pp. 372–374), and that discussion is incorporated here by reference. This analytical conclusion that all alternatives and the Proposed RMP would increase the large wood and small functional wood contribution to streams over time is based on high-quality information using robust analytical methodology and provides an accurate, albeit generalized, description of the effects of the alternatives and the Proposed RMP across the decision area and a sound basis for comparing the alternatives and the Proposed RMP. However, because of the limitations on available data and analytical methodologies and the uncertainties described above, there may be more substantial differences among the alternatives and the Proposed RMP on wood delivery to streams than is apparent in this analysis in some locations and under some circumstances. Such circumstances are exceptional or not conducive to analysis at this scale with the data available. Where such circumstances would be relevant, the BLM would address these site-specific effects on potential wood delivery more fully in the analysis for specific implementation actions.

Issue 2

How would delivery of sediment to fish-bearing and non-fish-bearing streams affect fish under the alternatives?

Summary of Analytical Methods

The delivery of sediment to fish-bearing and non-fish-bearing streams is presented in the Hydrology section. That analysis describes the amount of new road construction and use within a 200-foot delivery distance to streams to estimate the contribution of fine sediment to stream channels.

In this analysis, the BLM assumed that increases in fine sediment less than 1 percent would not result in measurable or meaningful effects on fish survival and that every 1 percent increase in fine sediment from management activities would result in a 3.4 percent decrease in fish survival. The 2008 FEIS summarized the effects of sediment on fish and aquatic habitat and that summary is incorporated here by reference (USDI BLM 2008, pp. 385–388, 799–800). Thresholds for lethal and sub-lethal effects on fish from increases in sediment delivery have not been well established at the scale of this analysis. Cederholm (1981) concluded that there was a 2 percent decrease of egg to emergence survival of salmonids for each 1 percent increase in fine sediment over natural levels at the watershed scale. Suttle *et al.* (2004) suggest there is no threshold below which fine sediment is harmless to fish, and the deposition of fine sediment in the stream channel (even at low concentrations) can decrease the growth of salmonids. Such sub-lethal effects on individual fish would occur under every alternative and the Proposed RMP from timber harvest activities, broadcast burning, grazing, culvert replacements, and other management activities, but it is not possible to describe quantitative changes in sub-lethal effects under the alternatives and the Proposed RMP over time at this scale of analysis. Therefore, this analysis focuses on the sediment levels that would measurably affect fish survival.

Background

Sediment occurs naturally in stream systems and can affect fish directly by increasing turbidity and inhibiting foraging and breathing functions, or indirectly by embedding in stream substrates, thereby reducing macroinvertebrate productivity, or smothering eggs and fry. Fine sediment in streams can affect fish habitat by filling interstitial spaces in gravel substrate, reducing oxygen flow to incubating eggs, and by physically preventing newly hatched fish from emerging. In suspension, fine sediment reduces visibility, reduces foraging ability, and impairs oxygen uptake in gill membranes (Waters 1995).

Affected Environment

In 2009, the Oregon Department of Environmental Quality published an assessment of water quality indicators for forested lands in Western Oregon (ODEQ 2009). The ODEQ modeled sediment using the

PREDATOR model, which uses known preferences and tolerances of aquatic macroinvertebrates to predict stream sediment and other water quality indicators. The model showed that over two-thirds of sites on all Federal lands had less than 10 percent fines, which would be considered ideal for salmonids. Federal lands had the highest percentage of sites in excellent water quality condition, higher than either State or private forestlands (ODEQ 2009).

The ODEQ report summarized conditions by ownership and grouped BLM-administered lands and Forest Service lands into a single category of Federal lands; therefore, conditions may not precisely reflect BLM-administered lands independently. The Willamette region has the highest percent of sites in excellent condition (less than 10 percent fines) with 92 percent, followed by the South Coast with 81 percent, and the North Coast with 69 percent. Although the ODEQ report did not break down the Lower Columbia region by ownership, 81 percent of sites in that region are in excellent condition across all ownerships (ODEQ 2009).

In 2015, the Aquatic and Riparian Effectiveness Monitoring Program, a joint monitoring program of the BLM and Forest Service, released their 20-year monitoring summary, and the analysis and findings contained are incorporated here by reference (Miller *et al.* 2015). That monitoring summary evaluated habitat on Federal lands and found that a majority of watersheds showed an increase in Watershed Condition Scores. In-channel substrate showed an overall positive score indicating that conditions are not only improving but also are trending toward more historical conditions. Substrate scores take into account percent fine sediment, median substrate size, and presence of macroinvertebrates.

Environmental Consequences

Under each of the action alternatives and the Proposed RMP, the estimated amount of additional sediment delivered to streams channels from roads in the first decade would be less than a 1 percent increase from the current amounts (see the Hydrology section in this chapter). At this level, there would be no detectable effect to fish or stream channels from additional sediment. At the site scale, small accumulations of fine sediment could begin to fill pool-tails, or these fines could become embedded in gravel substrates used for spawning. These sediments would be flushed during subsequent high flows and dispersed downstream, where no discernable effect would be detected. Under all alternatives and the Proposed RMP, the increase in fine sediment delivery to streams would not increase more than 1 percent above the current conditions, and would therefore be below the threshold for measurable effects on fish survival at this scale of analysis.

As sediments are flushed from road surfaces, there could be some short-term increases (i.e., lasting several hours) in stream turbidity that would be dispersed within tens to hundreds of feet downstream from the source depending on flow, channel gradient, channel complexity including the amount of woody debris, and other factors (Duncan *et al.* 1987, Gomi *et al.* 2005). This would result in a short-term and localized effect to fish that would elicit non-lethal stress or physical movement out of the stream reach until turbidity levels return to ambient levels. Given that these short-term and localized non-lethal effects on fish would depend on site-specific road conditions, and the total mileage of roads within the sediment delivery distance of streams would vary only slightly among alternatives and the Proposed RMP, there would be no measurable difference in effects from short-term flushing of sediment from road surfaces on fish under any of the alternatives or the Proposed RMP.

Pacific lampreys require sediment accumulations in slow water habitat to complete juvenile rearing. Juvenile lampreys bury themselves in thick sediment deposits where they rear for up to seven years while filter feeding (Luzier *et al.* 2009). Since none of the alternatives of the Proposed RMP would increase sediment contribution above the site level, there would be no measurable difference in effects on Pacific lamprey under any of the alternatives or the Proposed RMP.

Watershed restoration actions, such as log and boulder placement and fish passage improvements that are beneficial to fish habitat, would also result in short-term increases in sediment delivery to stream channels. Removal of culverts and other in-stream structures like blockages would cause stream channel disturbance during summer in-stream operating periods (ODFW 2008). Juvenile fish rearing in these reaches would be displaced moving either upstream or downstream during the time of elevated turbidity and these juveniles would return shortly after disturbance. This could be up to 8 hours in duration and the elevated turbidity could extend tens to hundreds of feet downstream from the site of the disturbance. Application of BMPs (**Appendix J**) would help meet ODEQ water quality standards (see the Hydrology section of this chapter) and further reduce the effects of elevated turbidity on juvenile fish. Additionally, because the BLM does not forecast any difference among the alternatives in watershed restoration actions, there would be no difference in effects on turbidity because of restoration actions under any of the alternatives or the Proposed RMP.

Under all of the alternatives and the Proposed RMP, the effect on stream sediment from livestock grazing would remain the same or decrease. Heavy livestock grazing can consume and trample riparian vegetation and displace soil in riparian and upland areas, potentially creating sources of sediment and reducing the ability of the riparian vegetation to filter sediment. As discussed in the Livestock Grazing section, under all and the Proposed RMP, livestock grazing (acres for grazing, number of allotments, animal unit months, and permittees/lessees) would remain the same or decrease. Under the No Action alternative, Alternatives A, B, and C, and the Proposed RMP, the BLM would manage livestock grazing in accordance with the Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington (USDI 1997) included in **Appendix L**. Standard #5 of the rangeland health standards (Native, T&E, and Locally Important Species; 1.j.) includes guidance to provide for the life cycle requirements, and maintain or restore the habitat elements of native (including threatened and endangered, Bureau Special Status, and locally important species) and desired plants and animals. This guidance would allow the BLM to restrict the timing of livestock grazing to avoid impacts to ESA-listed fish species and Bureau Sensitive fish species. The BLM assumes the current level of livestock grazing would continue under the No Action alternative, Alternatives A, B, and C and the Proposed RMP (see the Livestock Grazing section of this chapter). Under Alternative D, the BLM would eliminate livestock grazing. Because the BLM would adjust grazing practices under the No Action alternative, Alternatives A, B, and C, and the Proposed RMP as needed to manage livestock grazing in accordance with the rangeland health standards, including maintaining and restoring habitat for threatened and endangered fish species and Bureau Sensitive fish species, the effects of livestock grazing on sediment delivery that could affect fish would be similar to Alternative D at this scale of analysis.

Where livestock grazing would be restricted or eliminated, there would be some recovery of streamside vegetation, which would result in a reduction of stream bank erosion and sediment contribution to streams. This would result in improved spawning substrate for fish through a reduction in fine sediment in gravels. However, at the scale of the planning area, there would be no discernable difference among any of the alternatives or the Proposed RMP in the effects to fish from livestock grazing.

The extraction of minerals on BLM-administered lands adjacent to streams could generate sediment from operations that involve bank excavation with heavy machinery or in-channel suction dredge mining. Operation of heavy machinery and suction dredges for mining within the active channel or floodplain of streams containing ESA-listed fish or critical habitat for ESA-listed fish would result in addition of sediment from stream banks and elevated turbidity from disturbance of the stream bed. The scale and extent of mining is variable and therefore difficult to predict. The amount of sediment generated could result in similar turbidity related stress or effects to the stream by reducing substrate quality for spawning or pool habitat volume. There is no reasonable basis upon which the BLM could predict any difference in these potential effects from mining among the action alternatives, the No Action alternative, or the Proposed RMP at this scale of analysis.

Issue 3

How would the alternatives vary in maintaining stream temperatures for fish-bearing and non-fish-bearing streams?

Background

The 2008 FEIS described the effects of temperature to fish and that discussion is incorporated here by reference (USDI BLM 2008, pp. 388–389). Salmon and steelhead require relatively narrow ranges of temperature at multiple life stages for optimal migration, growth, and reproduction. The Oregon Department of Environmental Quality has defined those ranges in their cold-water protection standards (**Table 3-46**).

Table 3-46. State of Oregon cold-water protection criteria for trout and salmon species

Salmonid Beneficial Use	Criteria
Salmon and Steelhead Spawning	55.4 °F
Core Coldwater Habitat	60.8 °F
Salmon and Trout Rearing and Migration	64.4 °F
Salmon and Steelhead Migration Corridor	68.0 °F
Lahontan Cutthroat Trout or Redband Trout	68.0 °F
Bull Trout Spawning and Juvenile Rearing	53.6 °F

Affected Environment and Environmental Consequences

As stated in the Hydrology section, the riparian management strategies under the No Action alternative and Alternatives A and D and the Proposed RMP would be highly protective of stream shade and would have little risk of increasing stream temperatures. Under these alternatives and the Proposed RMP, less than 0.5 percent of all perennial and fish-bearing reaches in the decision area would be susceptible to shade reductions that could affect stream temperature if the BLM applies thinning in the outer zone of the Riparian Reserve, based on the current condition. However, this limited stream mileage reflects areas with currently low canopy cover in the inner zone, which are the riparian stands least likely to be thinned under the management direction of the No Action alternative, and Alternatives A and D and the Proposed RMP. As discussed in the Hydrology section, this result does not reflect an actual reduction in stream shading, but a susceptibility to such a reduction in stream shading if the BLM thins the outer zone along these streams. If the BLM does not thin the stand in the outer zone, no reduction in stream shading would occur. Even if the outer zone adjacent to inner zone with low canopy cover were thinned, not all of the susceptible reaches would be treated in a given year. In addition, as some stream reaches are treated other stream reaches would recover, reducing the overall effect of canopy removal. This limited stream mileage susceptible to shade reductions would decrease over time as the stands in the inner zone increase in canopy cover. The stream mileage susceptible to shade reductions would decrease to almost zero in 20 years under Alternatives A and D, and the Proposed RMP, and in 30 years under the No Action alternative. Intermittent streams that only flow during colder, generally overcast winter months are much less able to contribute to temperature increases downstream (see the Hydrology section in this chapter). Narrower Riparian Reserve widths on non-fish-bearing intermittent streams under Alternatives B and C and in Class III subwatersheds under the Proposed RMP would therefore not have any measurable effect on stream temperature.

Under Alternatives B and C, approximately 5 percent of fish-bearing and perennial streams would be susceptible to shade reductions that could affect stream temperature if the BLM applied thinning in the outer zone of the Riparian Reserve, based on the current condition. This larger stream mileage does not reflect greater effects of thinning under Alternatives B and C, but a greater susceptibility to shade reductions because of the combination of the current condition of low canopy cover in the inner zone along these streams, combined with the narrower inner zone width under Alternatives B and C. As noted above, areas with low canopy cover in the inner zone are the riparian stands least likely to be thinned under the management direction of Alternatives B and C. Even if the outer zone adjacent to inner zone with low canopy cover was thinned, not all of the susceptible reaches would be treated in a given year. In addition, as some stream reaches are treated other stream reaches would recover, reducing the overall effect of canopy removal. The stream mileage susceptible to shade reductions would decline within the first 20 years under Alternatives B and C, and then would remain relatively constant.

At the stream reach scale, a loss in stream shade that could affect stream heating might result in non-lethal stress for juvenile salmonids rearing (e.g., lowered disease resistance and reduced growth rate) where stream temperatures already exceed ODEQ standards for fish use. However, relatively few miles of streams susceptible to shade reductions that could affect stream temperature are coincident with temperature impaired. Under the No Action alternative, Alternatives A and D, and the Proposed RMP, 30–34 miles of stream reaches in the decision area would be susceptible to shade reductions that could affect stream temperature, and less than 9 percent of these susceptible stream reaches (2.4 miles) overlap temperature impaired reaches. Under Alternatives B and C, 370–372 miles of stream reaches would be susceptible to shade reductions that could affect stream temperature, and about 10 percent of these susceptible reaches (36.8 miles) overlap temperature impaired reaches. Effects from canopy removal would be most noticeable in smaller headwater perennial streams that have a continuous canopy over the channel. Shade reductions on intermittent streams that are dry during the hotter summer months would not result in a measurable increase in stream temperatures or affect fish.

Larger order channels would have a sufficient buffer to temperature increases from the large volume of water that the overall effect on salmonids would be negligible. Additionally, larger streams have more open canopy over the center of the channel and a small reduction in shade would represent a relatively small change in the overall amount of sunlight reaching the steam.

Issues Considered but not Analyzed in Detail

How would peak streamflows affect fish habitat?

The effect of changes in peak streamflows on fish habitat was not analyzed in detail, because the slight changes in peak streamflow susceptibility under the alternatives and the Proposed RMP would not result in any measurable difference in effects on fish habitat. The Hydrology section identifies watersheds that would be susceptible to peak flow increases from rain-on-snow events and evaluated how each of the alternatives would affect the potential for peak flow increases. Atypically high stream flows can modify stream channels by scouring banks and substrate, altering fish habitat. The 2008 FEIS provided a summary of the potential effects of stream flow and peak flows on fish habitat. That discussion is incorporated here by reference (USDI BLM 2008, pp. 390, 800–801). The Hydrology section contains the conclusion that a very small acreage of BLM-administered lands in the planning area would be susceptible to peak streamflow increases under any alternative or the Proposed RMP. Consistent with the conclusions in the 2008 FEIS, there would be no identifiable difference among the alternatives and the Proposed RMP in the effects on fish from peak flow increases for the following two reasons: (1) there is no methodology for detecting differences in effects on fish habitat at this scale of analysis, given the small acreage susceptible to peak flow increases and the relatively small difference in peak flow susceptibility among the alternatives; and (2) the causal connection between watershed susceptibility to increases in peak flow and fish habitat is too speculative and tenuous to describe direct or indirect effects that would differ among the alternatives and the Proposed RMP.

How would stream productivity resulting from nutrient and sunlight influences vary between the alternatives?

The effect of changes in stream productivity was not analyzed in detail, because there would be no measurable difference in effects among the alternatives and the Proposed RMP. In addition to primary productivity, there are other sources of nutrient input and food web stimulus into small fish-bearing streams. Opening the riparian overstory and increasing the available light that reaches the stream can increase primary productivity (Hill *et al.* 1995), hasten breakdown of litter and leaf material (Lagrue *et al.* 2011) and translate to increases in macroinvertebrate and fish biomass (Wootton 2012, Kiffney *et al.* 2014). Fish-bearing stream reaches can receive nutrient influxes from headwater reaches. Both invertebrates and detritus can be exported downstream from non-fish-bearing, headwater reaches year-round and, in turn, support large numbers of juvenile fish (Wipfli and Gregovich 2002). Thinning riparian stands, especially near streams, could potentially increase the primary productivity in streams by increasing sunlight to streams and altering the litter fall composition. All action alternatives and the Proposed RMP would limit near-stream thinning to maintain stream shading. However, Alternatives B and C, which could partially reduce streamside shade, could result in increased primary productivity and growth rates of juvenile salmonids. However, as described above under stream shading, such effects under Alternative B and C are uncertain, and it is not possible to identify any specific change in stream productivity under any of the alternatives or the Proposed RMP.

Historic salmon runs would have also added a large nutrient component to headwater streams that could be utilized by macroinvertebrates and juvenile fish. The ODFW has added spent hatchery carcasses to streams since salmon carcasses could potentially increase growth and abundance of macroinvertebrates that provide forage for juvenile salmonids (Chaloner and Wipfli 2002, Kiffney *et al.* 2014). The addition of salmon carcasses by ODFW could happen under all of the alternatives, and there is no basis for identifying any difference among the alternatives in nutrient inputs to streams.

How would Lost River sucker and shortnose sucker be affected by BLM management actions?

The effects of BLM management on Lost River (*Deltistes luxatus*) and shortnose sucker (*Chasmistes brevirostris*) were not analyzed in detail, because there would be no measurable difference in effects under the alternatives or the Proposed RMP. The primary effects to Lost River and shortnose sucker adjacent to or downstream of BLM-administered lands on the east side of the Klamath Falls Field Office would be through management of livestock grazing allotments. As noted previously, livestock could trample streamside vegetation and disturb stream banks causing erosion and sediment delivery to adjacent streams. This would reduce spawning substrate quality where fine sediment becomes entrained in gravel and pool habitats by reducing pool volume through deposition of sediment.

Within the decision area, grazing on allotments in the Klamath Falls Field Office would have no effect on Lost River sucker critical habitat. However, where Lost River sucker occupy habitat in the Klamath River, there is potential for grazing to cause an effect in very limited areas where livestock could potentially access the Klamath River.

Four grazing allotments in the Klamath Falls Field Office could adversely affect shortnose sucker or its critical habitat (USDI FWS 2013). The Pitchlog, Dry Prairie, and Horsefly allotments are adjacent to streams designated as critical habitat, and the Paddock allotment is adjacent to Gerber Reservoir, which is designated critical habitat for the shortnose sucker. Together these four allotments comprise 7.5 stream miles and 147.1 acres of critical habitat for shortnose sucker in reservoirs.

Grazing is not a causal factor for non-attainment of Rangeland Health Standards on any of these four allotments. A Rangeland Health assessment found that Pitchlog, Dry Prairie, and Horsefly allotments are meeting or substantially meeting criteria for Riparian/Wetland Areas (see the Livestock Grazing section of this chapter). Water Quality is not being met on any of the three allotments, with summer stream temperature exceeding state standards. However, the causal mechanism for elevated water temperature is regulation of the upstream Gerber Reservoir, over which the BLM has no control. Grazing practices specifically are not considered a factor in the non-attainment of the standard (USDI FWS 2013). The Paddock allotment is meeting both Riparian and Wetland Areas and Water Quality Rangeland Health Standards (USDI BLM 2003).

As described above, the BLM would eliminate livestock grazing under Alternative D and would manage livestock grazing under all other alternatives and the Proposed RMP in accordance with the Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington (USDI 1997) included in **Appendix L**. This guidance would allow the BLM to restrict the timing of livestock grazing to avoid impacts to Lost River sucker and shortnose sucker. Because the BLM would adjust grazing practices under the No Action alternative, Alternatives A, B, and C, and the Proposed RMP as needed to manage livestock grazing in accordance with the rangeland health standards, including maintaining and restoring habitat for threatened and endangered species, the effects of livestock grazing on Lost River sucker and shortnose sucker would be similar to Alternative D at this scale of analysis.

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Forest Management

Key Points

- Even-aged management systems with clear-cutting would produce more uniform stands in a mix of age classes without structural legacies. Two-aged management systems with variable-retention regeneration harvesting would produce stands in a mix of age classes with legacy structures and multiple canopy layers. Uneven-aged management systems with selection harvesting regimes would produce mostly older, structurally-complex stands and mature forests with multiple canopy layers.
- The allowable sale quantity (ASQ) under the alternatives would range from 120 million board feet (MMbf) per year under Sub-alternative B to 486 MMbf per year under Alternative C. The ASQ under the Proposed RMP would be 205 MMbf per year. The ASQ is primarily determined by the size of the Harvest Land Base, the intensity of forest management practices, and restrictions on timber harvest.
- Non-ASQ timber harvest volumes in the first decade would range from 4 MMbf per year under Alternative D to 122 MMbf per year under the No Action alternative. Non-ASQ timber harvest volume in the first decade for the Proposed RMP would be 73 MMbf per year.
- The proportion of harvest volume coming from large logs (i.e., > 20" diameter at the small end of the log inside the bark) would be lowest under Sub-alternative C, at 5 percent of total harvest volume, and highest under the No Action alternative and Alternative C, at 14 percent of total harvest volume. The proportion of harvest volume coming from large logs would be 9 percent under the Proposed RMP.

Summary of Notable Changes from the Draft RMP/EIS

- BLM revised the 2006 net inventory value in **Table 3-51**. In **Table 3-52**, the BLM revised inventory values by district, removed the acreage column and the gross inventory column, and added 2006 inventory data by district for direct comparison. The BLM revised the calculation of the 2006 value and the 2013 value directly from collected inventory data for a more accurate comparison between the 2 measurement periods.
- BLM added information about how reforestation of disturbed areas would be achieved in each alternative and the Proposed RMP, and how this relates to the abundance of the early successional structural stage under Issue 1.
- BLM added **Table 3-48** reporting average regeneration harvest ages through time under each alternative and the Proposed RMP under Issue 1.
- BLM added discussion and analysis in **Figure 3-60** regarding small inclusions of early successional forest created through implementation of group selection openings in the Late-Successional Reserve, Riparian Reserve, and Uneven-aged Timber Area, which are not reflected in stand average structural stage categories under Issue 1.

Issue 1

How would the age classes, structural stages, and inventory of merchantable timber volumes in forest stands change among alternatives in the Harvest Land Base and reserve land use allocations?

Summary of Analytical Methods

The BLM used Current Vegetation Survey plots and the Forest Operations Inventory to create a data set representing the current condition of the forest. The BLM then modeled a variety of silvicultural treatments, stand growth, and forest development through time using the ORGANON growth and yield model in conjunction with the Yield Table Generator (YTG Tools) and the Woodstock model. The BLM modeled silvicultural treatments to simulate the management that would occur under the various alternatives and the Proposed RMP, based on the management direction found in **Appendix B**.

For several aspects of this analysis, the BLM categorized the decision area into the 'coastal/north' areas (the Coos Bay, Eugene, and Salem Districts) and the 'interior/south' areas (the Klamath Falls Field Office, and the Medford and Roseburg Districts). This division represents a general divide in forest productivity and the current stand conditions within the decision area. The interior/south currently contains a higher proportion of lower productivity/fire-prone dry forests than the coastal/north areas.

For other aspects of this analysis, the BLM categorized the decision area into moist and dry forest areas. This division of the decision area is consistent with the discussion of moist and dry forest in the Fire and Fuels section in this chapter.

The BLM analyzed changes in age classes, structural stages, and standing inventory over a period of 200 years to provide a meaningful comparison of the effects of the alternatives and the Proposed RMP. This length of analysis is necessary given the varying and sometimes long periods between forest management treatments to capture forest structural development. The combined effects of forest management and forest growth across the landscape would take this longer analysis period to show meaningful changes in forest condition.

Acreage summaries in this section do not include Eastside Management Lands, non-forested lands, or other areas not given an age or structural stage classification in the Forest Operations Inventory. In the majority of this analysis, the BLM reports structural stage classifications as stand level averages.

For selection harvesting and commercial thinning, where development of structural complexity and high quality late-successional habitat are primary treatment objectives, implementation would include the creation of group selection openings > 0.25 acre in size. These group selection openings would function as small inclusions of early successional habitat within young, mature, and structurally-complex stands. Therefore, the BLM analyzed the abundance of acres in functional created canopy openings[54] to supplement the data presented as stand average structural classifications. In order to analyze the abundance of this condition in the decision area reported in **Figure 3-60**, the BLM calculated the area in functional created canopy openings as a percentage of harvest acres by land use allocation. The BLM based this calculation on management objectives and direction included for each alternative and the Proposed RMP in **Appendix B**. For this analysis, the BLM assumes that these created canopy openings are functional for two decades after the harvest entry is completed.

The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which are incorporated here by reference (USDI BLM 2014, pp. 56–61).

[54] These represent openings > 0.25 acre embedded in a larger stand which provide early successional habitat, but do not change the structural classification of the stand as a whole and are therefore not in the acreage calculation of the early successional structural stage.

Background

A wide variety of forest conditions exist within the decision area, which includes a variety of forest types, ages, structural stages, and productive capacity for timber production. While the forest conditions in many areas are the result of past fires and other natural disturbances, the BLM has altered much of the landscape through a variety of management activities and harvest. Timber harvest levels in the decision area have fluctuated substantially over the past 80 years, with a generally flat trend over the past two decades (**Figure 3-50**).

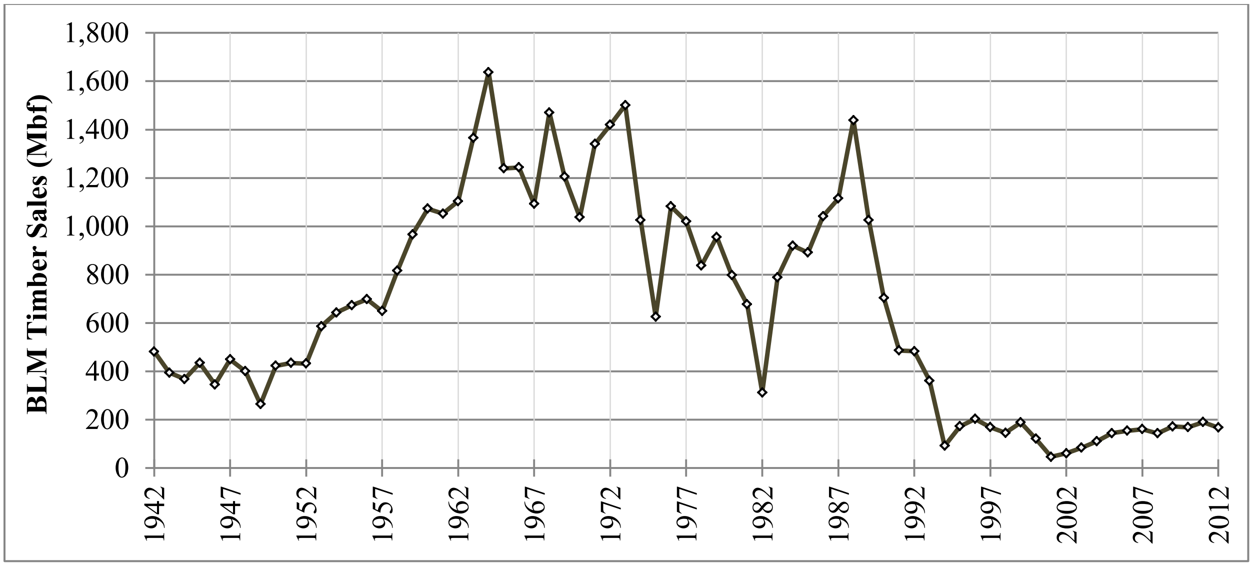


Figure 3-50. BLM historical timber sales; 1942–1961 data represents volume sold while 1962–2012 data represents volume harvested

Between 1962 and 1994, the BLM timber harvest from the planning area was 16 percent of western Oregon totals and averaged 980 MMbf per year. Since adoption of the 1995 RMPs, the BLM contribution has been less than 5 percent of western Oregon totals and has averaged 144 MMbf per year (**Figure 3-51**).

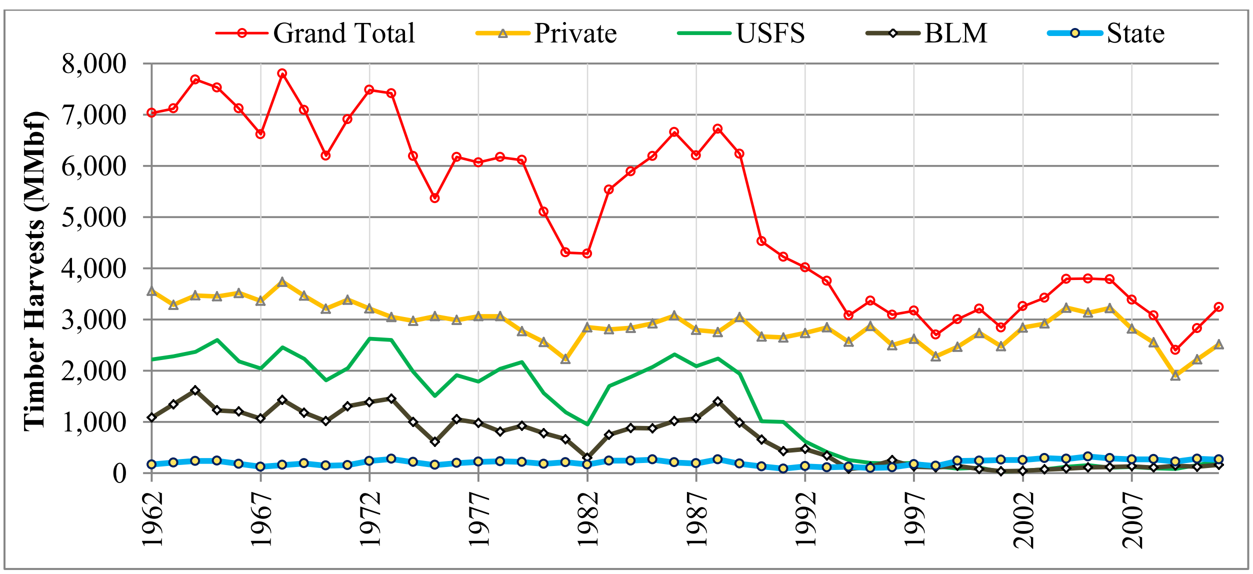


Figure 3-51. Western Oregon timber harvests by landowner, 1962–2011 (Tuchman and Davis 2013)

Age Classes

The natural disturbance and management history of the decision area has resulted in a mix of stand ages. The current age class distribution of lands in the decision area is shown in **Figure 3-52**.

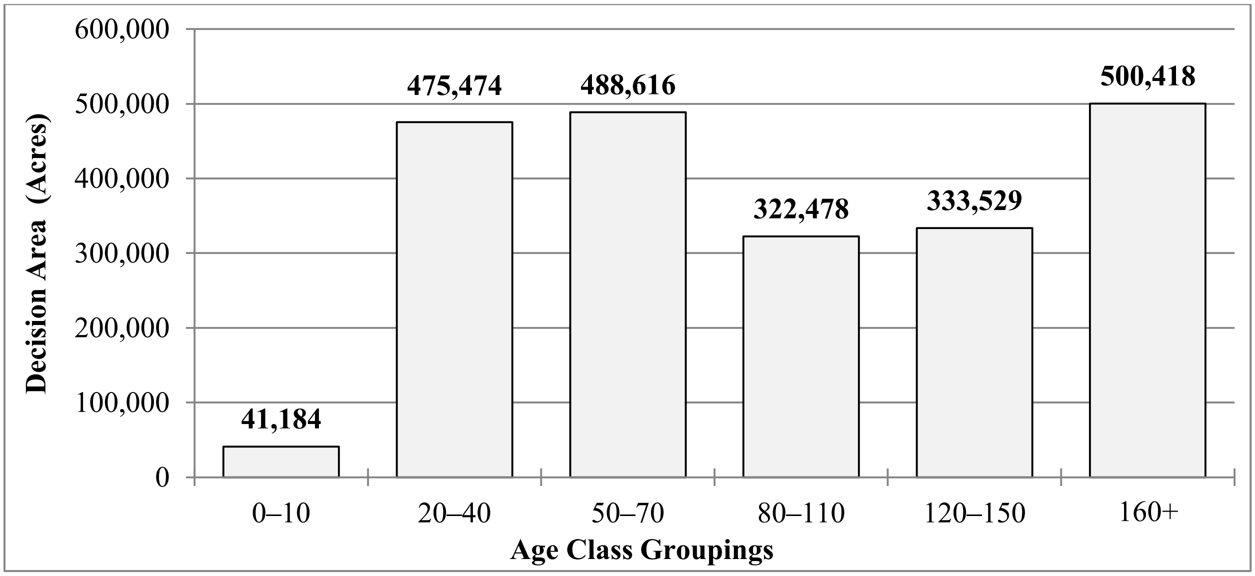


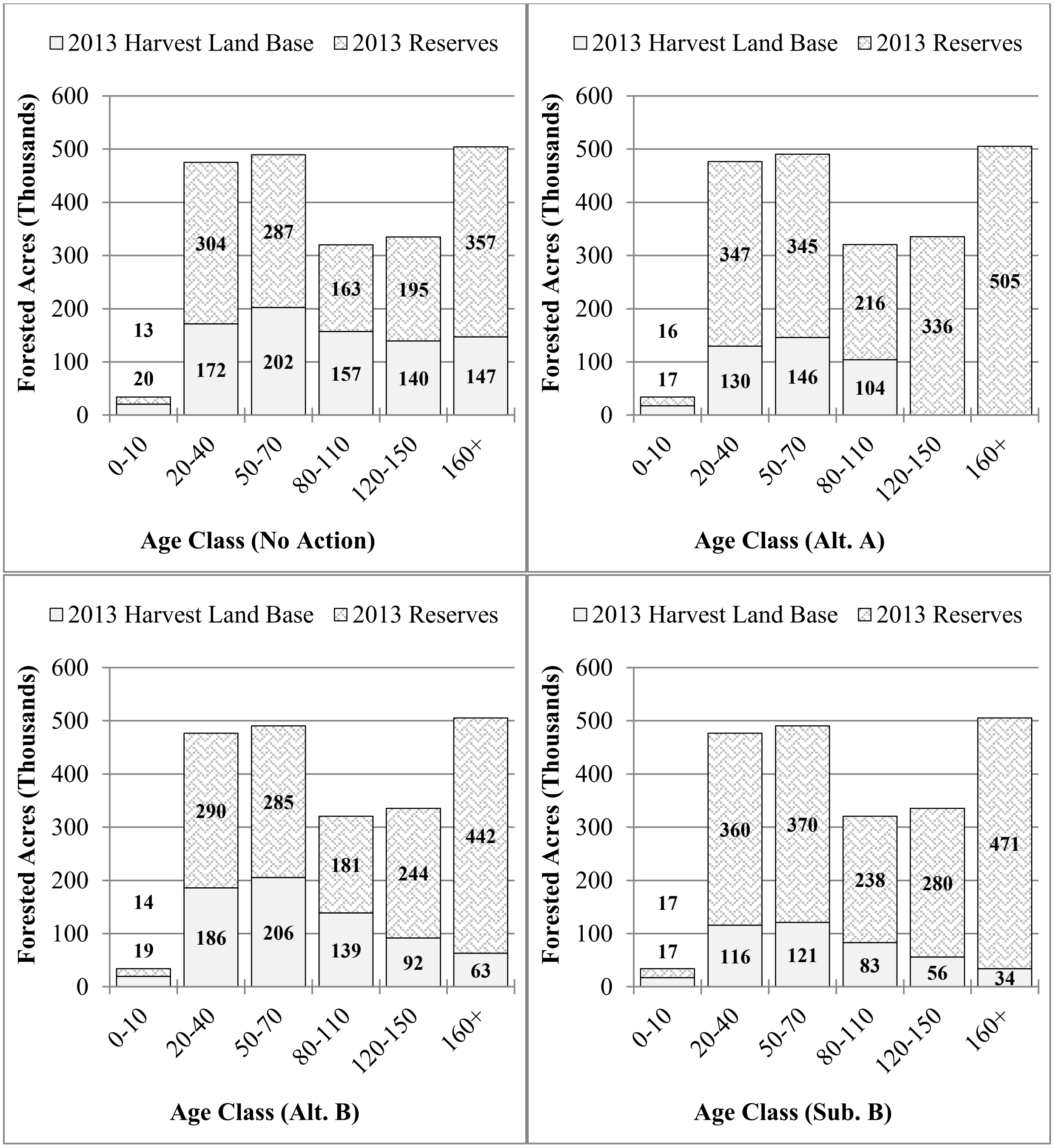
Figure 3-52. 2013 age class distribution for forested acres within the decision area (10-year increments)

The Coos Bay, Medford, and Roseburg Districts currently have the highest proportion of stands 160 years old and older with 24 percent, 29 percent, and 32 percent respectively. The Salem District has the lowest proportion of stands 160 years old and older with 9 percent. With the exception of the Klamath Falls Field Office, the districts only have 1–2 percent of their forested lands in the 0- to 10-year age class (**Table 3-47**). This is mostly due to the low levels of regeneration harvesting that the BLM has implemented since 1994 (**Figure 3-64**).

Table 3-47. 2013 age class distribution (10-year increments); forested acres and percent

District/Field Office		10	20–40	50–70	80–110	120–150	160+	Grand Total
Coos Bay	Acres	3,288	91,747	79,527	21,370	34,978	73,119	**304,030**
	Percent	1%	30%	26%	7%	12%	24%	
Eugene	Acres	2,669	78,887	112,471	41,556	17,022	44,617	**297,222**
	Percent	1%	27%	38%	14%	6%	15%	
Klamath Falls	Acres	5,442	4,100	7,643	17,819	6,691	5,077	**46,773**
	Percent	12%	9%	16%	38%	14%	11%	
Medford	Acres	22,889	105,129	91,529	142,002	164,556	214,014	**740,119**
	Percent	3%	14%	12%	19%	22%	29%	
Roseburg	Acres	4,490	106,530	74,120	34,980	50,640	128,403	**399,163**
	Percent	1%	27%	19%	9%	13%	32%	
Salem	Acres	2,406	89,082	123,325	64,751	59,641	35,186	**374,392**
	Percent	1%	24%	33%	17%	16%	9%	
Totals	**Acres**	**41,184**	**475,474**	**488,616**	**322,478**	**333,529**	**500,418**	**2,161,699**
	Percent	**2%**	**22%**	**23%**	**15%**	**15%**	**23%**	

The alternatives and the Proposed RMP vary in their approach to protection of older, more structurally-complex forest, affecting the distribution of older forests among the reserves and the Harvest Land Base. The No Action alternative allocates the largest acreage of forests 80 years old and older to the Harvest Land Base, while Sub-alternative C allocates the least (**Figure 3-53**). Of the forests 80 years old and older in the Harvest Land Base in Alternative B and the Proposed RMP, 90 percent and 74 percent of the acreage, respectively, are located in the interior/south portion of the decision area. The interior/south portion of the decision area contains the majority of dry forest types on BLM-administered lands.


2013 Harvest Land Base
2013 Reserves
Forested Acres (Thousands)
600
500
400
300
200
100
0
0-10
20-40
50-70
80-110
120-150
160+
13
20
304
172
287
202
163
157
195
140
357
147
Age Class (No Action)
16
17
347
130
345
146
216
104
336
505
Age Class (Alt. A)
14
19
290
186
285
206
181
139
244
92
442
63
Age Class (Alt. B)
17
17
360
116
370
121
238
83
280
56
471
34
Age Class (Sub. B)

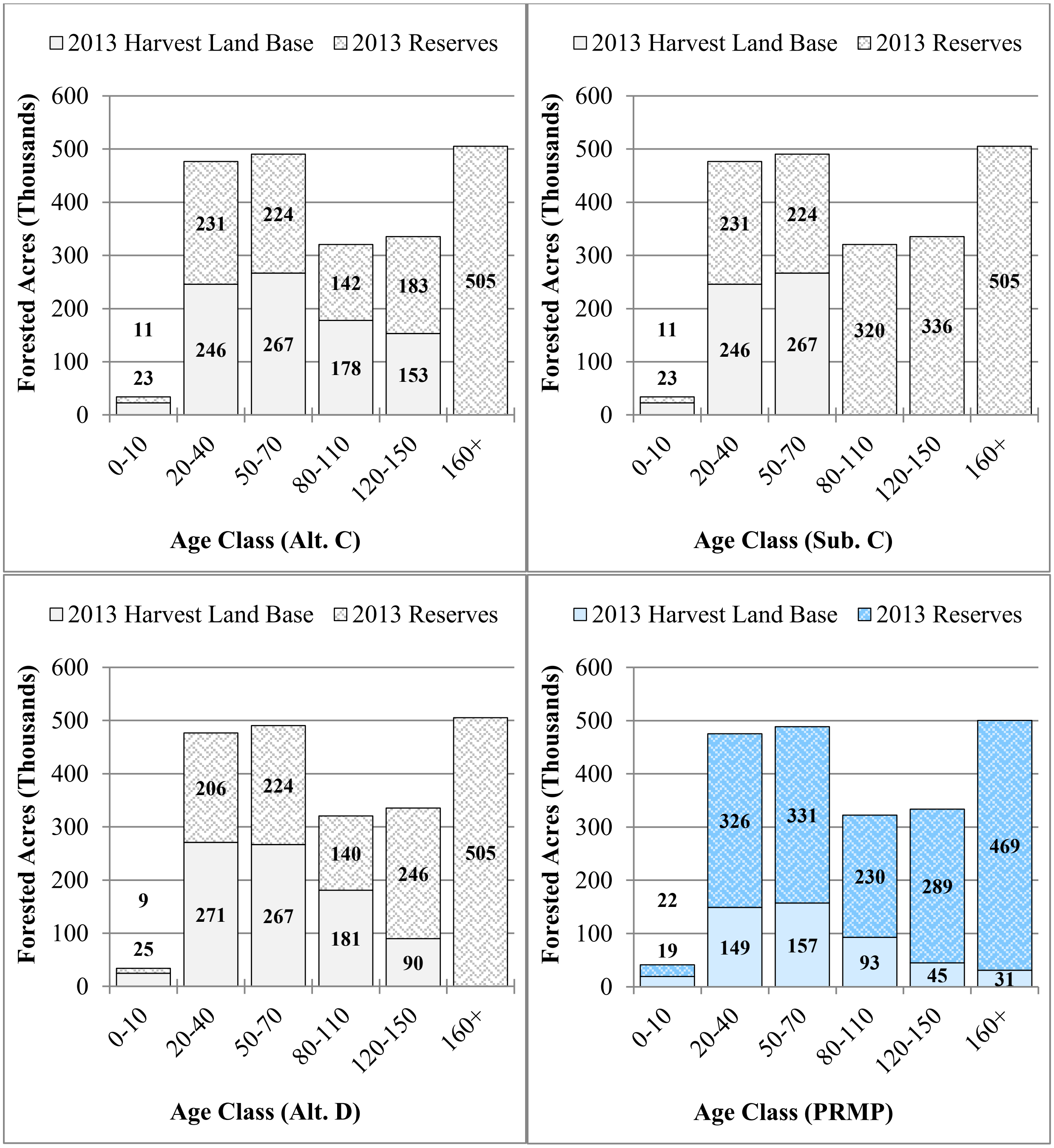


Figure 3-53. 2013 age class distribution by age class grouping and by the Harvest Land Base and the reserves (10-year increments)

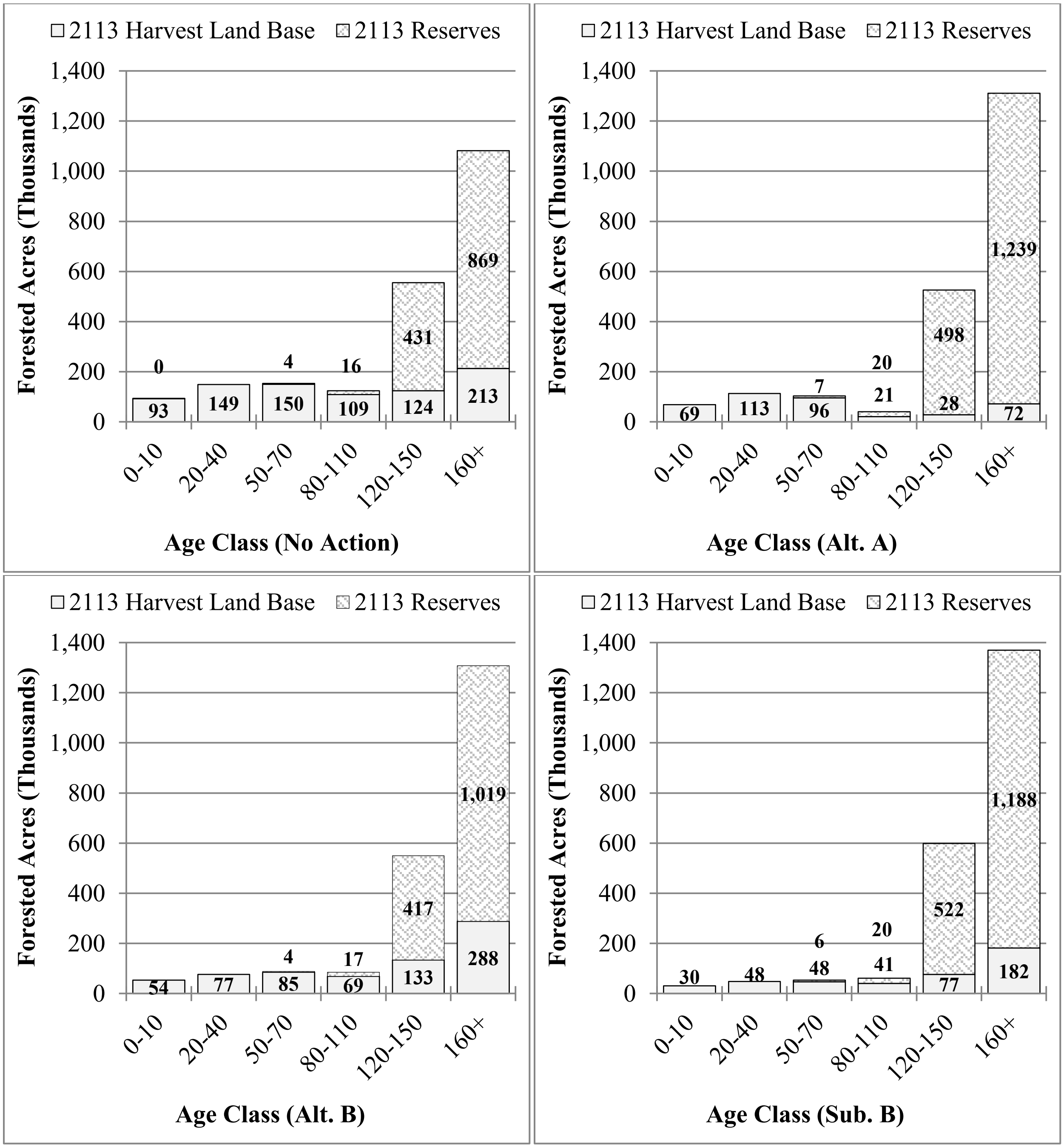
Dry forests typically are the product of relatively frequent low- to mixed-severity fire, which produces stands with multiple cohorts of trees of varying ages (Franklin and Johnson 2012, Sensenig *et al.* 2013). Therefore, the concept of stand age in these forests is less useful to approximate structural complexity or northern spotted owl habitat value. The BLM's approach to the protection of older, more structurally-complex forests in Alternative B and the Proposed RMP is based on district-defined[55] maps, rather than stand age, which explains why Alternative B and the Proposed RMP would allocate some older stands, especially in the dry forest, to the Harvest Land Base.

Over time, the age class distribution in the decision area would represent the product of management under the different alternatives and the Proposed RMP. In 100 years, the forest stands in reserve land use allocations would be mostly greater than 120 years old, since the harvest types employed would not result in an alteration of stand structure sufficient to cause a reset of stand age. The BLM expects that wildfire would also play a role in shaping the future age class distribution of the decision area, but it would be a relatively limited role. The BLM did not simulate other large-scale episodic natural disturbances including wind-throw or insect and disease damage in the vegetation modeling.[56]

The BLM's simulations of wildfire impacts in the decision area reveal that a relatively small number of acres of BLM-administered lands are forecasted to experience high-severity wildfire per decade. On average, roughly 150 acres of BLM-administered lands in the coastal/north area and 2,950 acres in the interior/south area are forecasted to experience high-severity wildfire per decade. **Appendix H** contains more details of wildfire modeling on these simulations. In the absence of timber harvest, these and other natural disturbances would create the only areas in reserve land use allocations containing young stands. In the Harvest Land Base, the future age class distribution would be determined by the harvest intensity and cutting cycle under each alternative and the Proposed RMP (**Figure 3-54**).

[55] Districts defined "older, more structurally-complex forests" as stands meeting the definition high-quality northern spotted owl habitat as described in Recovery Action 32: "These high-quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees" (USDI FWS 2011, p. III-67). Within the landscape of the entire planning area, forest types do not equally meet the definition of Recovery Action 32, meaning that there is not one age class or one measure of canopy cover that ensures this definition has been met, for the BLM to apply unilaterally across the Coos Bay, Eugene, Medford, Roseburg, and Salem Districts and the Klamath Falls Field Office of the Lakeview District. For example, a Douglas-fir stand near the Cascade Mountains may meet the definition of Recovery Action 32 at a different age, diameter, canopy cover, or decadence components than a Douglas-fir stand near the coast. BLM staff applied locally sourced information to stands within each district to determine which stands met this definition of Recovery Action 32 on their landscapes, and which ones did not.

[56] In the Woodstock vegetation modeling, the BLM accounted for reductions to timber growth and yield due to endemic levels of insects and diseases, but the BLM did not model large-scale episodic insect or disease outbreaks or windthrow that would affect stand structural stage classifications or age class distributions. The BLM modeled the predicted effects from wildfire and associated timber salvage for the first five decades in the planning area.



2113 Harvest Land Base
2113 Reserves
Forested Acres (Thousands)
1,400
1,200
1,000
800
600
400
200
0
0-10
20-40
50-70
80-110
120-150
160+
0
93
149
4
150
16
109
431
124
869
213
Age Class (No Action)
2113 Harvest Land Base
2113 Reserves
Forested Acres (Thousands)
69
113
7
96
20
21
498
28
1,239
72
Age Class (Alt. A)
2113 Harvest Land Base
2113 Reserves
Forested Acres (Thousands)
54
77
4
85
17
69
417
133
1,019
288
Age Class (Alt. B)
2113 Harvest Land Base
2113 Reserves
Forested Acres (Thousands)
30
48
6
48
20
41
522
77
1,188
182
Age Class (Sub. B)

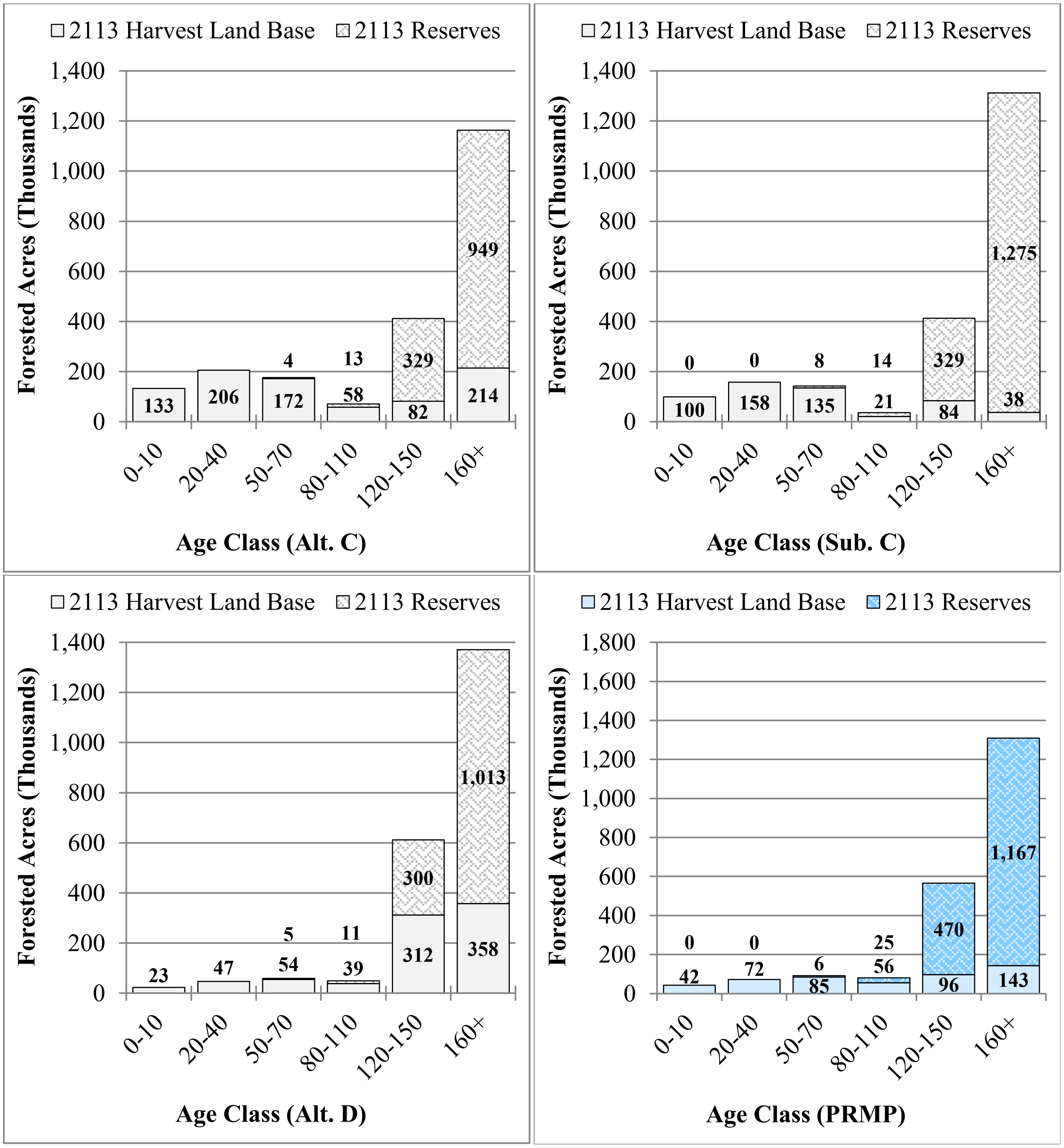


Figure 3-54. 2113 age class distribution by age class grouping, and broken out by the Harvest Land Base and the reserves (10-year increments)

In the long-term, the age class distribution in the Harvest Land Base in the No Action alternative (the Matrix and the Adaptive Management Areas) would approach forest regulation (i.e., an equal number of acres in each age class grouping). This would be the result of long-rotation, two-aged management on the entire Harvest Land Base. The portions of the Harvest Land Base in Alternatives A and C in the High Intensity Timber Area (HITA) would trend towards regulation in age classes 0–70 years, which would be the product of relatively short-rotation, even-aged management. In Alternatives B and D, and the Proposed RMP, the portions of the Harvest Land Base in the Moderate Intensity Timber Area (MITA) and Low Intensity Timber Area (LITA) would generally trend towards regulation in age classes 0–140 years in the dry forest, and 0–100 years in the moist forest. **Table 3-48** displays average regeneration harvest age by decade, which reflects the trend towards longer rotations in the No Action Alternative, Alternatives B and D, and the Proposed RMP, when compared to the trend towards shorter rotations in Alternatives A and C, and Sub-alternative C.

Table 3-48. Average regeneration harvest age in years by decade in the decision area

Alternative/ Proposed RMP	2023 (Age)	2033 (Age)	2043 (Age)	2053 (Age)	2063 (Age)	2073 (Age)	2083 (Age)	2093 (Age)	2103 (Age)	2113 (Age)	2213 (Age)
No Action	162	167	157	136	117	130	125	130	125	125	123
Alt. A	65	74	74	75	77	75	78	64	61	61	51
Alt. B	87	79	75	73	89	96	89	103	97	100	99
Sub. B	82	70	70	72	82	85	77	98	99	99	98
Alt. C	80	91	88	87	86	85	86	78	71	76	54
Sub. C	61	65	70	70	73	75	76	67	67	67	65
Alt. D	71	83	74	78	76	82	61	122	124	120	122
PRMP	88	80	78	89	93	105	76	101	93	101	125

The portions of the Harvest Land Base in the Uneven-aged Timber Area (UTA) in all action alternatives and the Proposed RMP, and the Owl Habitat Timber Area (OHTA) in Alternative D would tend to get older at a similar rate as stands within reserve land use allocations, because stands in the Uneven-aged Timber Area and Owl Habitat Timber Area would be partially cut on a perpetual re-entry cycle. Stands partially cut under uneven-aged management regimes would never be reset to stand age zero by stand-wide regeneration harvest. These stands would transition to multi-aged, multi-cohort stands. The following table shows the percentage of the Harvest Land Base in each land use allocation category grouped in a way that is relevant to describe effects on the future age class distribution (**Table 3-49**).

Table 3-49. Percentage of Harvest Land Base in each land use allocation category

Alternative/ Proposed RMP	Longer Rotation Two-aged; GFMA, NGFMA, SGFMA, CONN, AMA, LITA, MITA (Percent)	Shorter Rotation Even-aged; HITA (Percent)	Uneven-aged; UTA, OHTA (Percent)
No Action	100%	-	-
Alt. A	-	84%	16%
Alt. B	51%	-	49%
Sub. B	54%	-	46%
Alt. C	-	75%	25%
Sub. C	-	81%	19%
Alt. D	25%	-	75%
PRMP	69%	-	31%

In summary, progression of the age class distribution of the decision area through time would be dictated by the harvesting practices directed in each land use allocation. Reserves and allocations dedicated to uneven-aged management regimes and associated selection harvesting, the Uneven-aged Timber Area and Owl Habitat Timber Area, would continue to age since the stand age would never be reset to zero, barring an intense natural disturbance event. The relatively short rotation even-aged management regimes and associated clear-cutting in the High Intensity Timber Area land use allocation in Alternatives A and C would result in roughly an equal number of acres in each age class up to the 70-year class.

The emphasis on longer rotation two-aged management regimes and associated variable-retention regeneration harvesting would result in roughly an equal number of acres in each 10-year age class up to the 100-year age class in moist, higher productivity forest, and up to the 140-year age class in drier, lower productivity forests. This would occur in the No Action alternative, in the Moderate Intensity Timber Area and Low Intensity Timber Area in Alternative B, Sub-alternative B, and the Proposed RMP, and in the Moderate Intensity Timber Area in Alternative D. The more clear-cutting and variable-retention regeneration harvesting[57] in an alternative or the Proposed RMP, the more acres would be in the younger age classes in 100 years. Therefore, the overall age class distribution in Alternative C would contain the most acres in stands less than or equal to 40 years old in 100 years (**Figure 3-54**).

Structural Stages

In this analysis, the BLM evaluated the development of the forest categorized by structural stages (**Table 3-50**). **Appendix C** has a more detailed discussion of the structural stage classification system.

Table 3-50. Structural stage classification generalized definitions.

Code	Structural Stage Classification Label
ES-WSL	Early Successional with Structural Legacies
ES-WOSL	Early Successional without Structural Legacies
SE-WSL	Stand Establishment with Structural Legacies
SE-WOSL	Stand Establishment without Structural Legacies
YHD-WSL	Young High Density with Structural Legacies
YHD-WOSL	Young High Density without Structural Legacies
YLD-WSL	Young Low Density with Structural Legacies
YLD-WOSL	Young Low Density without Structural Legacies
M-SINGLE	Mature Single-layered Canopy
M-MULTI	Mature Multi-layered Canopy
SC-DEV	Structurally-complex, Developed Structurally-complex
SC-OF	Structurally-complex, Existing Old Forest
SC-VOF	Structurally-complex, Existing Very Old Forest

The natural disturbance and management history of the decision area has affected the mix of structural stages similarly to age classes. The decision area is currently comprised predominately of Stand Establishment without Structural Legacies, Young without Structural Legacies, Mature, and Structurally-complex forest (**Figure 3-55**).

[57] The BLM uses the term variable-retention regeneration harvest in this analysis to describe regeneration harvest practices in the Matrix and Adaptive Management Area land use allocations under the No Action alternative, and the Moderate Intensity Timber Area and Low Intensity Timber Area land use allocations in the action alternatives and the Proposed RMP. The 1995 RMPs require retention of green trees in regeneration harvests based on a range of trees per acre, while the Moderate Intensity Timber Area and Low Intensity Timber Area base retention levels on a target proportion of pre-harvest basal area.

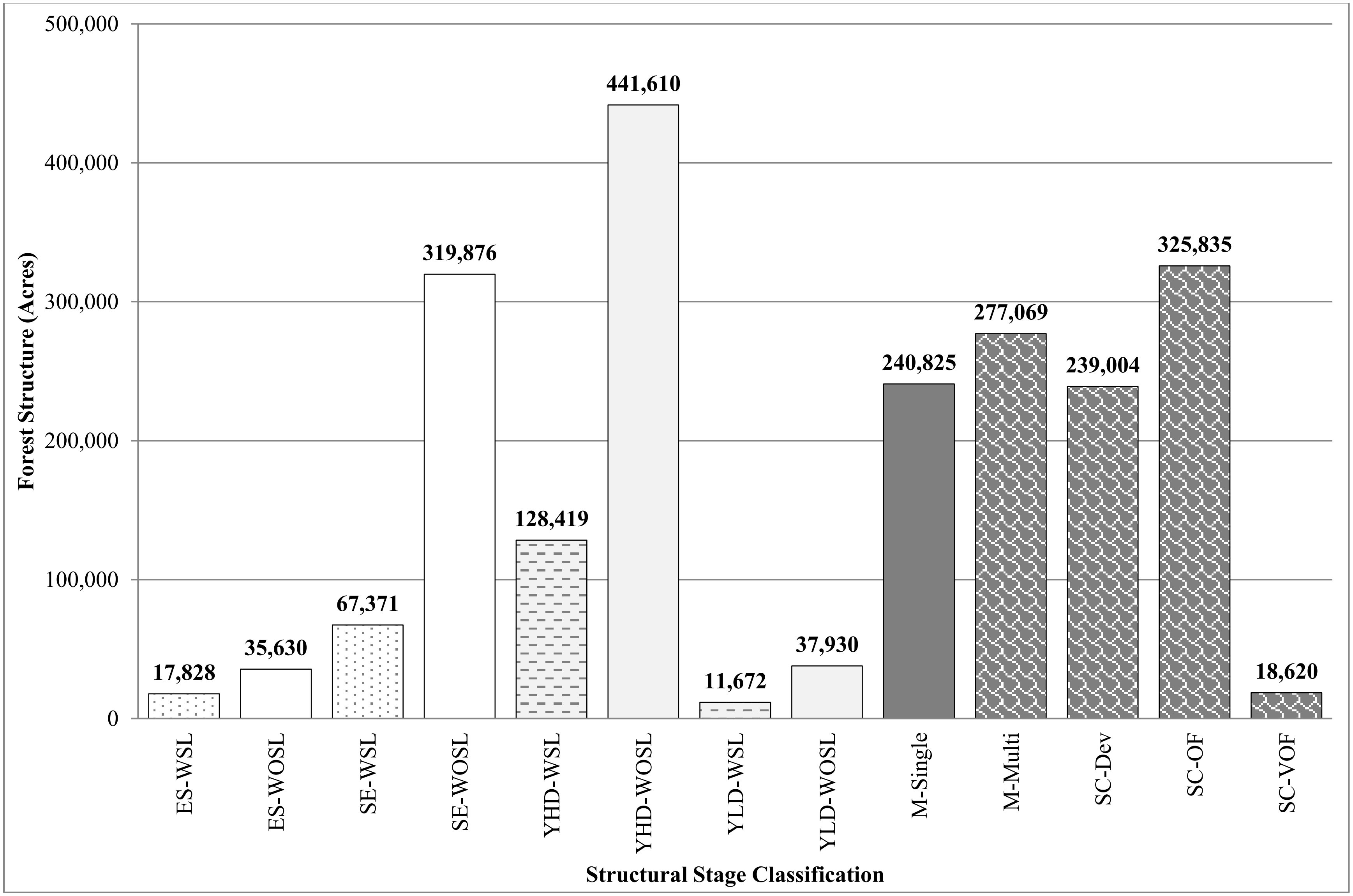


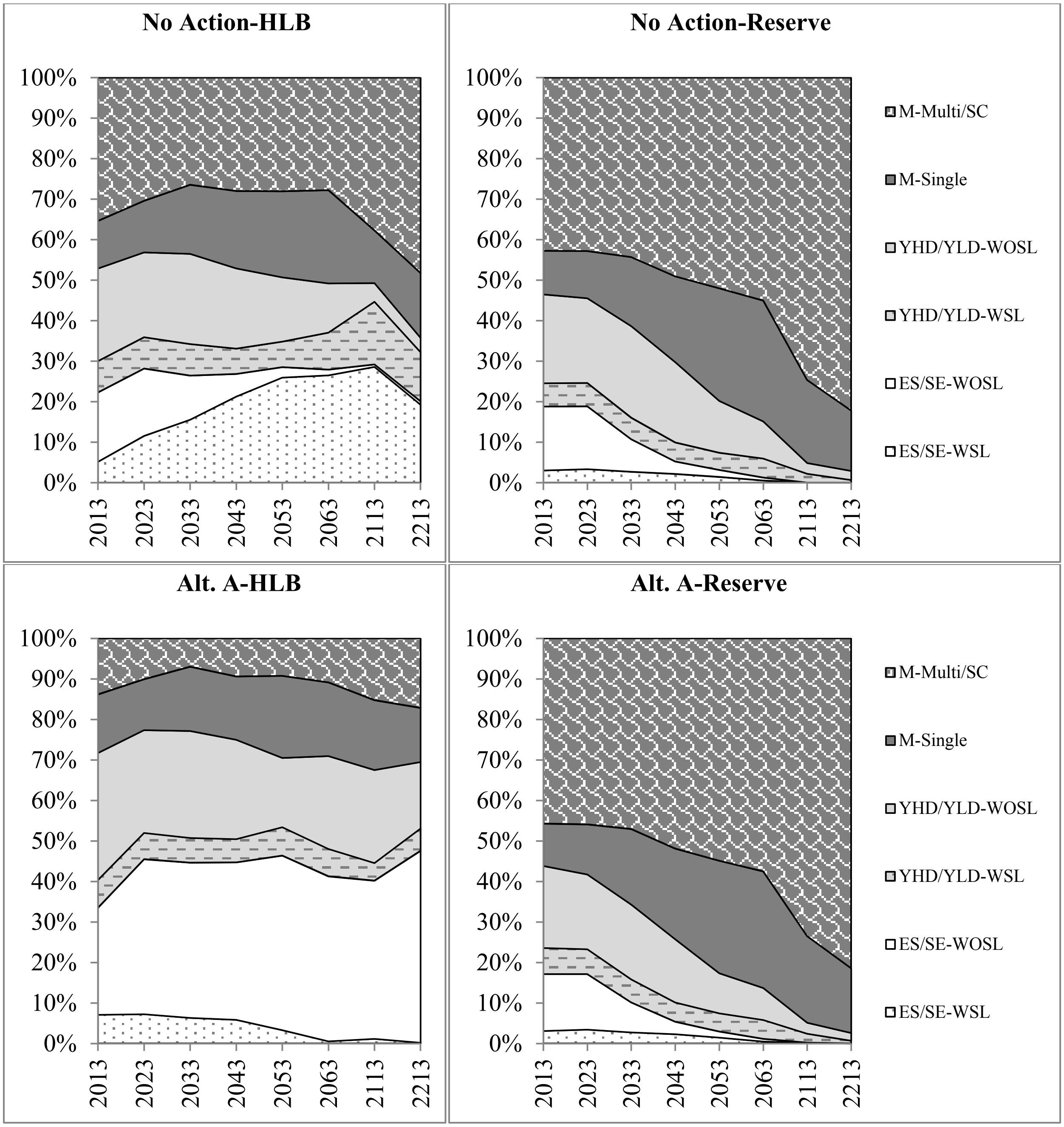
Figure 3-55. Current structural stage distribution for the decision area

Note: See **Table 3-50** for label definitions and **Appendix C** for more details on structural stage classifications.

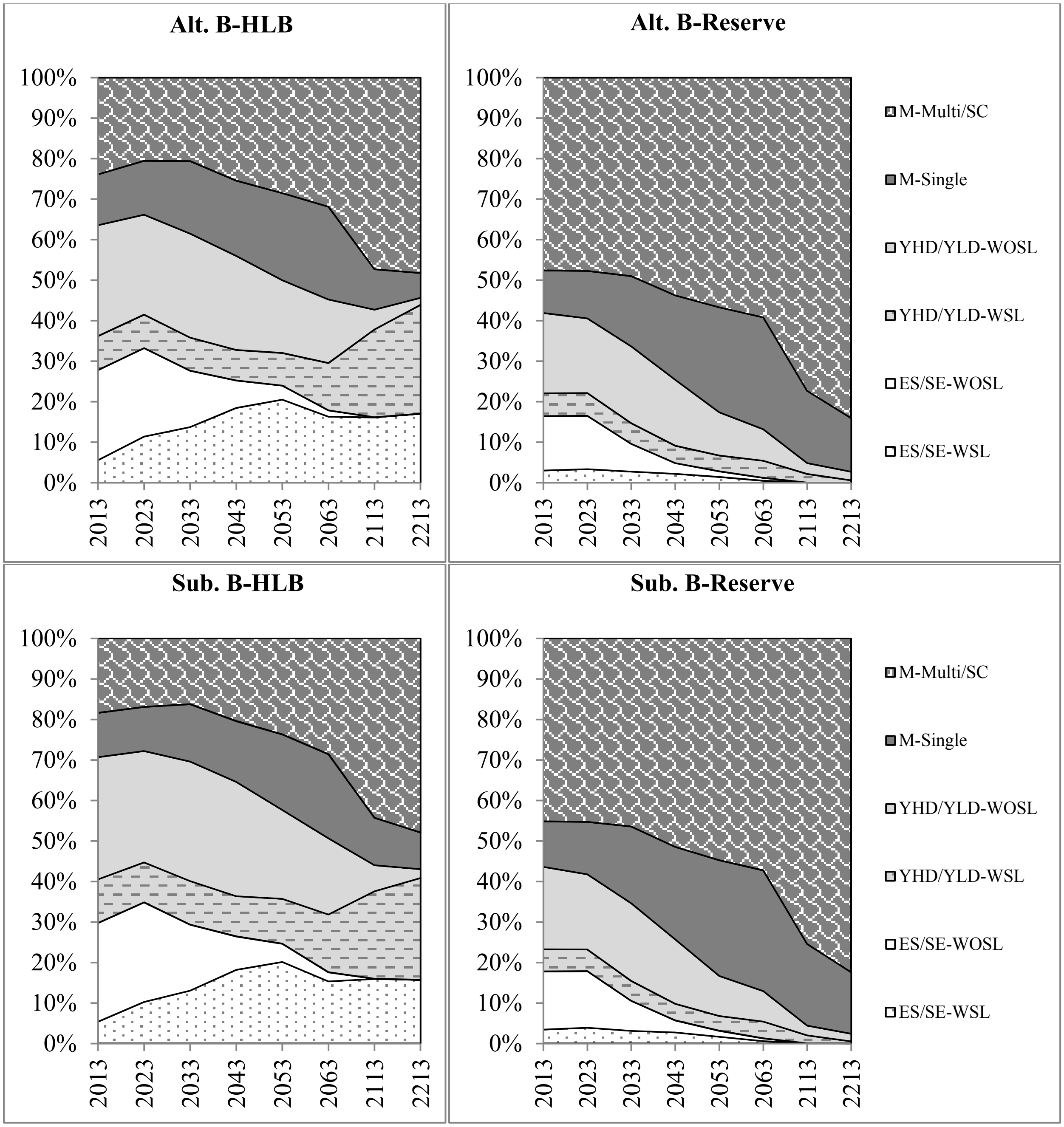
The BLM management has the potential to cause substantial changes to the structural stage distribution of forested lands in the decision area over time. The 2008 FEIS contains a robust spatial and temporal analysis regarding Forest Structure and Spatial Pattern compared to historic condition, which is incorporated here by reference (USDI BLM 2008, pp. 501–536).

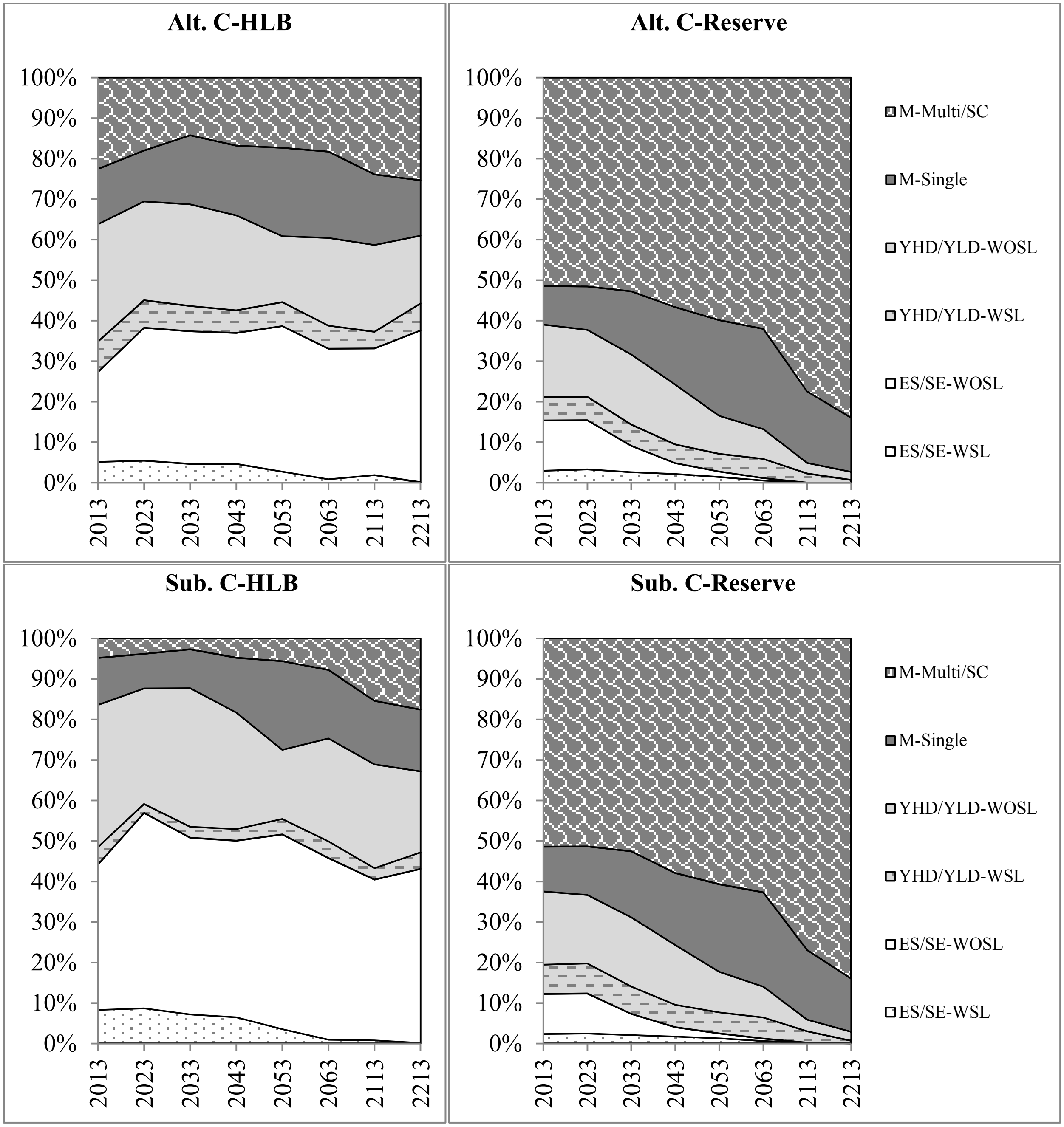
The structural stage progression in the reserve land use allocations would represent the majority of the forested land in the decision area, because the BLM would allocate no more than 30 percent of the decision area to the Harvest Land Base in any alternative or the Proposed RMP. Since the majority of forested land resides in reserve land use allocations, structural stage differences between alternatives and the Proposed RMP are muted when the Harvest Land Base and reserves are combined, therefore they will be discussed and shown separately. **Figure 3-56** highlights the structural stage progression through time for each alternative and the Proposed RMP, grouped into similar categories, and broken out by the Harvest Land Base and reserves.

The proportion of the Harvest Land Base composed of Mature Multi-layered Canopy and Structurally-complex forests in 2013 in each alternative and the Proposed RMP would be mostly driven by the alternative-specific approach to the protection of older, more structurally-complex forests. The BLM has grouped Mature Multi-layered Canopy with Structurally-complex stands in the following figures and discussion due to their similarities related to northern spotted owl habitat quality.



No Action-HLB
No Action-Reserve
Alt. A-HLB
Alt. A-Reserve
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2013
2023
2033
2043
2053
2063
2113
2213
M-Multi/SC
M-Single
YHD/YLD-WOSL
YHD/YLD-WSL
ES/SE-WOSL
ES/SE-WSL


Alt. B-HLB
Alt. B-Reserve
Sub. B-HLB
Sub. B-Reserve
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2013
2023
2033
2043
2053
2063
2113
2213
M-Multi/SC
M-Single
YHD/YLD-WOSL
YHD/YLD-WSL
ES/SE-WOSL
ES/SE-WSL


Alt. C-HLB
Alt. C-Reserve
Sub. C-HLB
Sub. C-Reserve
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2013
2023
2033
2043
2053
2063
2113
2213
M-Multi/SC
M-Single
YHD/YLD-WOSL
YHD/YLD-WSL
ES/SE-WOSL
ES/SE-WSL

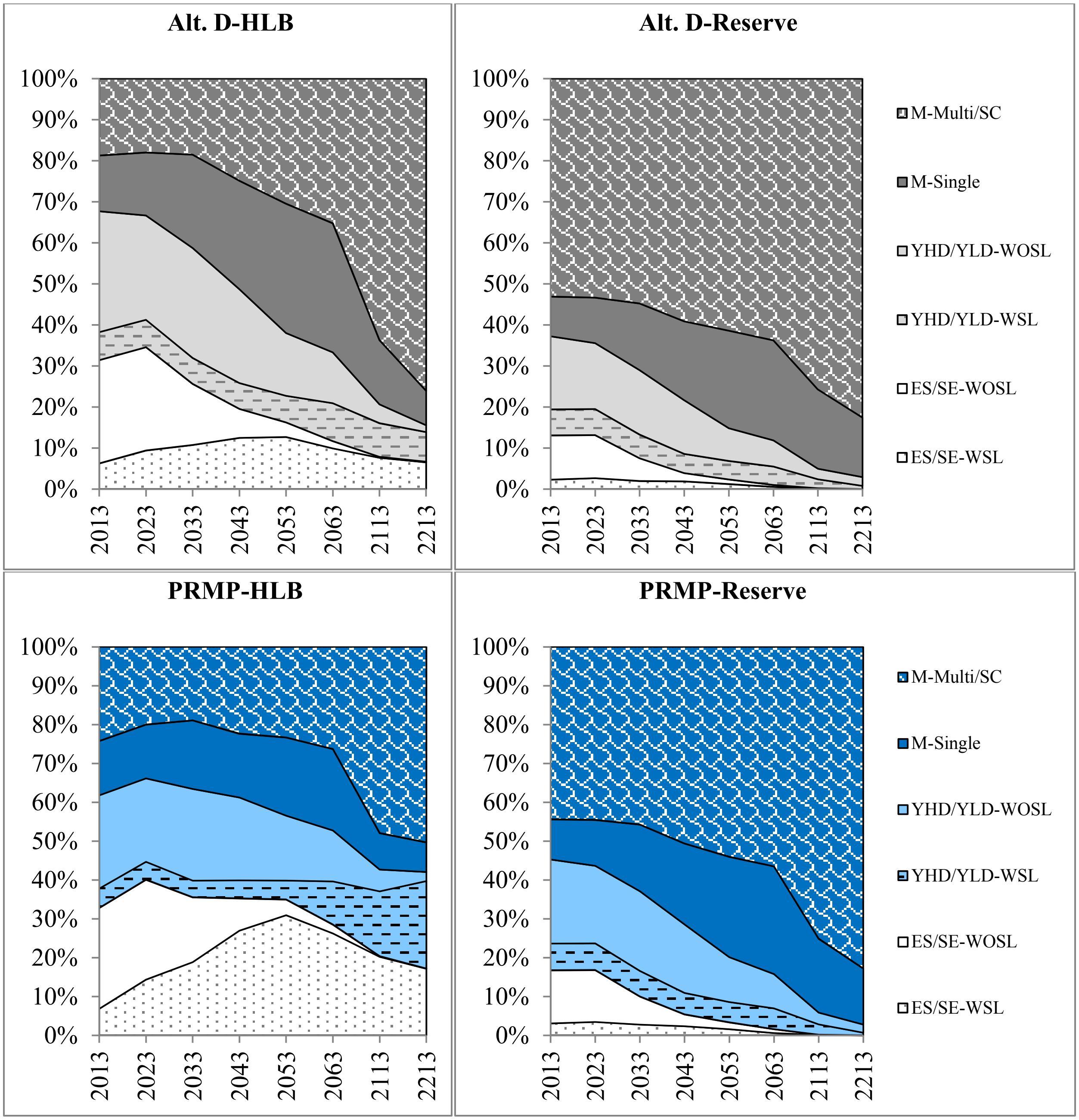


Figure 3-56. Structural stage progression over 200 years in the Harvest Land Base and reserves
Note: See **Table 3-50** for label definitions.

The No Action alternative contains the highest proportion of the Harvest Land Base in Mature Multi-layered Canopy and Structurally-complex structural stages (35 percent). Sub-alternative C contains the smallest proportion of these stands in the Harvest Land Base, with approximately 5 percent, since the BLM would reserve all stands greater than 80 years old in this sub-alternative. It is notable that while close to 25 percent of the Harvest Land Base is in the Mature Multi-layered Canopy and Structurally-complex structural stages in Alternative B and the Proposed RMP, over 70 percent of those acres are in the interior/south portion of the decision area. Alternative B and the Proposed RMP include a district-defined designation of older, more structurally-complex forests. See Chapter 2 for a more thorough explanation of the varying approaches to older forest protection.

In the Harvest Land Base, the patterns of structural stage progressions would follow three distinct patterns (**Figure 3-57**). In Alternatives A and C, the Harvest Land Base would mostly trend towards single-story stands and structural stages without structural legacies, in almost equal parts of Early Successional, Stand Establishment, Young, Mature, and Structurally-complex in 100 years. In the No Action alternative, Alternative B, and the Proposed RMP, the Harvest Land Base would mostly trend towards multi-layered stands and structural stages with structural legacies, with Mature Multi-layered Canopy and Structurally-complex stands occupying around 50 percent of the area in 100 years. In Alternative D, in which 75 percent of the Harvest Land Base would be managed using uneven-aged management regimes (**Table 3-49**), the majority of the Harvest Land Base would develop into Mature Multi-layered Canopy or Structurally-complex stands in 100 years.

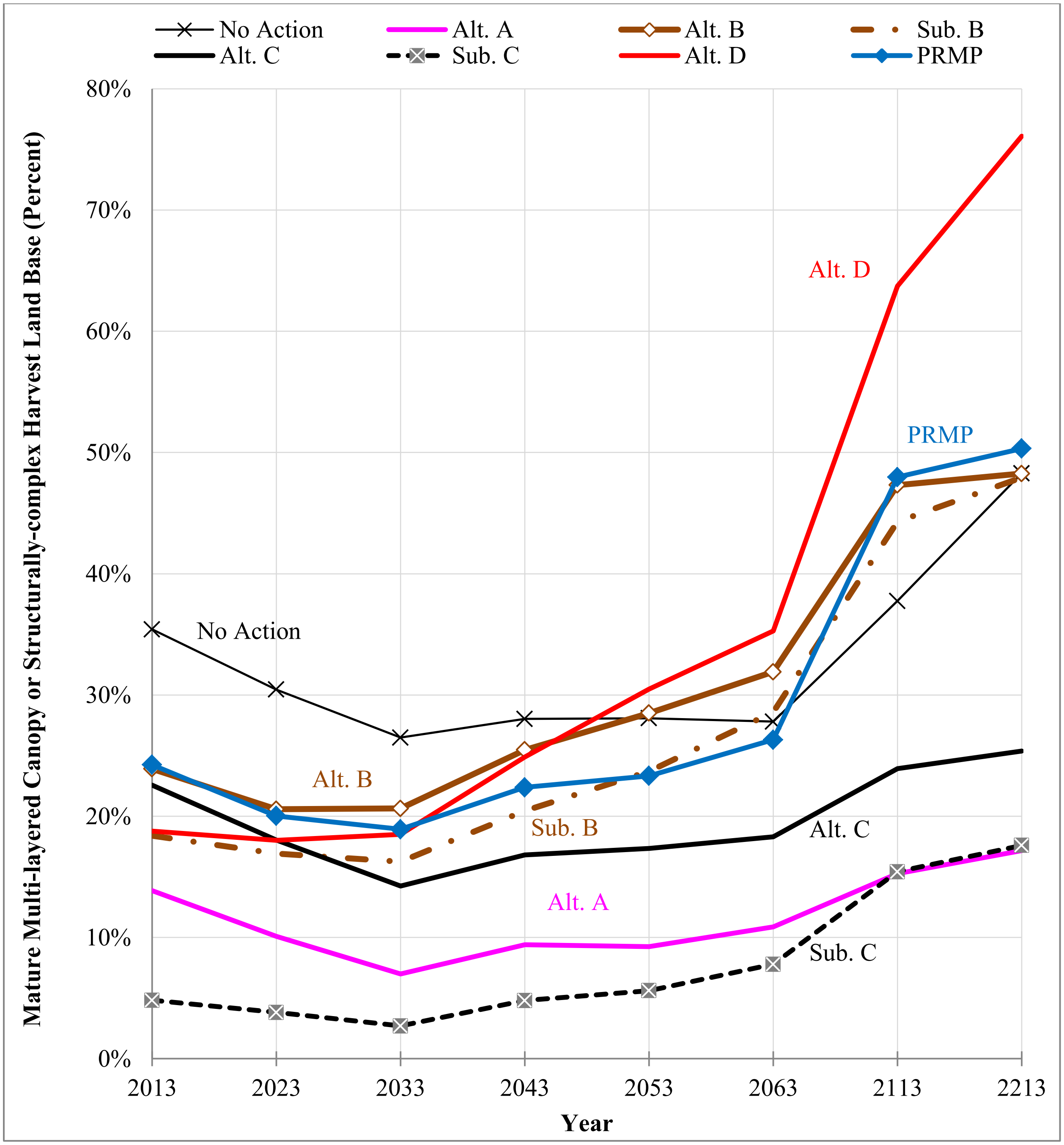


Figure 3-57. Proportion of the Harvest Land Base as Mature Multi-layered Canopy or Structurally-complex through time

Under Alternatives A and C, clear-cutting in the High Intensity Timber Area would produce relatively uniform, single–story stands, with little to no structural legacies. In contrast, the variable-retention regeneration harvesting in portions of the No Action alternative, Alternatives B and D, and the Proposed RMP would produce heterogeneous, multi-layered stands with structural legacies (**Figure 3-58**). This is consistent with the analytical conclusions about the effect of different regeneration harvest approaches on structural stage development in the 2008 FEIS (USDI BLM 2008, pp. 505–506, 508–513, 517) and recent publications on retention forestry (Gustafsson *et al*. 2012).

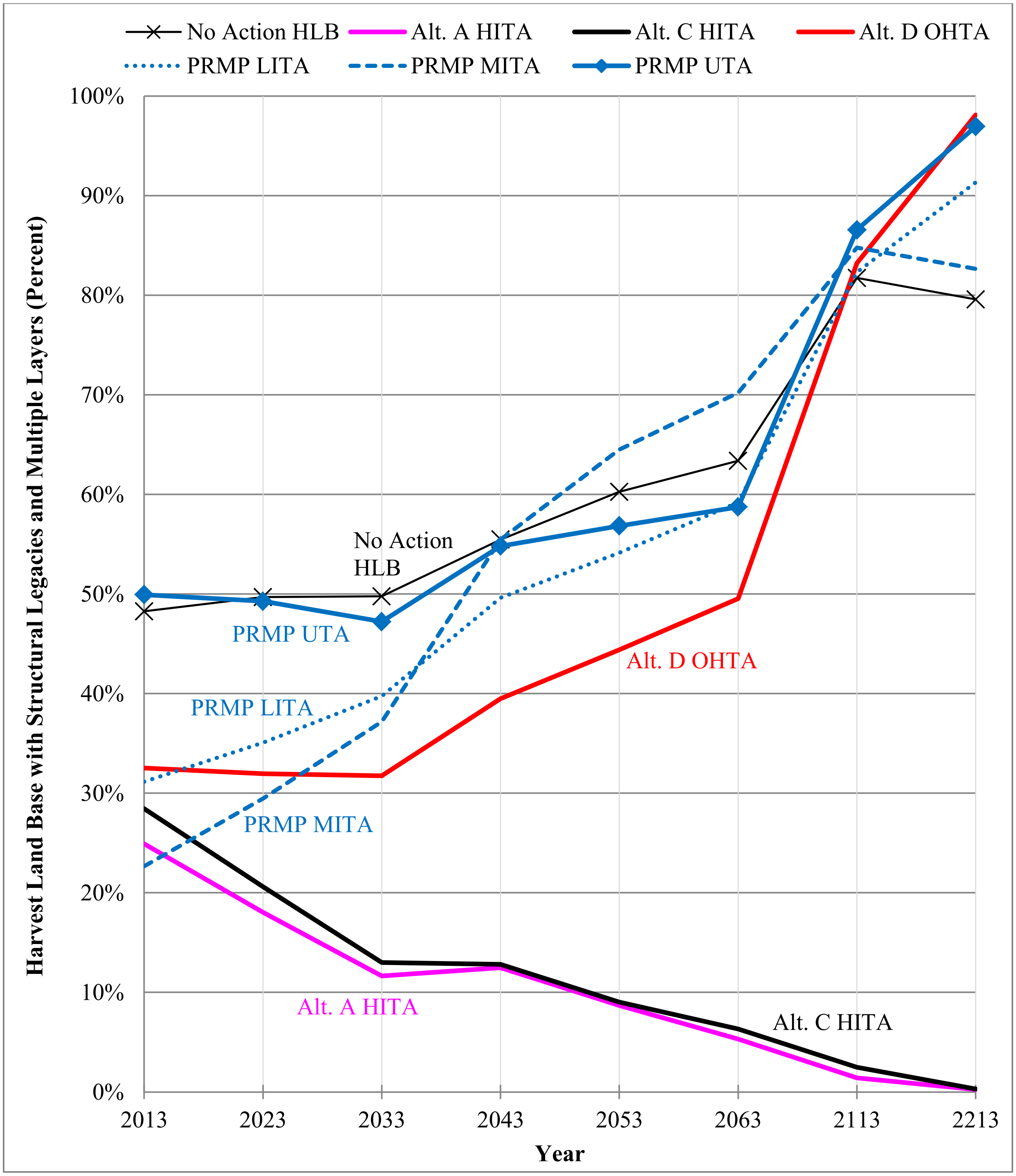


Figure 3-58. Proportion of the Harvest Land Base sub-allocations with structural legacies or multiple layers through time

Note: The data is not shown for Alt. B Low Intensity Timber Area, Alt. B and D Moderate Intensity Timber Area, Alt. A, B, C, and D Uneven-aged Timber Area since the land use allocation development trends within the Harvest Land Base sub-allocations are nearly identical among the action alternatives and would be indiscernible from the Proposed RMP on this graph.

Clear-cutting under Alternatives A and C would produce different post-harvest conditions than variable-retention regeneration harvesting under the No Action alternative, Alternatives B and D, and the Proposed RMP. Alternative C would produce the most Early Successional conditions, while Alternative B would produce the most Early Successional with Structural Legacies. Alternative D would produce the least amount of acres in Early Successional conditions of the alternatives and the Proposed RMP, the majority of which would contain structural legacies. The Proposed RMP would produce the second least number of acres of Early Successional condition, and the majority would be Early Successional with Structural Legacies (**Figure 3-59**).

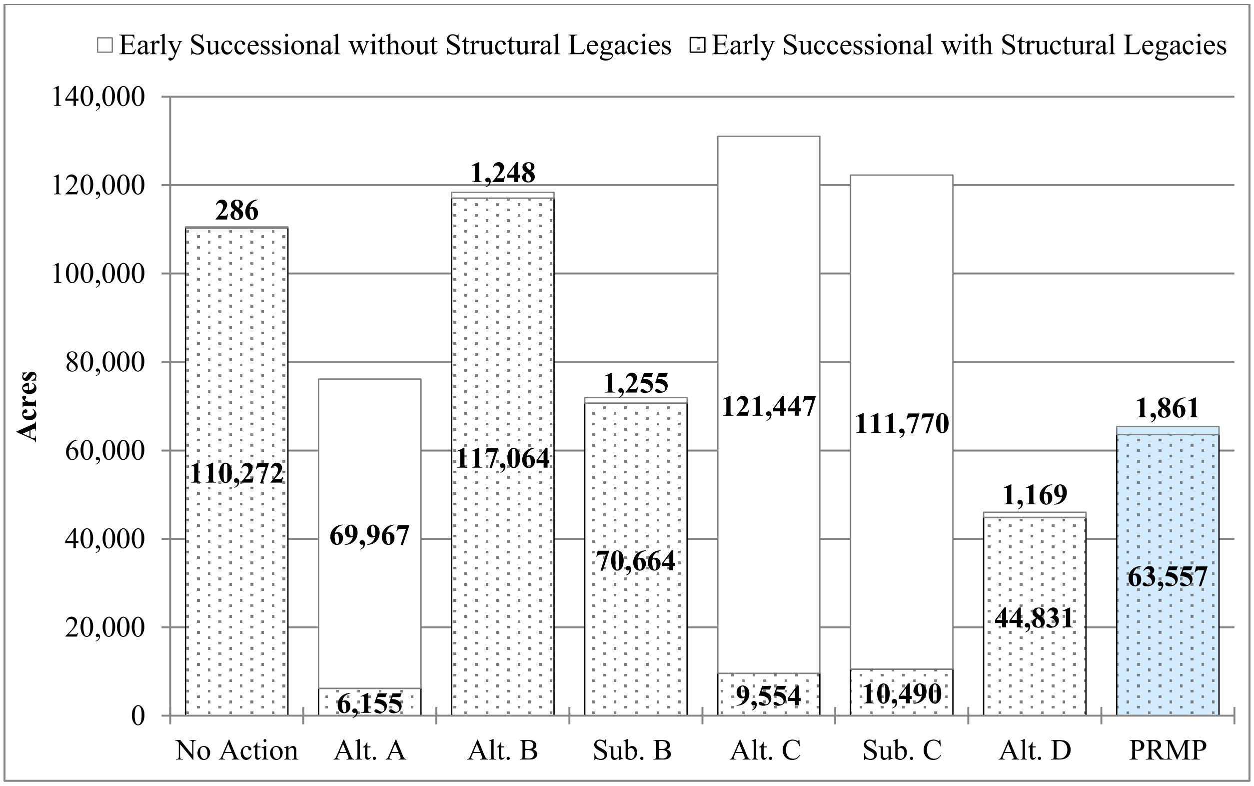


Figure 3-59. Structural complexity and abundance of the Early Successional structural stage in 2063

Reforestation practices after regeneration harvest would vary depending on the Harvest Land Base sub-allocation, and the alternatives and the Proposed RMP, which would affect duration and quantity of the Early Successional structural stage. For the Low Intensity Timber Area in Alternative B, the BLM would achieve reforestation using natural regeneration only, prohibiting tree planting. In addition, the BLM would delay canopy closure of regenerated trees on a portion of the harvest area for three decades after harvesting. In the Moderate Intensity Timber Area in Alternative B, the BLM would allow tree planting, but would delay canopy closure by three decades after harvesting. The BLM would achieve delayed canopy closure in Alternative B through altering the timing and intensity of pre-commercial thinning. The combination of delayed canopy closure of regenerated trees in the Low Intensity Timber Area and Moderate Intensity Timber Area, and the prohibition on planting trees in the Low Intensity Timber Area in Alternative B, would act to extend the duration and increase the abundance of the Early Successional structural stage, when compared with the other alternatives and the Proposed RMP. In the No Action alternative, the High Intensity Timber Area in Alternatives A and C, the Moderate Intensity Timber Area in Alternative D, and the Low Intensity Timber Area and Moderate Intensity Timber Area in the Proposed RMP, the BLM would require adequate reforestation within 5 years of completion of harvest. This explains why the Proposed RMP would produce fewer acres in the Early Successional structural stage through time than Alternative B, despite the fact that the Proposed RMP would result in more regeneration harvesting per decade than Alternative B. Forest Management Issue 2 further discusses reforestation practices as they relate to intensity of management.

In the reserves, the pattern of structural stage development would vary little because the BLM would implement silvicultural treatments in the reserve land use allocations only for restoration purposes under all alternatives and the Proposed RMP. Therefore, the reserve land use allocations would generally trend towards Mature and Structurally-complex conditions, while Early Successional, Stand Establishment, and Young stands would mostly disappear over time.

Natural disturbances, especially wildfire, would create some Early Successional stands, regardless of land use allocation designation. Because the acreage of reserve allocations would vary by alternative and the Proposed RMP, the acreage of reserve allocations affected by wildfire would vary as well. Based on wildfire simulation, on average, between 41–115 acres of reserve land use allocations on BLM-administered lands in the coastal/north area and between 911–2,317 acres of reserve land use allocations on BLM-administered lands in the interior/south area would experience high-severity wildfire per decade. Assuming burned stands remain in an Early Successional structural stage for three decades, this would only yield up to 345 acres of Early Successional stands in the coastal/north areas, and 6,951 acres of Early Successional stands in the interior/south areas in any given decade. With the exception of wildfire, the BLM did not simulate the impacts of large-scale episodic natural disturbances (e.g., windthrow or insect and disease outbreaks) in the vegetation modeling to determine effects to stand structural development.

In the vegetation modeling, the BLM calculated structural stage classifications based on stand level average conditions. However, the BLM recognizes that selection harvesting and commercial thinning would create functional canopy openings resulting in small inclusions of Early Successional habitat in Young, Mature, and Structurally-complex stands. The amount of functional canopy openings the BLM would create through silvicultural treatments varies by the primary objectives for forest management. For selection harvesting and commercial thinning where production of a stable wood supply is the primary objective, forest management would create few functional canopy openings. For selection harvesting and commercial thinning, where development of structural complexity and high quality late successional habitat are primary treatment objectives, implementation would involve the creation of group selection > 0.25 acres in size. These group selection openings would function as small inclusions (i.e., functional created canopy openings) of Early Successional habitat within Young, Mature, and Structurally-complex stands, but do not show up in the calculation of acres by stand level average structural stage classification. Created canopy openings would enhance structural development by contributing to multiple layered canopies, creating growing space for desirable understory vegetation and hardwoods, and increasing edge-tree limb development and diameter growth. **Figure 3-60** reports the number of acres of functional created canopy openings > 0.25 acres in size in 2043 by land use allocation or sub-allocation. Alternative B would produce the highest acreage in functional created canopy openings in 2043, followed by the Proposed RMP, Alternative D, and Alternative C, with the No Action alternative producing the fewest acres.

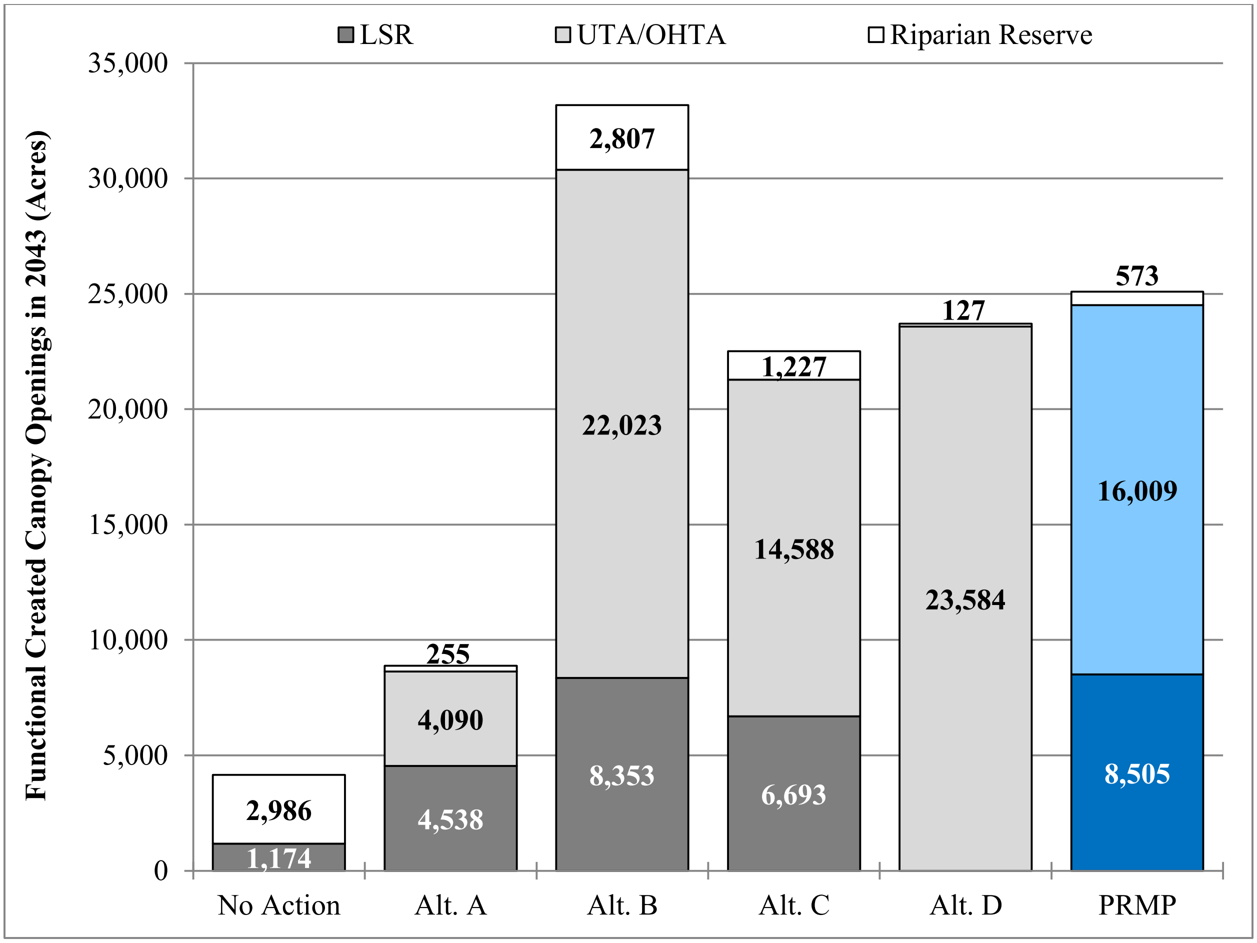


Figure 3-60. Acreage of functional created canopy openings > 0.25 acres in 2043 by alternative and land use allocation

Management direction for stand treatments within the Late-Successional Reserve would vary. The No Action alternative, Alternatives B and C, and the Proposed RMP would include timber harvesting as a tool for attainment of Late-Successional Reserve management objectives. Alternative A would achieve these management objectives in the moist forest Late-Successional Reserve through non-commercial management (i.e., cutting trees but not removing them from the stand). In Alternative D, the Late-Successional Reserve is comprised of older, more structurally-complex forest and thus would not require the same treatments to attain Late-Successional Reserve management objectives. However, the Owl Habitat Timber Area within the Harvest Land Base in Alternative D includes management direction to apply selection harvesting to speed the development of and then maintain northern spotted owl habitat, similar to the management direction within the Late-Successional Reserve in other action alternatives and the Proposed RMP. Therefore, the outcomes for the Owl Habitat Timber Area in Alternative D provide a relevant comparison to the outcomes for portions of the Late-Successional Reserve under other alternatives and the Proposed RMP.

The following figure (**Figure 3-61**) illustrates the differences in the proportion of forested acres in Mature Multi-layered Canopy and Structurally-complex conditions in 2013 and 2213. The BLM grouped the Mature Multi-layered Canopy and Structurally-complex structural stages together because they generally represent the highest quality spotted owl habitat. The difference in structural conditions in the moist forest Late-Successional Reserve managed using commercial thinning is indistinguishable from structural conditions in the Late-Successional Reserve using non-commercial thinning only (Alternative A). However, 98 percent of stands develop into Mature Multi-layered Canopy and Structurally-complex stands in response to the uneven-aged management prescriptions in the Owl Habitat Timber Area in Alternative D.

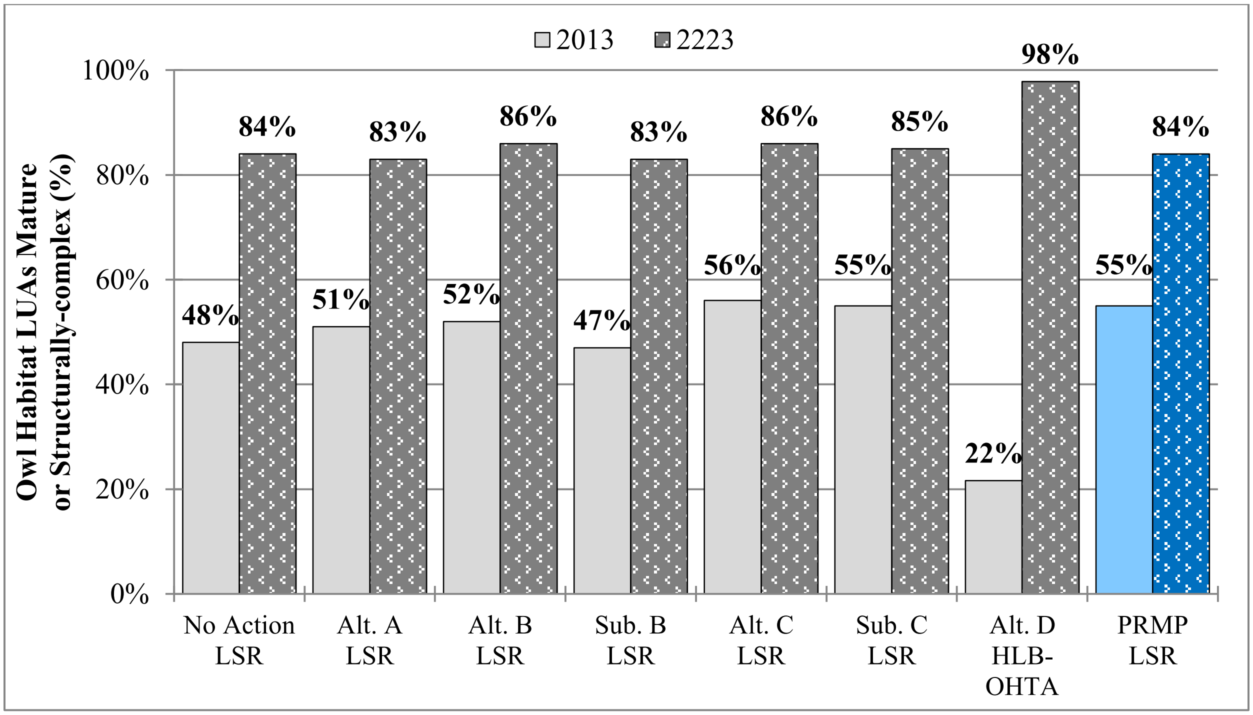


Figure 3-61. Proportions of owl habitat management land use allocations in Mature Multi-layered Canopy or Structurally-complex structural stages in 2013 and 2223

Figure 3-62 shows that the proportions of acres in Mature Multi-layered Canopy and Structurally-complex conditions in the Late-Successional Reserve, the Uneven-aged Timber Area, and the Owl Habitat Timber Area would range between 60 percent and 81 percent in 100 years. In the High Intensity Timber Area under Alternatives A and C, the acreage of Mature Multi-layered Canopy and Structurally-complex stands would decline to zero in 100 years due to the emphasis on relatively short-rotation clear-cutting harvest practices. The Low Intensity Timber Area and Moderate Intensity Timber Area in Alternative B, and the Moderate Intensity Timber Area in alternative D, would achieve moderately higher proportions in Mature Multi-layered Canopy and Structurally-complex forest than the High Intensity Timber Area under Alternatives A and C, with around 10 percent, due the trend towards longer rotation lengths and variable-retention regeneration harvest practices. The proportion of acres in Mature Multi-layered Canopy and Structurally-complex conditions in the Low Intensity Timber Area and Moderate Intensity Timber Area in the Proposed RMP in 100 years would be 22 percent and 28 percent respectively.

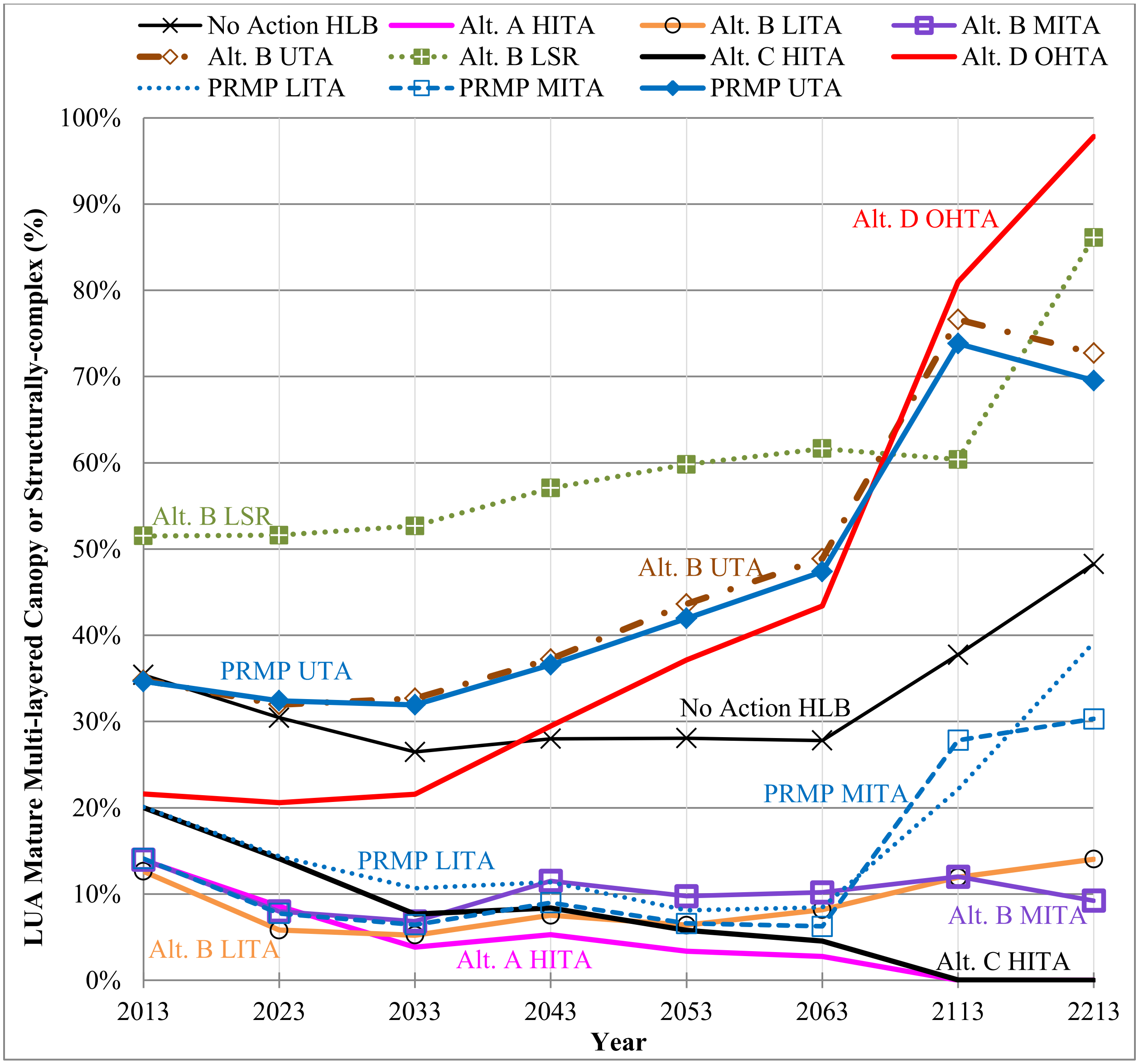


Figure 3-62. Proportions of land use allocations in Mature Multi-layered Canopy or Structurally-complex structural stages through time

Note: LSR is only shown for Alternative B since developmental trajectory within LSR land use allocations is nearly identical between alternatives and the Proposed RMP. The Uneven-aged Timber Area, Moderate Intensity Timber Area, and Low Intensity Timber Area are only shown for Alt. B and the PRMP, since structural development in the Uneven-aged Timber Area is nearly identical among the action alternatives and the Proposed RMP, and the Moderate Intensity Timber Area in Alternatives B and D show very similar trends.

The Harvest Land Base in the No Action alternative would contain 38 percent in Mature Multi-layered Canopy and Structurally-complex structural stage conditions within 100 years. This is due to the interaction between starting age class distribution and minimum rotation age assumptions in the vegetation modeling for the Harvest Land Base in the No Action alternative. Having a substantial acreage of stands beyond the culmination of mean annual increment (CMAI) of net timber volume in land use allocations dedicated to two-aged management regimes would allow the BLM to implement long rotations right away. Reserving older forests in the action alternatives and the Proposed RMP would reduce BLM's available acreage of older stands eligible for regeneration harvest, reducing average regeneration harvest age for 100 years or more before the BLM could transition completely to longer rotations. See **Table 3-48** for more details on regeneration harvest ages by decade, alternative and the Proposed RMP, and land use allocation.

In summary, the mix of silvicultural systems and harvesting practices applied will determine the future of the structural stage distribution within the decision area. Wildfire is projected to play a relatively small role in the creation of early seral structural stages when compared to timber harvest, especially in the coastal/north areas. Early Successional stands in the High Intensity Timber Area in Alternatives A and C would not contain structural legacies. There is a substantial difference in the structural complexity of most future stands when comparing even-aged management (e.g., clear-cutting) practices in the High Intensity Timber Area in Alternatives A and C, to two-aged practices (e.g., variable retention-regeneration harvest) in the No Action alternative, the Low Intensity Timber Area and Moderate Intensity Timber Area in Alternative B, Sub-alternative B, and the Proposed RMP, and the Moderate Intensity Timber Area in Alternative D.

Even-aged management with clear-cutting would result in relatively simple structured stands lacking legacy structures, while two-aged harvesting would produce stands with multiple layered canopies and legacy structures. Land use allocations dedicated to uneven-aged management regimes in the Harvest Land Base, the Uneven-aged Timber Area and Owl Habitat Timber Area, would eventually produce Mature Multi-layered Canopy and Structurally-complex stands in proportions equal to or greater than Late-Successional Reserve management. The structural stage development of the moist Late-Successional Reserve would be similar among all alternatives and the Proposed RMP. Retention of cut trees in Alternative A versus commercial removal in other alternatives and the Proposed RMP would not result in differences in structural stage development. The Harvest Land Base in the No Action alternative would contribute a higher proportion of Mature Multi-layered Canopy and Structurally-complex stands to the decision area when compared to the action alternatives and the Proposed RMP because there are substantial acreages of stands beyond CMAI of net timber volume in the Harvest Land Base. This would allow the BLM to implement long rotations right away, rather than the gradual trend towards longer rotations that would be required in the Moderate Intensity Timber Area and Low Intensity Timber Area in Alternative B, Sub-alternative B, and the Proposed RMP, and in the Moderate Intensity Timber Area in Alternative D.

Inventory of Merchantable Timber

The inventory of merchantable timber volume in the decision area has increased since 1940 (**Table 3-51**).

Table 3-51. The standing net timber inventory at each measurement period

Historic Estimates	1940	1960	1970	1980	1990	2006
Timber Volume (MMbf)	46,000	49,100	50,300	46,900	49,900	64,854
Acres Considered in Calculation	2,165,900	2,145,072	2,391,172	1,771,657	1,794,420	2,478,857

A combination of factors caused the large increase between the 1990 and 2006 inventory of timber volumes. These include—

- The increase in acres included in the determination of volume;
- The increase in growth and volume resulting from the increase in faster-growing, younger stands; and
- Harvest levels below the maximum potential annual productive capacity (**Table 3-54** and **Figure 3-64**).

Although these inventories were conducted using different inventory systems, different assumptions, and occurred on different portions of the BLM-administered lands, the inventories provide the basis for broad comparisons and general trends. These historical records of timber inventories show that overall growth on the BLM-administered lands has exceeded harvest levels, especially in the last two decades. Current standing net timber inventory based on 2013 data is approximately 13 percent higher than the 2006 estimate, which reflects an average annual inventory increase of almost 2 percent per year since 2006 (**Table 3-52**).

Table 3-52. 2006 and 2013 Scribner 16' scale net standing timber volume MMbf inventory estimates

District/ Field Office	2006 Net Inventory (MMbf)	2013 Net Inventory (MMbf)
Coos Bay	11,358	13,036
Eugene	10,915	12,792
Klamath Falls	694	750
Medford	15,133	16,347
Roseburg	11,322	12,634
Salem	15,431	17,660
Totals	**64,854**	**73,220**

The amount of current timber inventory within the Harvest Land Base varies primarily with the extent of the Harvest Land Base under each alternative and the Proposed RMP. Alternative C contains the highest timber inventory within the Harvest Land Base of any alternative and the Proposed RMP, with approximately 24 billion board feet. Sub-alternative B has the lowest timber inventory within the Harvest Land Base, with approximately 9 billion board feet. The current timber volume in the Harvest Land Base ranges between 13–33 percent of total timber inventory in the decision area among the alternatives and the Proposed RMP. Conversely, reserve land use allocations contain between 67–87 percent of total timber inventory (**Figure 3-63**).

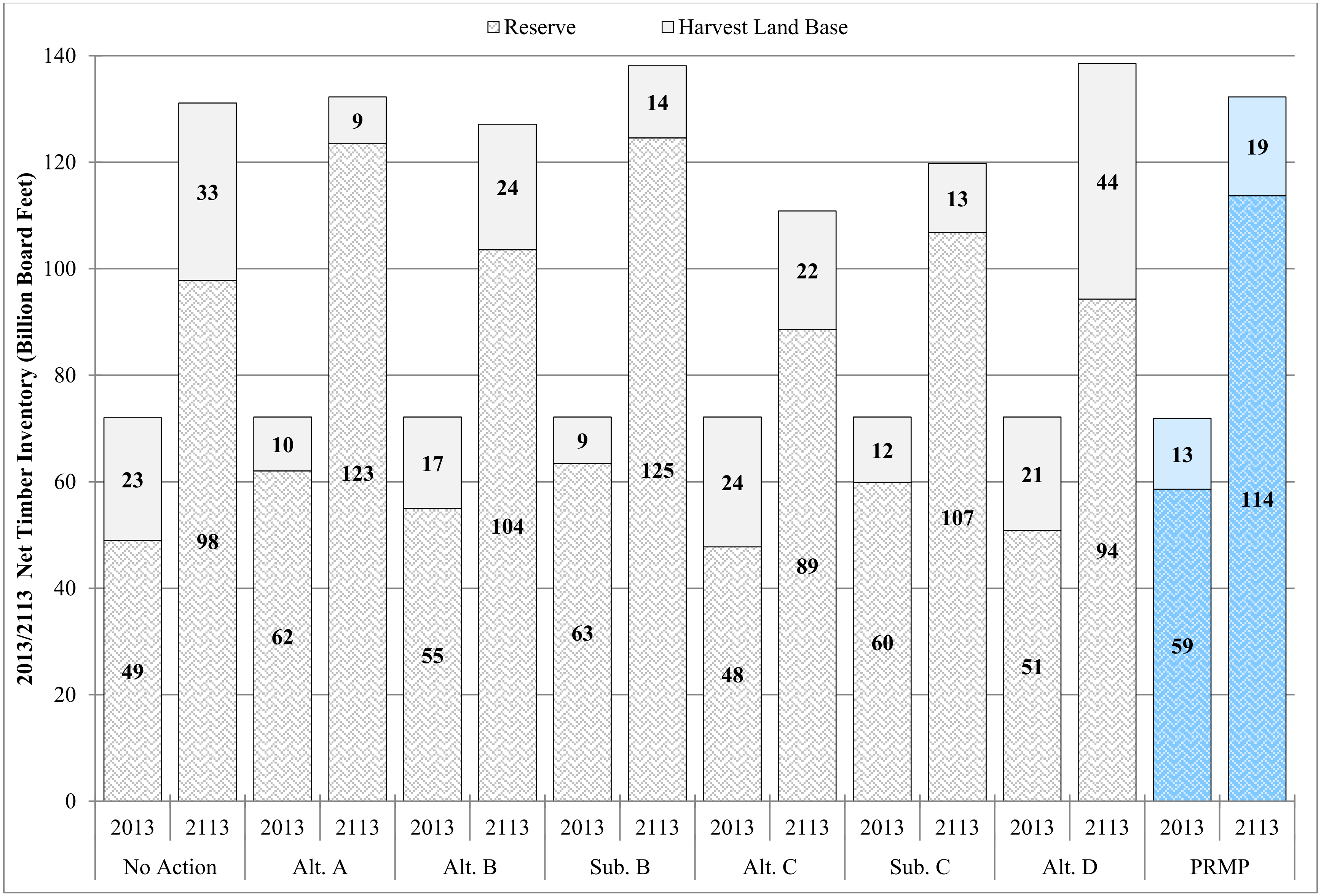


Figure 3-63. 2013 and 2113 net inventory broken out between the Harvest Land Base and reserves in the decision area

The timber inventory would increase under all alternatives and the Proposed RMP. This is mostly due to timber volume accumulation in the reserve land use allocations. Timber volume would increase between 58-100 percent in the reserves over the next 100 years, since the BLM would only be harvesting timber to achieve restoration purposes.

Table 3-53. Percent change in inventory between 2013 and 2113 broken out between the Harvest Land Base and reserves in the decision area

Inventory	No Action (Percent Change)	Alt. A (Percent Change)	Alt. B (Percent Change)	Sub. B (Percent Change)	Alt. C (Percent Change)	Sub. C (Percent Change)	Alt. D (Percent Change)	PRMP (Percent Change)
Reserve	100%	99%	88%	96%	86%	78%	86%	58%
Harvest Land Base	45%	-13%	37%	56%	-9%	6%	108%	12%
Overall	**82%**	**83%**	**76%**	**91%**	**54%**	**66%**	**92%**	**44%**

Note: Positive numbers indicate inventory increase, while negative numbers indicate inventory decrease.

The timber inventories in the Harvest Land Base would slightly decline in Alternatives A and C; they would remain relatively stable in Sub-alternative C, because of shorter rotations and even-aged timber harvest in the majority of the Harvest Land Base. In these alternatives, the BLM would convert sub-optimal timber production stands in the High Intensity Timber Area into fully stocked stands near the maximum timber production potential. The BLM would only hold the minimum inventory on the Harvest Land Base to ensure long-term sustainability of the timber harvest regime.

The timber inventory would increase in the Harvest Land Base under the No Action alternative, Alternative B, Sub-alternative B, the Proposed RMP, and, to the largest extent, Alternative D. For the No Action alternative, the modeling assumptions scheduling regeneration harvest at the CMAI of net harvest volume would interact with the modeling assumption for non-declining even flow to cause inventories to substantially increase on some districts. The Harvest Land Base inventory increases in Alternatives B and D, Sub-alternative B, and the Proposed RMP, is partly explained by the modeling assumptions guiding the transition to longer rotations on a relatively young Harvest Land Base, which would require an increase in the standing inventory on those stands as they age into the desired age classes for regeneration harvest. **Appendix C** contains more information on the modeling assumptions used for each alternative and the Proposed RMP.

Another contributing factor leading to the inventory increase in the Harvest Land Base in these alternatives and the Proposed RMP is the implementation of uneven-aged management regimes. The BLM would implement selection harvesting to achieve desired stand conditions in the Uneven-aged Timber Area in all the action alternatives and the Proposed RMP, and in the Owl Habitat Timber Area in Alternative D. Volume accumulation would outpace harvest until the desired conditions were reached, which could take 100 years or more, and then the inventory would flatten out as those conditions are maintained, where from that point forward timber harvest would equal growth. Since 75 percent of the Harvest Land Base would be in land use allocations dedicated to uneven-aged management regimes in Alternative D, this net inventory would increase more than any other alternative or and the Proposed RMP with a 108 percent increase in net timber inventory in the next 100 years (**Table 3-53** and **Figure 3-63**).

In summary, all alternatives and the Proposed RMP would result in an overall increase in net timber inventory of between 44 percent (Proposed RMP), and 92 percent (Alternative D) in the next 100 years. The net timber inventory in reserve land use allocations would increase more than 58 percent in all alternatives and the Proposed RMP. Net timber inventories in the Harvest Land Base in Alternatives A and C would remain stable or slightly decrease in the next 100 years as the High Intensity Timber Area land use allocation would transition into a fully regulated relatively short-rotation forest. Net timber inventories in the Harvest Land Base in the No Action alternative, Alternatives A, B, and D, Sub-alternative B, and the Proposed RMP would increase between 12 percent (Proposed RMP) and 108 percent (Alternative D). The increase in net timber inventories in Alternatives B and D, and the Proposed RMP is due to the combination of the modeling assumptions guiding the transition of younger forests to long rotations and the implementation of uneven-aged management regimes. The increase in inventory in the No Action alternative's Harvest Land Base is explained primarily by the combination of the non-declining timber flow modeling assumption with the assumption that stands meet CMAI of net timber volume prior to implementing regeneration harvest, which causes inventories on some districts to increase substantially.

Issue 2

What would be the annual productive capacity for sustained-yield timber production under each alternative? How would different intensities of forest management and restrictions on timber harvest in the Harvest Land Base influence the annual productive capacity?

Analytical Methods

Through the RMPs, the BLM will determine and declare the annual productive capacity for sustained-yield timber production or allowable sale quantity (ASQ).[58] The ASQ is the annual timber volume that a forest can produce continuously under the intensity of management described in each alternative and the Proposed RMP for those lands allocated for sustained-yield timber production (i.e., the Harvest Land Base). The calculation of the ASQ is a direct output from the vegetation modeling analysis for each alternative and the Proposed RMP and would vary based on the timing and intensity of timber harvest, silvicultural practices, and restrictions on timber harvest in the Harvest Land Base. Because the ASQ volume reflects the capacity for sustained-yield timber production, it would not decline over time.

In contrast to the ASQ volume, timber volume produced as a by-product of silvicultural treatments in reserve land use allocations (i.e., non-ASQ volume) would change over time and eventually decline in moist forest areas. The calculation of the non-ASQ volume for each alternative and the Proposed RMP is also a direct output from the vegetation modeling, but reflects modeling assumptions about the intensity and extent of thinning or selection harvesting needed to achieve the management objectives of the reserve land use allocations.

The BLM calculated the ASQ and non-ASQ volume for each of the six sustained-yield units, which match the five western Oregon BLM district boundaries and the western portion of the Klamath Falls Field Office.

The vegetation modeling included forecasting future discovered marbled murrelet sites and North Coast Distinct Population Segment (DPS) red tree vole sites under alternatives and the Proposed RMP where surveys would occur. Under these alternatives and the Proposed RMP, the BLM would remove acres associated with discovered sites from the Harvest Land Base and manage them, instead, as Late-Successional Reserve. Therefore, these acres would no longer contribute to the ASQ volume. See the Wildlife section in this chapter for more detail on site management for these species. In the vegetation modeling, these forecasted discovered sites were calculated using prediction rates, and acres the model

[58] The terms 'annual productive capacity,' 'annual sustained yield capacity,' and 'allowable sale quantity' are synonymous.

predicted as future discovered sites were not included in the contributions to the calculation of sustained-yield timber harvest.

The forecasting of future marbled murrelet sites required slightly different methodologies for the No Action alternative, the action alternatives, and the Proposed RMP, and inherently includes substantial uncertainty. The modeling of future marbled murrelet sites in the No Action alternative assumed all stands currently 120-years old and older in Matrix and Adaptive Management Areas within 35 miles of the coast were occupied by marbled murrelets and reserved from timber harvest. The modeling assumed stands currently less than 120-years old in the Matrix and Adaptive Management Area were not occupied by marbled murrelets, even those stands that would become 120-years old or older during the modeling period. The modeling also assumed no stands greater than 35 miles from the coast were occupied by marbled murrelets. The assumption of all stands currently 120-years old and older within 35 miles of the coast are occupied by marbled murrelets is likely an overestimation, and the assumption that no stands currently less than 120-years old and no stands greater than 35 miles from the coast are occupied by marbled murrelets is likely an underestimation. Overall, the forecasting of future marbled murrelet sites for the No Action alternative likely underestimates the acres that would be reserved from timber harvest and consequently overestimates the ASQ. However, the BLM lacks sufficient data at this time to refine these assumptions about the No Action alternative or quantitatively describe the overestimation of ASQ. The BLM used this age-based assumption for future occupancy, because the No Action alternative, in contrast to the action alternatives and the Proposed RMP, includes harvest of older, more structurally-complex forest, which provides the highest quality marbled murrelet nesting habitat.

Because all of the action alternatives and the Proposed RMP would reserve older, more structurally-complex forest, the forecasting of future marbled murrelet sites within the Harvest Land Base focused on younger stands than the forecasting for the No Action alternative. Therefore, this analysis used a different methodology for the action alternatives and the Proposed RMP, which extrapolated from previous marbled murrelet survey results using the proportion of survey stations that had marbled murrelet occupancy. This approach has the advantage of using consistent data that is currently available across the entire decision area. The station-based methodology provided an estimation of marbled murrelet sites based on the existing BLM corporate data, from the perspective of analyzing the effects on marbled murrelets. This methodology may underestimate the acres reserved from timber harvest under an action alternative and the Proposed RMP that includes surveys for marbled murrelet sites and reserves occupied sites. Estimating the acres of occupied marbled murrelet habitat is not the same as estimating the acres reserved from timber harvest around an occupied site. Much of the difficulty in developing an effective methodology for analysis is in translating a positive survey result into an estimation of acres reserved from timber harvest. The station-based methodology provides an estimate for the purpose of analyzing the effects on marbled murrelets, but may underestimate the effects on timber harvest. However, the BLM lacks sufficient data at this time to describe quantitatively the uncertainty associated with ASQ estimates in the alternatives and the Proposed RMP that would require protection of future marbled murrelet sites.

Additionally, the detection rates that the BLM used to calculate acres by land use allocation reported in Chapter 2, and impacts to timber harvest in Alternatives A, B, and D, and Sub-alternatives B and C (24.4 percent 0–25 miles from the coast, and 5.6 percent 25–50 miles from the coast) are different than the detection rates the BLM used for these analyses in the Proposed RMP (54.8 percent 0–25 miles from the coast, and 10.2 percent 25–50 miles from the coast). The BLM updated marbled murrelet detection rates for the Proposed RMP to reflect recent survey results, in order to produce a more refined estimate of timber harvest volume. The BLM used the revised detection rates consistently across the action alternatives and the Proposed RMP in the Wildlife section in this chapter to analyze effects to marbled murrelets.

Under the No Action alternative, the BLM would conduct surveys to locate and manage for all populations of the Oregon red tree vole, not just the North Coast DPS of the red tree vole. The BLM did not quantitatively forecast the loss of Harvest Land Base area to future red tree vole sites in the vegetation modeling for the No Action alternative, and therefore likely overestimates the ASQ for this alternative. There is substantial variability in the detection rates of red tree voles and management requirements for detected red tree vole sites, which complicate any attempt to forecast the effects of future red tree vole sites on the ASQ under the No Action alternative. This analysis uses decision area-wide detection rates based on protocol surveys between 2000 and 2012 on BLM-administered lands irrespective of habitat condition outside of vegetation modeling. Detection rates range from 16.7 percent in the Salem District to 76.1 percent in the Coos Bay District, with an average of 42.1 percent for the decision area. The BLM uses the assumption that 40 percent of stands with red tree vole detections would be unavailable for long-term sustained-yield timber harvest, in order to bracket the potential effects of red tree vole site management on the ASQ for the No Action alternative. This estimate is not included in **Table 3-55**, but is shown in **Table 3-56**

In order to calculate estimated reductions to ASQ levels from predictions of red tree voles and marbled murrelet site occupancy and protection in all alternatives and the Proposed RMP, the number of acres where timber harvest was precluded was determined using geographic information system (GIS) analysis. The BLM then performed GIS analysis to determine which Harvest Land Base sub-allocation those acres of forested land would have been in had the BLM not predicted occupancy. The BLM then multiplied those acres by the expected board feet per acre per year ASQ contribution estimated for that sub-allocation and region based on values derived for **Figure 3-65**. This methodology produced an estimated ASQ reduction for each alternative and the Proposed RMP for predictions of site protection associated with red tree voles and marbled murrelets reported in **Table 3-56**.

A similar methodology was also used to determine the ASQ reductions associated with northern spotted owl site protection in Alternative D, where areas were mapped as Owl Habitat Timber Area or Late-Successional Reserve where needed to maintain spotted owl habitat around known, historic, and alternate sites. The BLM used GIS analysis to determine how many acres of Owl Habitat Timber Area or Late-Successional Reserve were mapped due to proximity of northern spotted owl sites, and the BLM estimated how many acres would have otherwise been mapped as either Uneven-aged Timber Area or Moderate Intensity Timber Area. The difference in productive contribution of those acres were used to calculate the estimated ASQ reduction associated with northern spotted owl site management in Alternative D, reported in **Table 3-56**. In Sub-alternative B, the impacts to ASQ from northern spotted owl site protection were reported directly, since this was the single difference between this sub-alternative and Alternative B. Since the BLM made these deductions to the Harvest Land Base in the vegetation modeling, ASQ values reported in **Table 3-55** include them, with the exception of red tree vole management in the No Action Alternative.

The BLM also made deductions to long-term yields based on both area lost and reduced growth and yield due to road construction and detrimental soil disturbances, endemic levels of insects and disease, defect and breakage, snag and downed wood requirements, and other factors. The Vegetation Modeling section earlier in this chapter and **Appendix C** provide more information on the calculations of ASQ and non-ASQ timber volume.

Background

The BLM has implemented timber harvest levels and a mix of harvest types that has differed from those anticipated in the 1995 RMPs. Specifically; the BLM has implemented less regeneration harvest and more commercial thinning (**Figure 3-64**). In 2012, the BLM conducted an evaluation of the 1995 RMPs in accordance with its planning regulations, and concluded that continuation of these trends in timber harvest practices is not sustainable at the declared ASQ level. Implementation of timber harvest since the adoption of the 1995 RMPs is described in detail in the BLM plan evaluations and is incorporated here by reference (USDI BLM 2012, pp. 6–12, and Appendices 3–8).

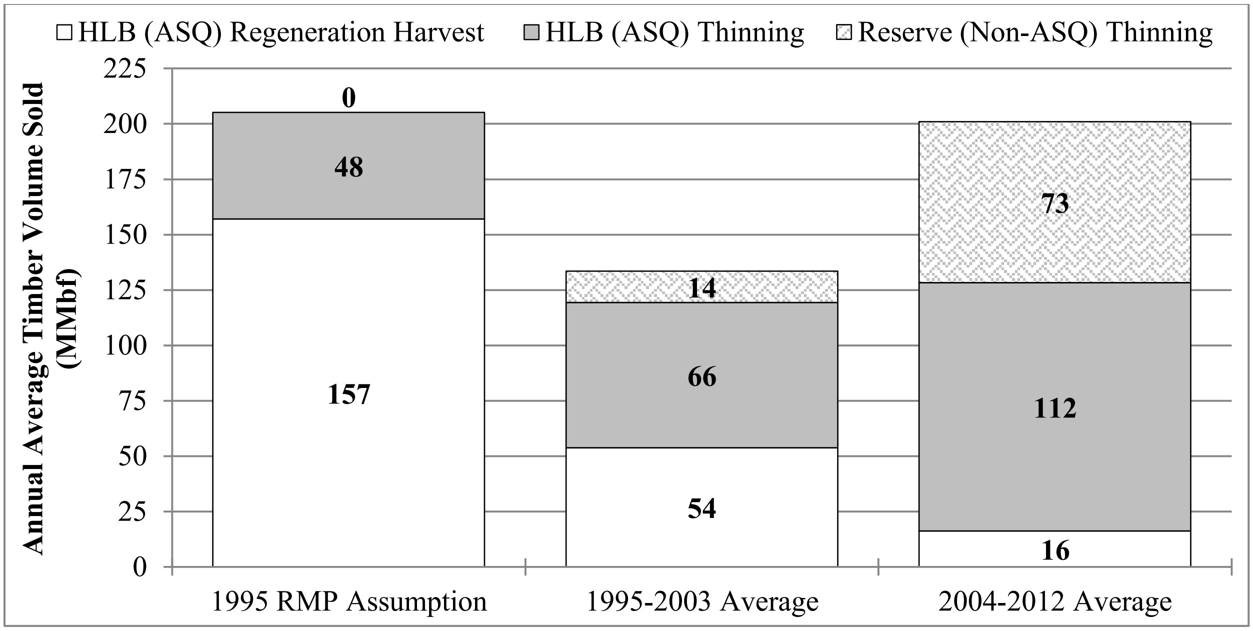


Figure 3-64. Assumed vs. implemented annual average sold timber volume levels and mix of harvest types, 1995 through 2012, in the Harvest Land Base (HLB) and Reserves in the decision area

The 1995 through 2010 data in **Figure 3-64** comes from district data requests for the 2012 plan evaluations. 2011 and 2012 data was generated from Forest Resource Information System data entered through 23 October 2014. Due to continual updates and data correction, these estimates may be different from other estimates generated at different times or from different sources.

Affected Environment and Environmental Consequences

The BLM performed a reference analysis of "Manage most commercial lands for maximizing timber production" in the 2008 FEIS (USDI BLM 2008, pp. 573–574) and that analysis is incorporated here by reference. This reference analysis evaluated the outcomes if all BLM-administered lands in the planning area capable of producing a long-term flow of commercial timber volume would be managed under intensive forest management, without regard for the requirements of other laws or the purpose and need for action. The results of this reference analysis concluded that the BLM-administered lands in the planning area are capable of producing approximately 1.2 billion board feet per year. Although there have been some changes in the decision area that would slightly alter these calculations resulting from timber harvest and growth since the calculations in the 2008 FEIS, these results provide an approximate outcome that is still relevant for the decision area.

Table 3-54. Reference analysis: "Manage Most Commercial Lands for Maximizing Timber Production" and 1995 RMP declared ASQ

District/ Field Office	Scribner 16' Scale (MMbf Per Year)	
	Reference Analysis ASQ	**1995 RMP Declared ASQ**
Coos Bay	257	27
Eugene	273	33
Klamath Falls	10	6
Medford	174	57
Roseburg	198	45
Salem	289	35
Totals	**1,201**	**203**

The 1995 RMPs declared ASQ levels for each of the sustained-yield units (**Table 3-54**). The ASQ for the No Action alternative calculated here (277 MMbf) is substantially higher than the ASQ declared in the 1995 RMPs (203 MMbf) because of improvements in data and changes in forest conditions since 1995. Improved field validation and mapping of stream classification and fish presence has revealed that the analysis for the 1995 RMPs overestimated the extent of the Riparian Reserve and thereby underestimated the extent of the area available for sustained-yield timber production. In addition, new inventory data, revised growth and yield information, and increases in timber inventory in the decision area since 1995 have increased the calculation of the ASQ under the No Action alternative. This is consistent with the conclusion in the 2008 FEIS, which calculated the ASQ for the No Action alternative to be 268 MMbf (USDI BLM 2008, p. 575), and that discussion is incorporated here by reference.

Alternative C would have the highest ASQ among the alternatives and the Proposed RMP, followed by Sub-alternative C, and the No Action alternative (**Table 3-55**). Major factors determining the ASQ include the size of the Harvest Land Base, the intensity of forest management practices, and restrictions on timber harvest (e.g., wildlife site protection, Visual Resource Management, and recreation management).

Table 3-55. First decade annual ASQ* timber harvest (MMbf/year Scribner 16' scale)[59]

District/ Field Office	No Action (ASQ)†	Alt. A (ASQ)	Alt. B (ASQ)	Sub. B (ASQ)	Alt. C (ASQ)	Sub. C (ASQ)	Alt. D (ASQ)	PRMP (ASQ)
Coos Bay	46	46	23	14	82	66	22	12
Eugene	58	63	56	25	138	103	45	53
Klamath Falls	8	3	7	4	10	3	5	6
Medford	73	27	42	15	54	24	28	37
Roseburg	55	25	35	14	78	51	22	32
Salem	37	71	71	47	124	85	54	65
Totals	**277**	**234**	**234**	**120**	**486**	**332**	**176**	**205**

* Reported ASQ volumes are rounded to the nearest MMbf, so there are minor errors associated with rounding.
† The BLM has made no deduction in the vegetation modeling for reductions due to management of future Survey and Manage sites. This and other issues place uncertainty around the expression of ASQ for the No Action alternative.

[59] These ASQ estimates for the alternatives and the Proposed RMP include modeled timber salvage from the first decade based on BLM's simulation of wildfire and subsequent timber salvage. Given the unpredictable nature of wildfire and timber salvage, the eventual declaration of the ASQ will include an average of simulated salvage volume over the first five decades to account for this uncertainty. Therefore, the eventual declaration of ASQ may be slightly different from what is reported here.

Size of the Harvest Land Base

The size of the Harvest Land Base is dependent on a number of factors including Riparian Reserve widths and the size of the Late-Successional Reserve, including the threshold for protection of older, more structurally-complex forest, and the protection of future reserved sites for some wildlife species under some of the alternatives and the Proposed RMP. Chapter 2 contains a description of the design of each alternative and the Proposed RMP and a description of the acreage in each land use allocation. The Harvest Land Base under Alternative C would be the largest (30 percent of the decision area) and Sub-alternative B the smallest (12 percent of the decision area). The Harvest Land Base under the Proposed RMP would be 20 percent of the decision area. Predicted marbled murrelet and red tree vole sites are not included in the calculation of Harvest Land Base size.

Sub-alternative B would be identical to Alternative B, except that it would include protection of habitat within the home ranges of all northern spotted owl known, alternate, and historic sites that would be within the Harvest Land Base in Alternative B. This single change in design reduces the Harvest Land Base from 22 to 12 percent of the decision area, which is smaller than any other alternative or the Proposed RMP. This difference in the size of the Harvest Land Base reduces the ASQ in Sub-alternative B by 114 MMbf per year from the ASQ in Alternative B.

Although the size of the Harvest Land Base has an important influence on the ASQ, it does not entirely determine the ASQ. For example, Alternatives A and B have almost identical ASQ levels, but the size of the Harvest Land Base would differ substantially (14 percent and 22 percent, respectively). Nevertheless, the size of the Harvest Land Base determines the number of acres of eligible forest stands that would be available for harvesting to meet the declared ASQ. Therefore, all other things held equal, the larger the Harvest Land Base, the higher the ASQ.

Intensity of Forest Management Practices

The more intensive the forest management practices applied, the more timber volume produced on a given acre of ground within a fixed unit of time. **Figure 3-65** shows a breakdown of calculated timber production rates by management intensity for the coastal/north areas, which generally have higher productivity lands, and the interior/south areas, which generally have lower productivity lands.

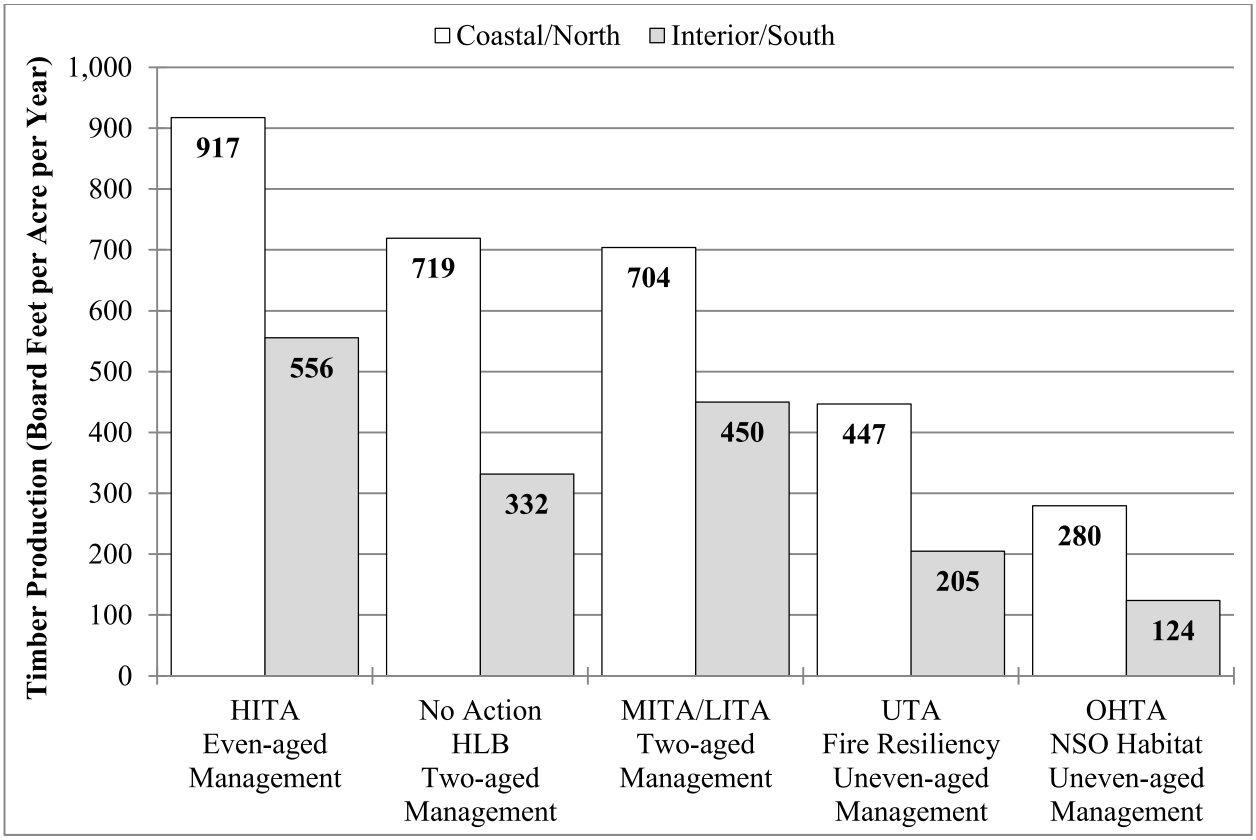


Figure 3-65. Timber production rates by management intensity (board feet per acre per year), broken out between coastal/north and interior/south areas

The highest timber yields per acre would come from the High Intensity Timber Area, because of even-aged management regimes including relatively short rotations, clear-cutting, rapid reforestation, fertilization, and control of competing vegetation. For every acre of High Intensity Timber Area in the Harvest Land Base, the ASQ contribution would be approximately 917 board feet per year in the coastal/north area, and 556 board feet per year in the interior/south areas.

The second-highest timber yields per acre would come from lands managed under two-aged management regimes, which includes variable-retention regeneration harvesting. This category includes the Matrix[60] and Adaptive Management Areas in the No Action alternative, the Moderate Intensity Timber Area and Low Intensity Timber Area in Alternative B, Sub-alternative B, and the Proposed RMP, and the Moderate Intensity Timber Area in Alternative D. The reduction in timber yield per acre in these land use allocations compared to the High Intensity Timber Area would result from the retention of a portion of the stand during regeneration harvest and the trend towards longer rotations (Birch and Johnson 1992, Long and Roberts 1992). The overstory retention in these land use allocations would also suppress the growth rates of regenerated trees compared the High Intensity Timber Area, but this effect would be highly variable, and in part dependent on the arrangement of retention trees (Di Lucca *et al.* 2004, Temesgen *et al.* 2006, Urgenson *et al.* 2013). It is not possible at this scale of analysis with the data available to quantify the effects of varying levels of retention on the growth of the regenerating stand. The

[60] The Matrix in the No Action alternative includes the General Forest Management Area, and Connectivity/Diversity Blocks, which identify differing levels of tree retention and other practices in regeneration harvest.

effects of varying retention levels in these land use allocations would also influence the timber yield per acre somewhat.

Nevertheless, for every acre of Moderate Intensity Timber Area or Low Intensity Timber Area land use allocations is in the Harvest Land Base in the action alternatives and the Proposed RMP, the ASQ contribution would average 704 board feet per year in the coastal/north area, and 450 board feet in the interior/south. For the No Action alternative, the ASQ contributions would be 719 board feet per acre per year in the coastal/north area, and 332 board feet per year in the interior/south. The reason the contribution from the interior/south is lower in the No Action alternative is that a substantial acreage of dry forest stands in the Harvest Land Base in the action alternatives and the Proposed RMP would be managed using uneven-aged management in the Uneven-aged Timber Area. In the No Action alternative, these dry forest stands are contained in lands dedicated to regeneration harvesting regimes. The dry forests tend to be lower productivity, thereby pulling the average production rate down in the interior/south in the No Action alternative.

Alternative B includes different reforestation practices after regeneration harvest than the other alternatives and the Proposed RMP. In the Moderate Intensity Timber Area in Alternative B, the BLM would delay canopy closure for at least three decades after regeneration harvest, in order to prolong and enhance the early successional stage of forest development. In the Low Intensity Timber Area in Alternative B, the BLM would rely on natural reforestation after regeneration harvest (i.e., natural seeding rather than planting). In all other alternatives and the Proposed RMP, the BLM would ensure rapid reforestation following regeneration harvest, consistent with current practices. There is no apparent difference in timber yields between delayed canopy closure in the Moderate Intensity Timber Area in Alternative B and prompt canopy closure in the other alternatives, including the Moderate Intensity Timber Area in Alternative D. The average delay in canopy closure in the Moderate Intensity Timber Area in Alternative B would be 10–15 years beyond what would typically occur with standard reforestation practices. This would theoretically delay attainment of timber merchantability and thereby reduce overall timber yield per acre (Miller *et al.* 1993). However, any effect of delaying timber harvest in the Moderate Intensity Timber Area would be diluted by the trend towards longer rotation lengths that would occur in the Moderate Intensity Timber Area. Additionally, there are so many factors affecting the varying timber yield per acre among the alternatives and the Proposed RMP that it is not possible to isolate the effect of this single factor.

The Low Intensity Timber Area would produce an average of 18 percent less timber yield per acre than the Moderate Intensity Timber Area in Alternative B, because of the higher level of retention and projected reforestation failures after regeneration harvest. Based on evaluation of past natural reforestation, the BLM concludes that an average of 10 percent of each regeneration harvest unit in the Low Intensity Timber Area would fail to reforest, 30 percent would reforest at very low levels of stocking, and 60 percent would reforest at target stocking levels. **Appendix C** contains more details about assumptions related to reforestation rates. Reforestation failures would eliminate future timber harvest opportunities; reforestation at very low levels of stocking would preclude commercial thinning opportunities. In addition to reductions in timber yield from reforestation failures in the Low Intensity Timber Area, the reliance on natural reforestation would limit the ability to manage the species composition of the regenerating stand. This would also preclude replanting stands with disease-resistant trees, such as rust-resistant sugar pine or root disease-resistant Port-Orford-cedar. This reliance on natural reforestation would also preclude the ability of the BLM to shift tree species composition or tree genotypes within stands to adapt to changing climate conditions (see the Climate Change section in this chapter). Since prompt reforestation using natural or artificial reforestation would be allowed under the Proposed RMP in the Low Intensity Timber Area and Moderate Intensity Timber Area, the only expected differences in timber yield between these two Harvest Land Base sub-allocations would come from the additional post-harvest retention requirements (15–30 percent basal area retention in the Low Intensity Timber Area and 5–15 percent basal area retention in the Moderate Intensity Timber Area).

The third-highest timber yields per acre would come from the uneven-aged management in the Uneven-aged Timber Area, which is included in all action alternatives and the Proposed RMP. In this sub-allocation, the continuous retention of substantial portions of the stand would reduce the timber yields compared to the yields under regeneration harvest. For every acre of Uneven-aged Timber Area in the Harvest Land Base, the ASQ contribution would be approximately 447 board feet per year in the coastal/north area, or 205 board feet in the interior/south area.

The lowest timber yields per acre would come from uneven-aged management in the Owl Habitat Timber Area in Alternative D. In this sub-allocation, the continuous retention of substantial portions of the stand would reduce the timber yields, as in the Uneven-aged Timber Area. However, timber harvest would be further limited in the Owl Habitat Timber Area to meet direction to develop and then maintain northern spotted owl habitat function at the stand level, limiting the intensity of harvest and the size of openings, further reducing timber yield compared to the Uneven-aged Timber Area. **Appendix B** contains more details on management objectives and direction for each sub-allocation. For every acre of Owl Habitat Timber Area, the ASQ contribution would be approximately 280 board feet per year in the coastal/north area, or 124 board feet in the interior/south area.

The varying timber yield per acre of the different sub-allocations demonstrates the influence the intensity of forest management practices has on the ASQ. This influence on the ASQ can be as important as the size of the Harvest Land Base. For example, Alternative A has almost the same ASQ as Alternative B even though it has a much smaller Harvest Land Base because of the more intensive forest management practices in Alternative A. Alternative D, which has a larger Harvest Land Base than Alternatives A and B, and the Proposed RMP, has a lower ASQ because forest management practices would be less intensive.

Restrictions on Timber Harvest

The alternatives contain various potential restrictions on timber harvest in the Harvest Land Base that could influence the calculation of the ASQ. The restrictions in the action alternatives and the Proposed RMP include site protection for northern spotted owls, protection of future marbled murrelet sites, protection of future North Coast DPS red tree vole sites, management of Wild and Scenic Rivers, Visual Resource Management, and Recreation Management Areas. The calculation of the ASQ in this analysis predicted the quantitative effects of some of these potential restrictions. However, other potential restrictions are too uncertain to incorporate into the calculation of the ASQ. As a result, there are varying levels of uncertainty about the calculation of the ASQ among the alternatives and the Proposed RMP because of these potential restrictions on timber harvest, as detailed below.

The No Action alternative includes a variety of restrictions on timber harvest in the Matrix and Adaptive Management Areas, including protection of known spotted owl activity centers, protection of future marbled murrelet sites, Survey and Manage protections, and the retention of old-growth fragments in watersheds where little remains. The effects of implementation of these restrictions on timber harvest levels are difficult to forecast, especially the Survey and Manage protections. The 2004 Final Supplemental EIS to Remove of Modify the Survey and Manage Mitigation Measure Guidelines discussed the difficulties in evaluating the effect of the Survey and Manage measures on timber harvest and provided estimates (USDA FS and USDI BLM 2000, pp. 428–438), and those discussions are incorporated here by reference. Because of the difficulty in forecasting future site abundances and locations for Survey and Manage species and the uncertainty of specific site management approaches, the BLM did not attempt to forecast restrictions on timber harvest within the Matrix and Adaptive Management Areas in the vegetation modeling. Red tree vole detection rates across the decision area between 2000 and 2012 irrespective of habitat condition are 42.1 percent. Assuming that 40 percent of stands in the Harvest Land Base where red tree voles are found become unavailable for long-term sustained yield timber production, this indicates that ASQ levels in **Table 3-55** for the No Action Alternative are 16.8 percent, or 47 MMbf/year too high (**Table 3-56**). Since the BLM did not include this assumption in vegetation modeling for the No Action alternative, the BLM believes that the ASQ predictions in **Table 3-55** for the No Action alternative are an overestimate. For the Adaptive Management Areas, the 1995 RMPs specifically directed developing and testing unspecified approaches to timber harvest and restrictions on timber harvest, lending considerable uncertainty to timber harvest levels within the Adaptive Management Areas.

Table 3-56. Estimated reductions to annual ASQ from wildlife surveys and site protection

Alternative/ Proposed RMP	Marbled Murrelet (MMbf/Year)	Northern Spotted Owl Site Management (MMbf/Year)	Red Tree Vole* (MMbf/Year)	Survey and Manage† (MMbf/Year)	Totals (MMbf/Year)
No Action	4	-	47	Unknown	**> 51**
Alt. A	-	-	-	-	-
Alt. B	6	-	6	-	**12**
Sub. B	6	115	6	-	**127**
Alt. C	2	-	-	-	**2**
Sub. C	-	-	-	-	-
Alt. D	29	57	4	-	**90**
PRMP	14	-	4	-	**18**

* The potential 47 MMbf per year reduction in ASQ for the No Action alternative due to future Survey and Manage red tree vole site management shown in **Table 3-56** was not deducted from the estimate of ASQ in **Table 3-55**. For the action alternatives and the Proposed RMP, red tree vole management and site protections varied around the North Coast DPS red tree vole population only. The estimated reductions to annual ASQ shown in this table for the action alternatives and the Proposed RMP are deducted from estimates of ASQ shown in **Table 3-55**.
† All other species on the Survey and Manage lists, including fish and plants

Northern Spotted Owl

Sub-alternative B includes protection of habitat within the home ranges of all northern spotted owl known and historic sites that would be within the Harvest Land Base in Alternative B, as described above. This would reduce the ASQ by approximately 115 MMbf per year (**Table 3-56**). Alternative D includes protection of habitat within the nest patch of all northern spotted owl known and historic sites, and sets thresholds for habitat within core areas and home ranges of all known and historic sites, limiting timber harvest. The BLM estimates that the combination of these two approaches to site management in Alternative D reduces the ASQ by 57 MMbf. None of the other action alternatives or the No Action alternative would require specific site management for known or historic northern spotted owl sites in the Harvest Land Base.

Under the Proposed RMP, the BLM would not authorize timber sales that would cause the incidental take of northern spotted owl territorial pairs or resident singles from timber harvest until implementation of a barred owl management program consistent with the assumptions contained in the Biological Opinion on the RMP has begun. The BLM assumes that the barred owl management program would begin within approximately 5 years of the signing of the Record of Decision, and subsequently the BLM would remove the prohibition on incidental take of northern spotted owl territorial pairs or resident singles resulting from timber sales. Given this assumption, northern spotted owl site management would not reduce long-term sustained yield from the Harvest Land Base in the Proposed RMP. Under the Proposed RMP, avoiding incidental take of northern spotted owls from timber harvest would require avoiding timber harvest or reducing the intensity of timber harvest of nesting-roosting habitat within the home ranges of most occupied northern spotted owl sites (depending on the quantity of nesting-roosting habitat within the home range). There is sufficient flexibility in scheduling the order in which stands would be harvested in the Harvest Land Base during the first half of the first decade of RMP implementation to avoid harvest that would result in incidental take of northern spotted owls without reducing the long-term sustained yield. This conclusion assumes that stands in the Harvest Land Base that the BLM would avoid harvesting during the first half of the first decade would be available for timber harvest in subsequent years. During the first half of the first decade of RMP implementation, the BLM would be able to conduct timber harvest that would not result in incidental take of northern spotted owls (e.g., by harvesting in stands that are not nesting-roosting habitat, in stands outside of occupied northern spotted owl sites, and in stands within occupied northern spotted owl sites with sufficient habitat above threshold amounts, or by reducing the intensity of timber harvest to maintain nesting-roosting habitat). Because of the availability of stands in which harvest would not result in incidental take of northern spotted owls and the temporary duration on the avoidance of incidental take of northern spotted owls, the requirement to avoid incidental take of northern spotted owls from timber harvest until a barred owl management program has begun would not reduce the long-term sustained yield from the Harvest Land Base in the Proposed RMP.

Marbled Murrelet

All alternatives and the Proposed RMP, except Alternative A and Sub-alternative C require marbled murrelet surveys prior to habitat disturbing activities and site protection for newly discovered sites in a portion or the entirety of the range of the marbled murrelet in the decision area. The effect of protection of future marbled murrelet sites on the ASQ would vary with the extent of the Harvest Land Base subject to surveys and the extent of protection around newly discovered sites. Marbled murrelet surveys and site protection would have the greatest effect on the ASQ in Alternative D, which would require surveys in marbled murrelet Zones 1 and 2 and protection of habitat within 0.5 miles around newly-discovered occupied sites, with an estimated ASQ reduction of 29 MMbf per year. Alternatives B and C, Sub-alternative B, and the Proposed RMP would require surveys in marbled murrelet Zone 1 only, and protection of habitat within 300 feet around newly discovered occupied sites. The effect of this protection on the ASQ is predicted to be relatively small in Alternative B and C, and Sub-alternative B, compared to the Proposed RMP because, as discussed above, these alternatives model a lower detection probability rate (i.e., 24.4 percent 0–25 miles from the coast, and 5.6 percent 25–50 miles from the coast) than the Proposed RMP (i.e., 54.8 percent 0-25 miles from the coast, and 10.2 percent 25–50 miles from the coast). This explains the more-than-double ASQ reduction under the Proposed RMP from Alternative B when there are very similar Harvest Land Base acres and survey and protection requirements between them. The small reduction in ASQ projections in the No Action alternative relative to the action alternatives is due, in part, to the difference in modeling methodology used, as discussed above.

Red Tree Vole

Alternatives B and D, and Sub-alternative B require surveys prior to habitat-disturbing activities and site protection for newly discovered sites for the North Coast DPS red tree vole. The Proposed RMP requires surveys and site protection for the North Coast DPS red tree vole north of Highway 20 only. The site protection in these alternatives and the Proposed RMP would reduce the acres in the Harvest Land Base, thereby reducing the ASQ. Protection around newly discovered North Coast DPS red tree vole sites would reduce the ASQ in Alternative B and Sub-alternative B by 6 MMbf per year, and in Alternative D and the Proposed RMP by 4 MMbf per year. Red tree vole surveys and protection are required across the decision area in the No Action alternative under Survey and Manage measures and the potential reductions to the ASQ were not built into the vegetation modeling (**Table 3-56**).

Wilderness Characteristics

The alternatives and the Proposed RMP vary in the protection of lands identified with wilderness characteristics outside of designated Wilderness Areas (see the Lands with Wilderness Characteristics section of this chapter). However, the alternatives do not include the protection of lands identified with wilderness characteristics in the Harvest Land Base on O&C lands, as discussed in the section on the O&C Act and the FLPMA in Chapter 1. Therefore, there is no influence on the protection of wilderness characteristics on the calculation of the ASQ in any of the alternatives or the Proposed RMP.

Wild and Scenic Rivers

The BLM would vary by alternative and the Proposed RMP the types of rivers recommended for inclusion into the Wild and Scenic River System (see the Wild and Scenic Rivers section of this chapter). The decision area includes 9 congressionally designated Wild and Scenic Rivers under BLM administration. The 1995 RMPs recommended 13 segments for inclusion into the Wild and Scenic River System and the BLM currently manages these segments to protect their components until Congress designates or releases them for other purposes. Under all alternatives and the Proposed RMP, the BLM would retain these 13 segments' recommendation for inclusion into the Wild and Scenic River System. Alternatives B, C, and the Proposed RMP would recommend for inclusion 6 eligible rivers also found to be suitable. Alternative D would recommend for inclusion all 51 eligible rivers within the decision area. Acres of BLM land associated with each Wild and Scenic River segment are not exactly known. In general, corridor widths for Wild and Scenic Rivers are 0.25 miles on either side of the river from the high water mark. This boundary, by Section 3(b) of the Wild and Scenic Rivers Act, may vary on either side of the river and be narrower or wider, as long as the total corridor averages no more than 320 acres per river mile. The BLM used the standard 0.25-mile distance as an assumption in the effects analysis of Wild and Scenic Rivers later in this chapter and in delineating the land use allocation (Congressionally Reserved lands and National Landscape Conservation System Lands) for the river segments in GIS under the alternatives and the Proposed RMP. The BLM excluded detailed assumptions for Wild and Scenic River corridors in the vegetation modeling calculation of ASQ timber harvest, because the complexity of the calculation for such a small acreage across the decision area was not warranted. For all segments, the near-distance portion of these corridors under all alternatives and the Proposed RMP would be Riparian Reserve and would not have been included in ASQ calculations. The acres of Harvest Land Base within 0.25 miles of river segments recommended for inclusion into the Wild and Scenic River system varies by management direction for river recommendations described above, and the spatial arrangement of the Harvest Land Base under each alternative and the Proposed RMP. These variations in the river recommendations and arrangement of the Harvest Land Base result in variations of the amount of recommended Wild and Scenic River corridor acres that may have been modeled as part of the Harvest Land Base when determining ASQ. Therefore, potential reductions to total acreage to the modeled Harvest Land Base from rivers that would be recommended for inclusion in the Wild and Scenic River System adds some uncertainty to the ASQ calculations.

Visual Resource Management

The BLM would manage visual resources on the following special landscapes the same under all action alternatives and the Proposed RMP, as described in **Appendix B**: Congressionally Reserved lands; Wild and Scenic Rivers; District-Designated Reserve – Lands Managed for their Wilderness Characteristics; National Trails; Recreation Management Areas; and ACECs. The action alternatives and the Proposed RMP only differ in Visual Resources Management (VRM) outside of these landscapes in that Alternative D includes both VRM Class III and Class IV lands in the Harvest Land Base, whereas the other alternatives and the Proposed RMP only assign VRM Class IV to the Harvest Land Base (see the Visual Resource Management section of this chapter). Special landscapes listed above that overlap the Harvest Land Base, either through land use allocation designation or acres that may have been modeled as part of the Harvest Land Base, would be minimal under these alternatives and the Proposed RMP. However, BLM-administered lands within these special landscapes not managed as VRM Class IV may limit intensity of timber harvest (**Table 3-57**). The calculation of the ASQ did not attempt to account for restrictions in timber harvest in these areas where there may be conflict between Visual Resource Management and timber management. These restrictions would likely reduce but not preclude sustained-yield timber harvest contribution from these areas. Potential mitigation measures, such as adjusting timber harvest practices to include or increase retention levels in regeneration harvests in these overlapping areas could reduce or avoid this conflict. Nevertheless, potential restrictions on timber harvest in these areas add a small level of uncertainty to the ASQ calculations.

Table 3-57. Compatibility of sustained-yield management regimes with VRM classifications

Classification	HITA (Even-aged Management)	LITA/MITA/No Action (Two-aged Management)	OHTA/UTA (Uneven-aged Management)
VRM I			
VRM II			
VRM III			
VRM IV			

Dark grey boxes indicate that the management regime would generally be incompatible.
Cross-hatched boxes indicate that the management regime may be compatible.
Light grey boxes indicate that the management regime would generally be compatible.

Recreation Management Areas

Within Special Recreation Management Areas (SRMA), the BLM would manage and protect specific recreation opportunities and recreation setting characteristics on a long-term basis. This recreation management may restrict timber harvest where SRMAs overlap with the Harvest Land Base, which occurs in varying amounts: no acres in Alternative A; 581 acres in Alternative B; 6,339 acres in Alternative C; 9,967 acres in Alternative D; and 7,926 acres in the Proposed RMP. In some areas of overlap, timber harvest may be compatible with recreation management. Where incompatible, recreation management would restrict, but not preclude, timber harvest. Potential mitigation measures, such as adjusting timber harvest practices to include or increase retention levels in regeneration harvests in these overlapping areas could reduce or avoid this conflict. The calculation of the ASQ did not attempt to account for restrictions in timber harvest in these areas for the No Action Alternative or Alternatives A, B, C, or D, but vegetation modeling did account for these effects for the Proposed RMP in order to ensure compatibility with SRMA management and produce a more accurate ASQ estimate. In the Proposed RMP, the BLM designated SRMAs overlapping the Harvest Land Base on O&C lands as Uneven-aged Timber Area in the western half of the Klamath Falls Field Office, the Medford District, and the South River Field Office of the Roseburg District. In the Coos Bay, Eugene, and Salem Districts, and the Swiftwater Field Office of the Roseburg District, the BLM designated these overlapping SRMAs as Low Intensity Timber Area.

In summary, restrictions on timber harvest in the Harvest Land Base would have varying levels of influence on the ASQ and would present varying levels of uncertainty about the ASQ calculation among the alternatives and the Proposed RMP. The quantified effects on the ASQ would be substantial for protection of future marbled murrelet sites in Alternative D and the Proposed RMP, and the management of known and historic northern spotted owl sites in Alternative D and Sub-alternative B. The northern spotted owl site management direction under the Proposed RMP of avoiding incidental take from timber harvest until the beginning of a barred owl management program would have no effect on ASQ projections. Although the effect is quantified here, the potential restrictions related to future marbled murrelet sites in the No Action alternative, Alternatives B, C, and D, Sub-Alternative B, and the Proposed RMP present uncertainty. Also quantified here, the action alternatives and the Proposed RMP would have potential uncertainty regarding restrictions to future North Coast DPS red tree vole sites. Unquantified potential restrictions on timber harvest would present substantial uncertainty in the ASQ calculation for the No Action alternative, especially related to implementation of Survey and Manage measures and forest management within Adaptive Management Areas. Areas of modeled and overlapping designations could result in potential restrictions on timber harvest in some alternatives and the Proposed RMP, most notably where the High Intensity Timber Area in Alternative C would overlap with designations for Wild and Scenic Rivers, VRM Class II, VRM Class III, or SRMAs.

Issue 3

What would be the total timber harvest volume, including timber harvested from the reserve land use allocations, under each alternative?

Summary of Analytical Methods

In addition to the calculation of the ASQ described above, the Woodstock model also provided calculations of timber volume produced from reserve land use allocations. In contrast to the ASQ volume, timber volume that would be produced as a by-product of silvicultural treatments in reserve land use allocations (i.e., non-ASQ volume) would change over time and eventually decline in moist forest areas. Therefore, the volume from reserve land use allocations does not constitute sustained-yield timber production and does not contribute to the ASQ. The calculation of the non-ASQ volume for each alternative and the Proposed RMP was also a direct output from the vegetation modeling, but reflected modeling assumptions about the intensity and extent of thinning needed to achieve the management objectives of the reserve land use allocations.

Background

The management direction in the 1995 RMPs directed thinning in the Late-Successional Reserve and Riparian Reserve to attain the management objectives of those land use allocations and permitted timber salvage after disturbance under certain conditions. However, as noted in the BLM plan evaluations, the analysis for the 1995 RMPs did not include an assessment of the potential harvest volume from the reserve allocations, hardwood conversion, or reserve salvage harvest (USDI BLM 2012, p. 11).

Affected Environment and Environmental Consequences

Between 1995 and 2012, the BLM has sold an average of 167 MMbf of timber annually in the decision area, including both ASQ and non-ASQ volume. Between 2004 and 2012, the BLM sold an average of 73 MMbf of non-ASQ timber annually, out of an average total timber volume sold of 201 MMbf. In 2011 and 2012, non-ASQ volume averaged 38 percent of total timber volume sold in the decision area (**Figure 3-66**).

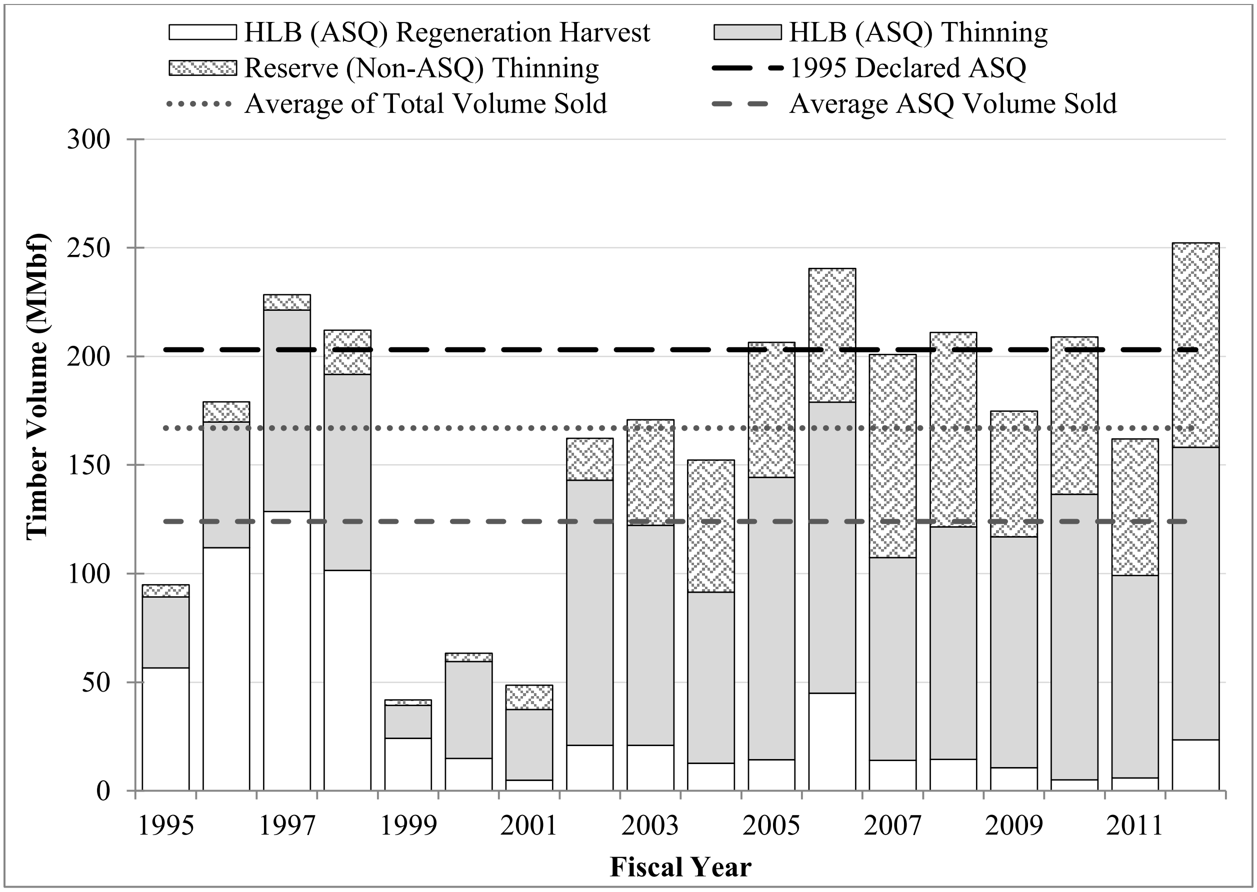


Figure 3-66. Total ASQ vs. Non-ASQ timber volume sold in the decision area between 1995 and 2012

In **Figure 3-66**, the 1995 through 2010 data comes from office data requests for the 2012 Resource Management Plan Evaluation Report. 2011 and 2012 data was generated from Forest Resource Information System data entered through October 23, 2014. Due to continual updates and data correction, these estimates may be different from other estimates generated at different times or from different sources.

Alternative C would have the highest total harvest volume at 555 MMbf per year during the first decade, while Alternative D would have the least, with 180 MMbf per year. The Proposed RMP would produce 278 MMbf of total timber harvest volume per year during the first decade (**Figure 3-67** and **Table 3-58**).[61] The No Action alternative would provide the most non-ASQ volume in the first decade, followed by Alternative B, Sub-alternative B, and the Proposed RMP. Alternatives A and D would provide the least non-ASQ volume. The amount of non-ASQ volume under the alternatives and the Proposed RMP would be influenced heavily by management direction for reserve thinning and the forest conditions within the reserve.

[61] Both **Figure 3-67** and **Table 3-58** contain minor errors associated with rounding.

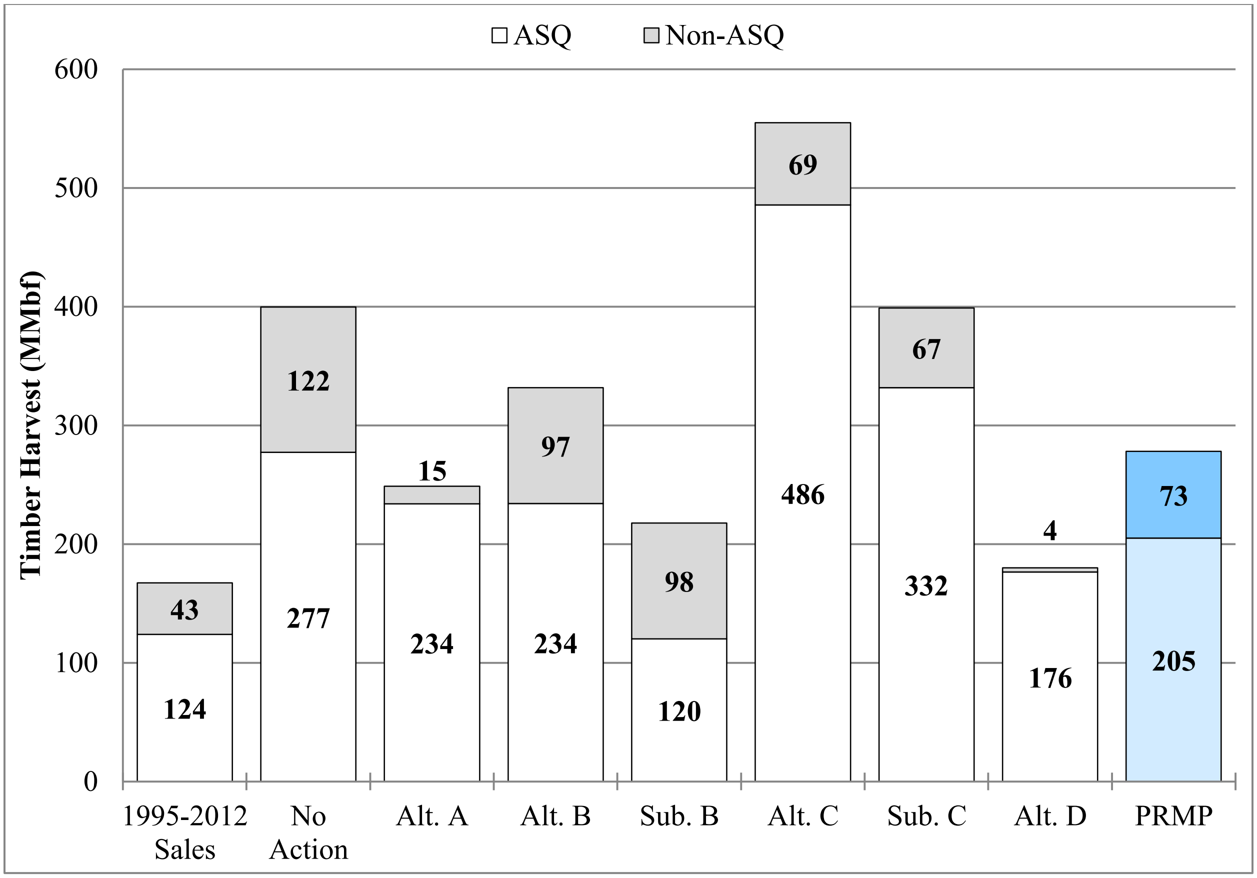


Figure 3-67. Total annual timber harvest in the decision area for the first decade compared to the 1995–2012 sold timber sale average, broken out between ASQ and non-ASQ sources

Table 3-58. Total annual timber harvest volume for the first decade by ASQ and non-ASQ sources

Alternative/ Proposed RMP	Coos Bay		Eugene		Klamath Falls		Medford		Roseburg		Salem		Totals (MMbf)
	ASQ (MMbf)	Non-ASQ (MMbf)	ASQ (MMbf)	Non-ASQ (MMbf)	ASQ (MMbf)	Non-ASQ (MMbf)	ASQ (MMbf)	Non-ASQ (MMbf)	ASQ (MMbf)	Non-ASQ (MMbf)	ASQ (MMbf)	Non-ASQ (MMbf)	
No Action	46	22	58	31	8	-	73	12	55	17	37	41	**400**
Alt. A	46	-	63	-	3	1	27	11	25	3	71	-	**249**
Alt. B	23	24	56	26	7	-	42	16	35	12	71	19	**332**
Sub. B	14	24	25	26	4	-	15	16	14	12	47	19	**218**
Alt. C	82	15	138	17	10	-	54	12	78	10	124	15	**555**
Sub. C	66	15	103	17	3	-	24	10	51	9	85	15	**399**
Alt. D	22	-	45	1	5	-	28	1	22	1	54	1	**180**
PRMP	12	18	53	20	6	-	37	14	32	9	65	12	**278**

The non-ASQ timber volume under Alternative D would be very low (4 MMbf per year during the first decade), because few if any stands allocated to the Late-Successional Reserve would require silvicultural treatments. Most timber harvesting in reserves in this alternative would be restricted to a small outer zone in the Riparian Reserve. This Riparian Reserve thinning would provide almost all of the non-ASQ volume under Alternative D.

The non-ASQ timber volume under Alternative A would be low (15 MMbf per year during the first decade), because Alternative A would employ non-commercial silvicultural treatments in moist forest reserves. The small non-ASQ volume in Alternative A would be produced almost entirely in the interior/south areas where removal of cut trees would be needed to manage fuels and promote forest resiliency.

The No Action alternative generally precludes management of stands over 80 years old in reserves. In the Late-Successional Reserve and Riparian Reserve in the dry forest, none of the action alternatives and the Proposed RMP specifies an age limit for determining treatment eligibility. Alternative B and Sub-alternative B limit timber harvest in the Late-Successional Reserve in the moist forest to stands less than 120 years old. None of the other action alternatives or the Proposed RMP would specify an age limit for silvicultural treatments in the reserve land use allocations in the moist forest. Instead, treatment eligibility for reserves would generally be based on habitat evaluations, rather than specific age limits. Regardless of the variation in age limits prescribed in the management direction, the BLM assumed that the majority of reserve treatments would occur in stands less than 80 years old in moist forests, and would not occur within older, more structurally-complex forests, as defined in the alternatives and the Proposed RMP in dry forests.

The non-ASQ volume would decline in future decades, as fewer moist forest stands would need silvicultural treatments to achieve Reserve land use allocation management objectives. This decline would be more pronounced in the coastal/north area than in the interior/south due to the higher proportion of dry forest reserves in the south. Under the action alternatives and the Proposed RMP, the BLM assumed that management in the Late-Successional Reserve in the dry forest would include stand density reduction, cultivation and release of large trees with old-growth characteristics, and introduction of heterogeneity into increasingly uniform stands. As described in more detail in the Fire and Fuels section in this chapter, the BLM assumed that mechanical treatments would be necessary to both restore dry forest stands and maintain them in a restored condition in order to increase stand resiliency to fire, disease, and the potential, yet unknown effects from climate change. This would involve selection harvest on a variable, but perpetual, re-entry cycle to keep stands from becoming overstocked. As a result, the non-ASQ volume associated with silvicultural treatments of the Late-Successional Reserve would not taper off to zero except in the No Action alternative and Alternative D (**Table 3-59**) in the dry forest.

Table 3-59. Annual non-ASQ timber harvest by decade: coastal/north vs. interior/south

Alternative/ Proposed RMP	Area	2023 (MMbf)	2033 (MMbf)	2043 (MMbf)	2053 (MMbf)	2063 (MMbf)	2113* (MMbf)
No Action	Coastal/North	94	87	76	63	46	-
	Interior/South	29	28	28	25	18	-
Alt. A	Coastal/North	0.1	0.1	0.2	0.8	0.3	0.3
	Interior/South	15	10	11	10	17	19
Alt. B	Coastal/North	70	66	57	47	33	-
	Interior/South	27	22	22	20	23	18
Sub. B	Coastal/North	70	66	57	47	33	-
	Interior/South	27	22	22	20	23	18
Alt. C	Coastal/North	47	45	38	31	22	-
	Interior/South	22	18	17	16	16	11
Sub. C	Coastal/North	48	45	38	31	22	-
	Interior/South	20	13	12	11	19	2
Alt. D	Coastal/North	2.6	2.4	2.0	1.6	0.9	-
	Interior/South	1.1	1.0	1.0	0.9	0.6	-
PRMP	Coastal/North	50	48	41	34	24	-
	Interior/South	22	18	17	14	17	16

* This table has minor errors associated with rounding.

In summary, all alternatives and the Proposed RMP would result in higher total harvest volumes in the first decade than the average annual timber sale volumes from the decision area since 1995, which averaged 167 MMbf per year. Although Sub-alternative B has the lowest ASQ volume, the total harvest volume would be 218 MMbf per year compared to 180 MMbf per year under Alternative D. Alternative C would have the highest total annual harvest in the first decade with 555 MMbf per year followed by the No Action alternative with 400 MMbf per year. The Proposed RMP would produce 278 MM bf per year of total timber harvest volume in the first decade. Non-ASQ timber harvest volumes would decline and eventually disappear in the moist forest Late-Successional Reserve, while non-ASQ timber harvest from dry Late-Successional Reserve would generally continue in future decades.

Issue 4

What log sizes would be harvested under each alternative?

Summary of Analytical Methods

The outputs from the Woodstock model grouped harvested timber volume into four generalized size/quality groups (**Table 3-60**). The BLM based these groupings on small end diameter inside bark from harvest tables, including taper assumptions by species group. Minimum merchantability standards were used in the vegetation modeling defining a minimum merchantable log as 8 feet long to a small end log diameter of 5 inches with 8 inches of trim, and a minimum tree DBH of 7 inches.

Table 3-60. Log size groups by small end diameter inside bark diameter class

Size Group	Small End Log Diameter Class (Inches)
1	> 20
2	12–20
3	8–11
4	5–8

Affected Environment and Environmental Consequences

Because the vast majority of BLM timber harvesting in the past decade has come from thinning stands less than 80 years old, most of the timber volume has been coming from log size groups 2 through 4, with relatively little timber volume being produced in log size group 1 (logs greater than 20”).

The percentage of timber harvested in log size groups 2, 3, and 4 would differ only slightly among the alternatives and the Proposed RMP. However, the alternatives and the Proposed RMP would differ more substantially in the percentage of timber harvested in log size group 1. Log size is generally smaller in younger stands, and taking older, more structurally-complex forests out of the Harvest Land Base would increase the reliance on timber harvest in younger stands. The percentage of timber in log size group 1 would be lowest in Sub-alternative C, at 5 percent of total volume; because Sub-alternative C would reserve all stands currently older than 80 years old. The percentage of timber in log size group 1 would be highest in the No Action alternative, which does not specifically reserve older, more structurally-complex forest, and in Alternative C, which would reserve all stands currently older than 160 years old. Under the Proposed RMP, the BLM would produce 9 percent of total timber harvest volume in log size group 1 in the first 5 decades of implementation (**Table 3-61**).

Table 3-61. Percentage of total timber harvest volume in the decision area by log size group; first 5 decades

Log Size Group	No Action (Percent)	Alt. A (Percent)	Alt. B (Percent)	Sub. B (Percent)	Alt. C (Percent)	Sub. C (Percent)	Alt. D (Percent)	PRMP (Percent)
1	14%	10%	10%	9%	14%	5%	11%	9%
2	50%	52%	50%	48%	51%	47%	47%	50%
3	22%	23%	23%	24%	21%	28%	24%	24%
4	15%	16%	16%	18%	14%	20%	18%	17%

Issue 5

What harvest types and silvicultural practices would the BLM apply under each alternative?

Summary of Analytical Methods

In the vegetation modeling, the BLM made assumptions for harvest types consistent with the management direction for each alternative (**Appendix C**). These harvest types fall into the following five categories:

- Commercial thinning
- Selection harvest
- Variable-retention regeneration harvest
- Clear-cut harvest
- Salvage

Non-commercial thinning in the Late-Successional Reserve and Riparian Reserve in Alternative A and the middle zone of the Riparian Reserve – Moist of Class I subwatersheds in the Proposed RMP would generally not include timber harvest, as the BLM would fell the timber and leave it on site. Non-commercial thinning is not reported in the timber harvest categories, but it is included in the report on silvicultural treatments (**Table 3-63**). Timber harvest implemented in the Late-Successional Reserve in the dry forest is categorized as selection harvest in the action alternatives and the Proposed RMP, but as thinning in the No Action alternative, because of differences in management direction. Variable-retention regeneration harvesting would include all regeneration harvest practices in the Matrix and Adaptive Management Area in the No Action alternative, regeneration harvest in the Moderate Intensity Timber Area and Low Intensity Timber Area in Alternative B, Sub-alternative B, and the Proposed RMP, and regeneration harvest in the Moderate Intensity Timber Area in Alternative D. All timber harvesting in the Uneven-aged Timber Area in all action alternatives and the Proposed RMP, and in the Owl Habitat Timber Area in Alternative D, is in the selection harvest category, with the exception of salvage.

The Woodstock model predicted the acreage of silvicultural treatments associated with timber harvest for each decade under each alternative and the Proposed RMP. These silvicultural treatments include fuels reduction, site preparation, planting, stand maintenance and protection, pruning, stand conversion, pre-commercial thinning, and fertilization. The extent of many silvicultural treatments is linked directly to the amount and type of regeneration harvest implemented. For example, following a regeneration harvest, the BLM would typically implement site preparation, tree planting, and stand maintenance. The BLM assumed that no aerial fertilization would be implemented under Alternatives B and D, Sub-alternative B, and the Proposed RMP because of their forest management practices. Modeling assumptions about post-fire timber salvage are used to approximate the management direction for salvaging after natural disturbances included in **Appendix B** by land use allocation. For the Harvest Land Base in all alternatives and the Proposed RMP, except for the Owl Habitat Timber Area in Alternative D, the BLM assumed that timber salvage would occur after high- and moderate-severity fire events. In the Owl Habitat Timber Area in Alternative D, and the Late-Successional Reserve in Alternative C, the BLM assumed that timber salvage would occur only after high-severity fire events. The BLM only modeled timber salvage volume from reserves in Alternative C. With the exception of wildfire and associated salvage, the BLM did not simulate the occurrence of large-scale episodic natural disturbances in the vegetation modeling, including insect and disease outbreaks or wind-throw; however, the management direction in **Appendix B** provides salvage guidance for all natural disturbances.

Affected Environment and Environmental Consequences

The 1995 RMPs estimated levels of silvicultural treatments that would occur under implementation of the plan, but the BLM has generally not achieved these levels of treatments. The BLM plan evaluations concluded that implementation of the timber management program was departing substantially from the outcomes predicted in the 1995 RMPs (USDI BLM 2012). On average, implementation of regeneration harvests has been 26 percent of levels anticipated in the 1995 RMPs, varying from 9 percent to 36 percent among districts. Commercial thinning has averaged 137 percent of levels anticipated in the 1995 RMPs, varying from 95 percent to 569 percent among districts. With the exception of commercial thinning, the levels of silvicultural activities within the decision area (**Table 3-62**) have been substantially less than anticipated in the 1995 RMPs. Average decadal accomplishments in the decision area since 1995 include 14,275 regeneration harvest acres sold and 122,245 acres of thinning sold. For this calculation, timber salvage is lumped into either the regeneration harvest category or the thinning category where it is the most similar. The levels of reforestation treatments have been directly affected by the timber harvest activities that the BLM has implemented. The lack of anticipated regeneration harvest levels and the shift to commercial thinning has reduced the extent of reforestation and young stand management activities since 1995.

Table 3-62. Average decadal silvicultural treatment accomplishment acres in the decision area, 1996–2012

Silvicultural Treatment	Coos Bay (Acres)	Eugene (Acres)	Klamath Falls (Acres)	Medford (Acres)	Roseburg (Acres)	Salem (Acres)	Totals (Acres)
Fertilization	14,213	1,511	-	1,389	3,440	2,903	**23,456**
Pre-commercial Thinning	18,135	21,374	10,352	26,423	36,428	27,082	**139,793**
Pruning	8,786	4,174	406	6,079	5,791	2,723	**27,960**
Slash Disposal and Site Preparation	2,928	2,759	30,727	129,829	4,573	6,522	**177,338**
Stand Conversion	489	-	92	-	-	121	**703**
Stand Maintenance and Protection	25,552	13,032	2,053	17,860	12,958	22,330	**93,784**
Tree Planting	5,170	4,243	2,236	22,156	4,726	4,851	**43,383**

Alternative C would have the largest acreage of clear-cutting and the largest acreage of regeneration harvest overall in the first two decades (**Figure 3-68**). The No Action alternative would have the largest acreage of variable-retention regeneration harvest. Alternative D would have the largest acreage of selection harvest. Based on simulations of wildfire occurrence and subsequent salvage harvest, salvage harvest would occur on a small acreage under all alternatives and the Proposed RMP (359 acres per year or less). Alternative C would have the largest salvage harvest acreage, in part because Alternative C would direct the salvage in the Late-Successional Reserve after natural disturbances to recover economic value. The Proposed RMP would result in the second highest level of variable-retention regeneration harvesting, and the third highest level of selection harvesting. Since the BLM did not simulate the occurrence of other large-scale episodic natural disturbances besides wildfire in the vegetation modeling, these salvage figures are likely underestimated.

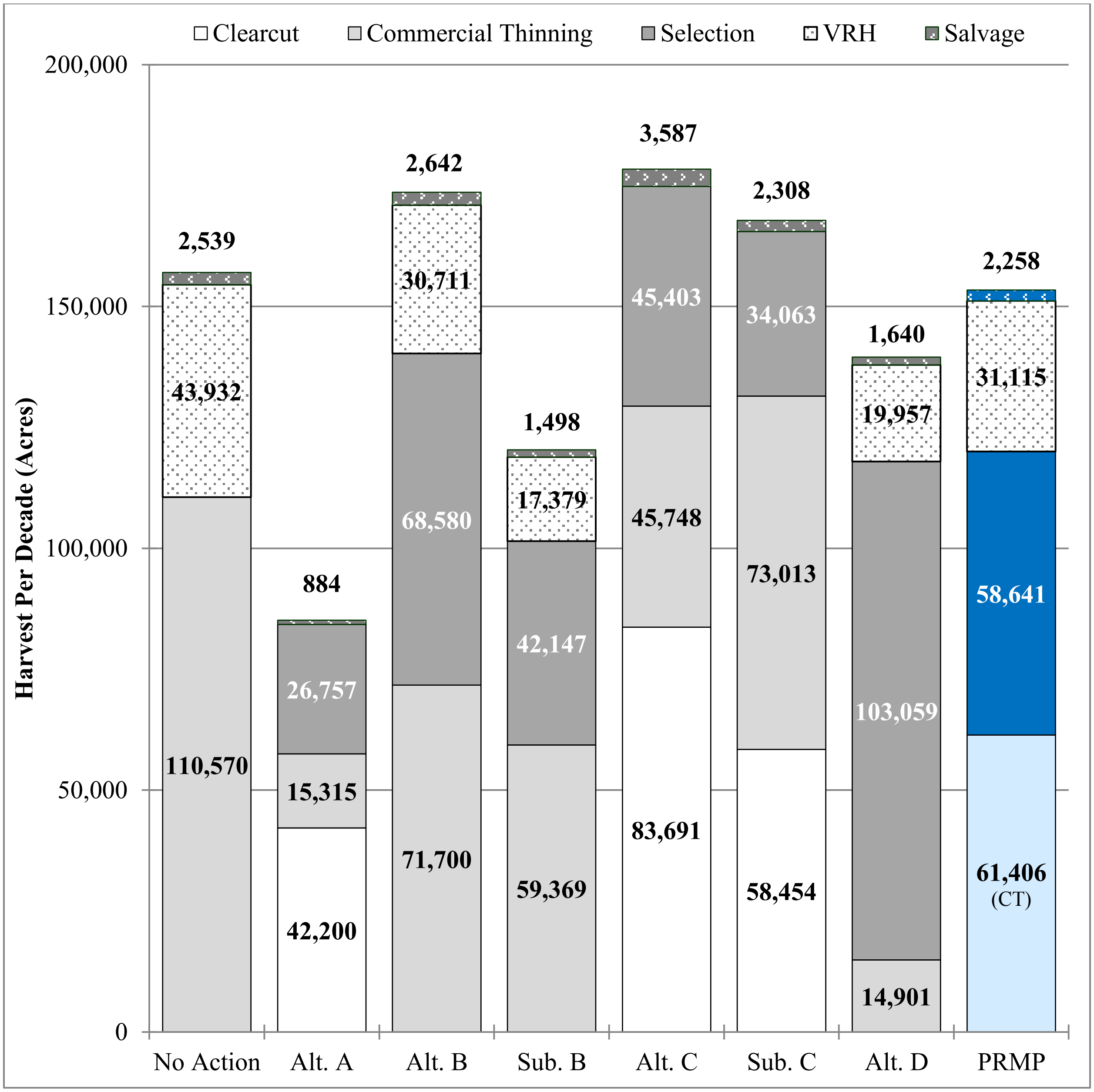


Figure 3-68. Harvest acres per decade by harvest type based on an average of the first two decades

The acreage of timber harvest would not mirror the volume of timber harvest, as discussed above in the issue on the annual productive capacity. The dramatic difference in the timber volume per acre among the harvest types results in different patterns in acres that would be harvested and timber volume among the alternatives and the Proposed RMP (**Figure 3-68** and **Figure 3-69**). For example, Alternative A would harvest the fewest total acres, but would harvest the sixth-highest timber volume. Alternative B would harvest the second-largest acreage, but would harvest the fourth-highest timber volume. Alternative D would harvest the fifth-highest acreage, but would harvest the least timber volume. These relationships are explained by the average timber volume per acre removed, which varies by harvest type, and is influenced by the log size class of timber eligible for harvest in each alternative and the Proposed RMP.

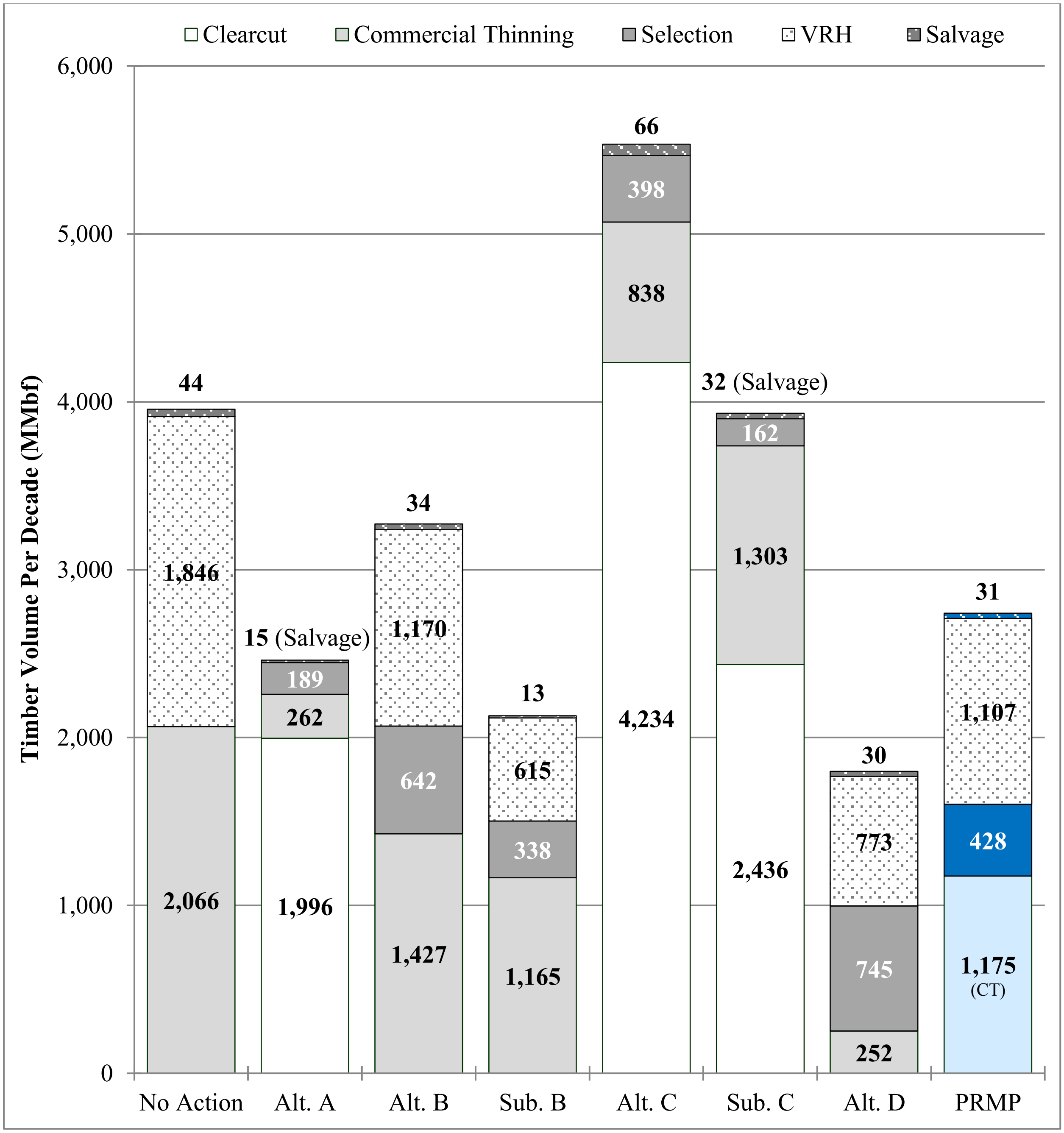


Figure 3-69. Harvested timber volume per decade by harvest type based on an average of the first two decades

Average timber harvest volume per acre also varies between the coastal/north and interior/south areas. Total annual timber harvest acreage is higher in the coastal/north area in the No Action alternative and Alternative C, and higher in the interior/south area in Alternative B and the Proposed RMP. Total annual harvest acreage in the other alternatives is relatively comparable between the coastal/north and the interior/south (**Figure 3-70**). However, total harvested timber volume per year is substantially higher in the coastal/north area than the interior/south in all alternatives and the Proposed RMP (**Figure 3-71**).

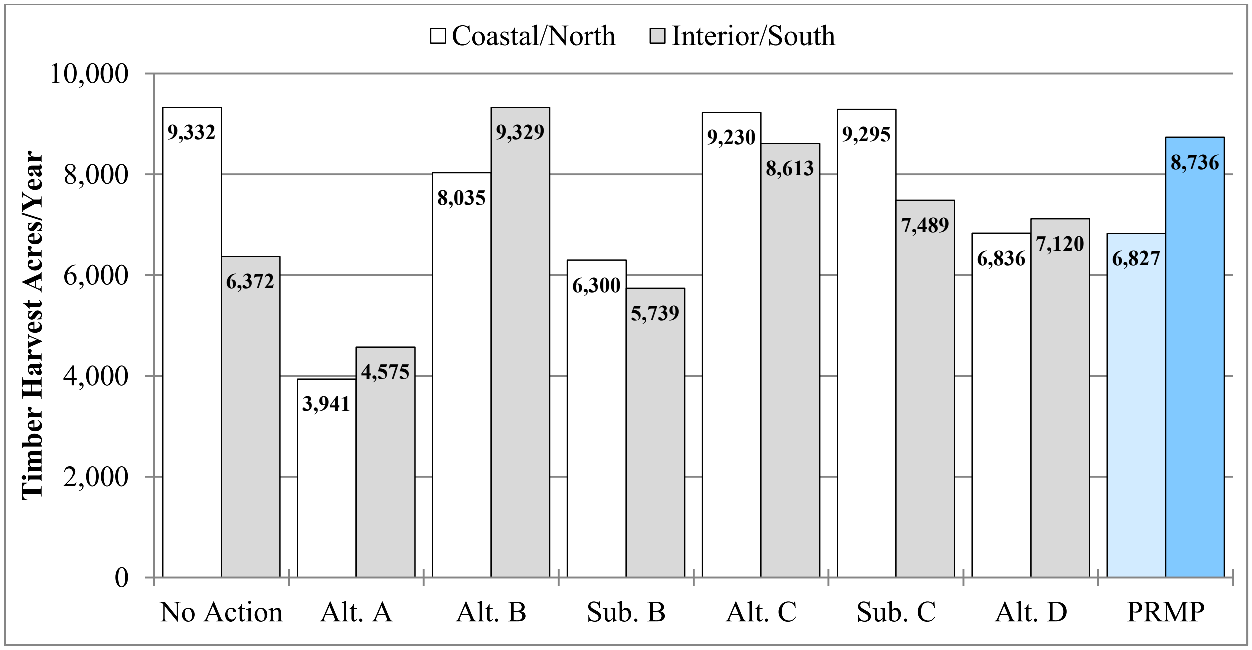


Figure 3-70. Total timber harvest acreage per year based on an average of the first two decades, broken out between coastal/north and interior/south areas

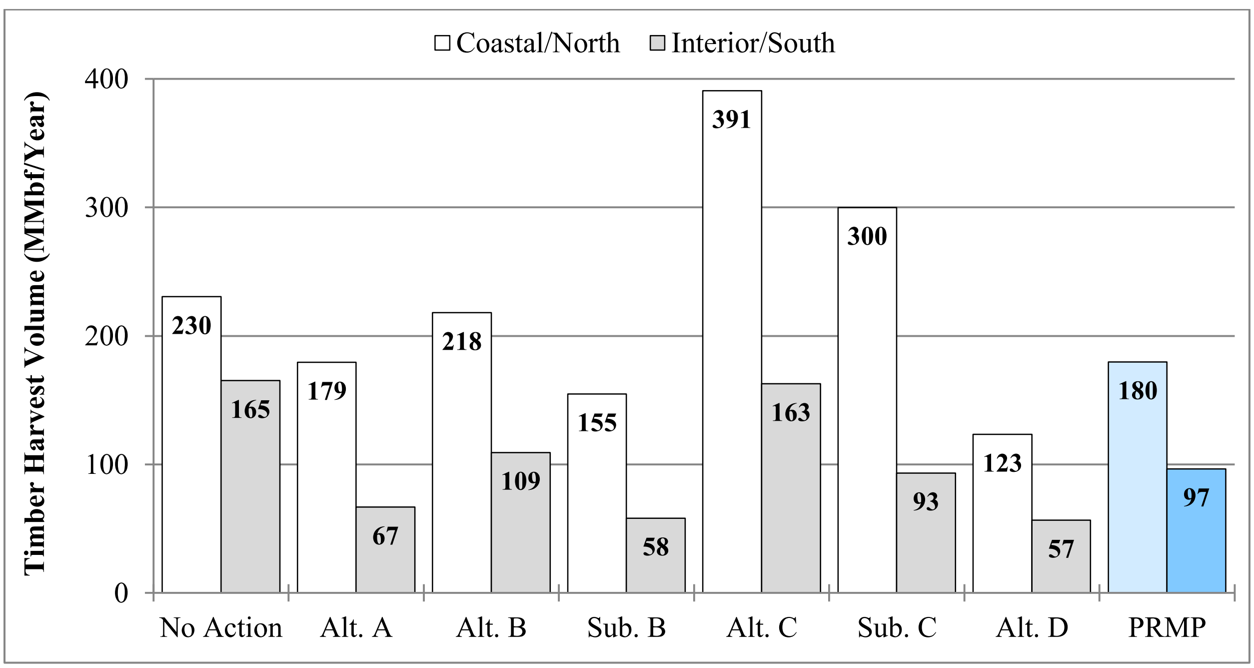


Figure 3-71. Total timber harvest volume per year based on an average of the first two decades, broken out between coastal/north and interior/south areas

The acreage of most silvicultural treatments, especially reforestation, site preparation, and stand maintenance activities that would occur under the alternatives and the Proposed RMP is correlated with the acreage of regeneration harvest (i.e., clear-cutting and variable-regeneration retention harvest). Uneven-aged management regimes would also require reforestation, site preparation, and stand maintenance activities, but these activities would only be undertaken on a portion of the treatment acres in a given decade. Alternative C would have the most acres of total silvicultural treatments and Alternative D would have the least acres of treatments (**Table 3-63**).

Table 3-63. Silvicultural treatment acreages per decade based on an average of the first two decades

Treatment Type	No Action (Acres)	Alt. A (Acres)	Alt. B (Acres)	Sub. B (Acres)	Alt. C (Acres)	Sub. C (Acres)	Alt. D (Acres)	PRMP (Acres)
Non-commercial Thinning	-	12,957	-	-	-	-	-	2,215
Under Burn	8,907	16,760	16,571	9,871	33,152	23,792	10,410	15,832
Hand Pile and Burn	24,734	23,309	35,349	21,950	45,751	36,590	25,822	32,232
Landing Pile and Burn	5,402	3,089	6,313	3,926	6,479	7,158	4,955	5,468
Machine Pile and Burn	14,780	7,429	13,353	9,874	17,907	17,197	10,313	11,274
Slash and Scatter	20,201	14,231	30,092	18,390	27,437	22,248	22,280	28,109
Mastication	3,010	4,669	3,902	2,129	10,664	7,488	2,352	4,056
Planting	55,999	57,223	44,750	27,154	117,004	82,669	38,064	52,833
Stand Maintenance and Protection	82,573	89,061	77,213	45,432	181,801	130,114	60,578	82,696
Pre-commercial Thinning	54,366	49,570	43,778	25,429	97,420	69,758	26,148	41,108
Fertilization	10,989	15,606	-	-	19,139	36,222	-	0
Pruning	3,498	4,362	3,878	2,119	9,474	6,516	2,740	3,910
Stand Conversion	114	295	216	164	555	436	139	106
Totals	**284,573**	**298,561**	**275,415**	**166,438**	**566,783**	**440,188**	**203,801**	**279,839**

In summary, Alternative C would have the most acres of clear-cutting per decade, followed by Sub-alternative C and Alternative A. The No Action alternative would have the most acres per decade of variable-retention regeneration harvesting, followed by the Proposed RMP. Alternative D would have the most acres of selection harvest followed by Alternative B. Timber harvest acreages by harvest type for the Proposed RMP are bracketed by the alternatives. Silvicultural treatments acres would be correlated most strongly to the number of acres of clear-cutting and variable-retention regeneration harvesting, although other harvest types would also require silvicultural treatments to a lesser degree. Total annual timber harvest acreage is higher in the coastal/north area in the No Action alternative and Alternative C, and higher in the interior/south area in Alternative B and the Proposed RMP. However, total annual timber harvest is substantially higher in the coastal/north areas in all alternatives and the Proposed RMP.

Issue 6

How would each alternative affect the availability of special forest products?

Summary of Analytical Methods

In this analysis, the BLM divided special forest products into two broad categories:[62]

- **Category I**—Disturbance-associated special forest products – Christmas trees, wood products, manzanita, huckleberries, beargrass, pine cones, morels, etc.
- **Category II**—Disturbance-averse special forest products – ferns, wild ginger, mosses, hemlock cones, chanterelles and matsutakes, coniferous boughs, and burls, etc.

The BLM assumed for the analysis that disturbances such as timber harvest, prescribed fire, and wildland fire would produce the conditions that would support the availability of Category I special forest products; areas without these disturbances would support the availability of Category II special forest products. The BLM assumed that less intensive treatments such as pre-commercial thinning, fuels reduction, and fertilization would have no effect on conditions for the availability of either category of special forest products, although the BLM recognizes that there are site and species-specific exceptions to this assumption. The more acres that would be disturbed by timber harvest, prescribed fire, and wildland fire in the decision area, the more acres would be available for harvest of Category I species. The more acres that would be undisturbed in the decision area, the more acres would be available for harvest of Category II special forest products.

In this analysis, the BLM considered acres without timber harvest, prescribed fire, or wildland fire within the previous 20 years as undisturbed and therefore supporting Category II special forest products. The BLM used outputs from the Woodstock model to estimate future disturbed and undisturbed areas, in order to compare special forest product availability between the alternatives and the Proposed RMP.

This analysis only addresses broad characterizations of the availability of special forest products. The BLM lacks information on the extent to which availability would affect the collection of special forest products or other factors that would affect collection. The number of available acres suitable for the collection of these products does not forecast future demand or sustainable harvest levels for each of these products. The BLM also assumed that public access was available to all lands that would be available to special forest products harvesting, although the BLM recognizes reciprocal right-of-way agreements are distinctly different across the decision area, and may limit access for certain special forest products; legal access may also be limited on some portions of BLM-administered lands. Finally, each specific product has fine-scale associations by aspect, plant association, and other unique site-level factors beyond disturbance history. The BLM does not have sufficient product-specific, species-specific, or site-specific information at the scale of analysis to refine this analysis beyond the broad categories of special forest products and the broad characterizations of disturbance.

[62] These categories are not a formal designation and are simply labeled here for the purpose of analysis. Some products fit in both categories, and some are conditionally included in one category or the other. For example, manzanita may benefit from open conditions created by disturbance, and be considered to be a Category 1 species, or depending on the type of disturbance, manzanita abundance could be reduced, making it fit better as Category II. Despite acknowledged limitations and site-specific nature of these generalized conceptual categories, the BLM believes that this analytical framework is useful in evaluating relative differences in special forest product availability across large and diverse range of landscapes and species, and long timescales considered in the analysis.

Background

'Special forest products' is a term used to describe some of the vegetative material found on public lands that can be harvested for recreational use, personal use, or as a source of income. They include, but are not limited to, grasses, seeds, roots, bark, burls, berries, mosses, greenery (e.g., fern fronds, salal, and huckleberry), edible mushrooms, boughs, tree seedlings, transplants, poles, posts, and firewood. Trees or logs that are sold as saw timber are not considered special forest products.

Management of special forest products is an important component of resource management in Oregon/Washington BLM. Special forest products are commonly referred to as 'minor forest products' and are restricted to vegetative material. The special forest products program benefits the Oregon/Washington BLM and the public in many ways. These include contributing to the economic stability in local communities, providing critical cultural and subsistence benefits, supporting a variety of cottage industries, forming partnerships with groups concerned with the harvest of management of these products, and providing educational opportunities regarding the value of natural, renewable resources.

Commercial, personal, free use, and free use with a permit are distinct categories for public users on BLM-administered lands, although the boundaries between personal and free use blend. Commercial use of special forest products requires a permit and harvesters generally search for and harvest high value products from patches in a systematic and thorough method for maximum resale value. Many individuals enjoy harvesting or collecting special forest products for their own personal use and tend to harvest smaller quantities, searching less systematically and less thoroughly and at smaller spatial scales. All personal use special forest products, with the exception of those meeting free use conditions, require permits. Free use includes collection and gathering of berries and mushrooms for immediate use and gathering firewood for campfires. 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).

Permits for commercial use and personal use for special forest products include restrictions to help meet ecological and renewable resource standards and to protect other sensitive resource values. Permits may restrict the type of species, harvest quantity, harvest or collection method, location, access, and season.

Field inventories of special forest products that include distribution and abundance, harvest areas, and actual harvest amounts on BLM-administered lands are lacking.

Affected Environment and Environmental Consequences

Currently, approximately 12 percent of the forested lands in the coastal/north area are available for the collection of Category I special forest products, while 17 percent of forested lands in the interior/south area are currently available for collection of these products. Conversely, approximately 88 percent of the coastal/north area and 83 percent of the interior/southern area are currently available for the collection of Category II special forest products. Based on this analysis, the availability of Category I special forest products are more limited than Category II special forest products in the decision area.

Under all alternatives and the Proposed RMP, the interior/south area would consistently have a higher proportion of the forested lands available for the harvesting of Category I special forest products than the coastal/north area (**Figure 3-72** and **Figure 3-73**).

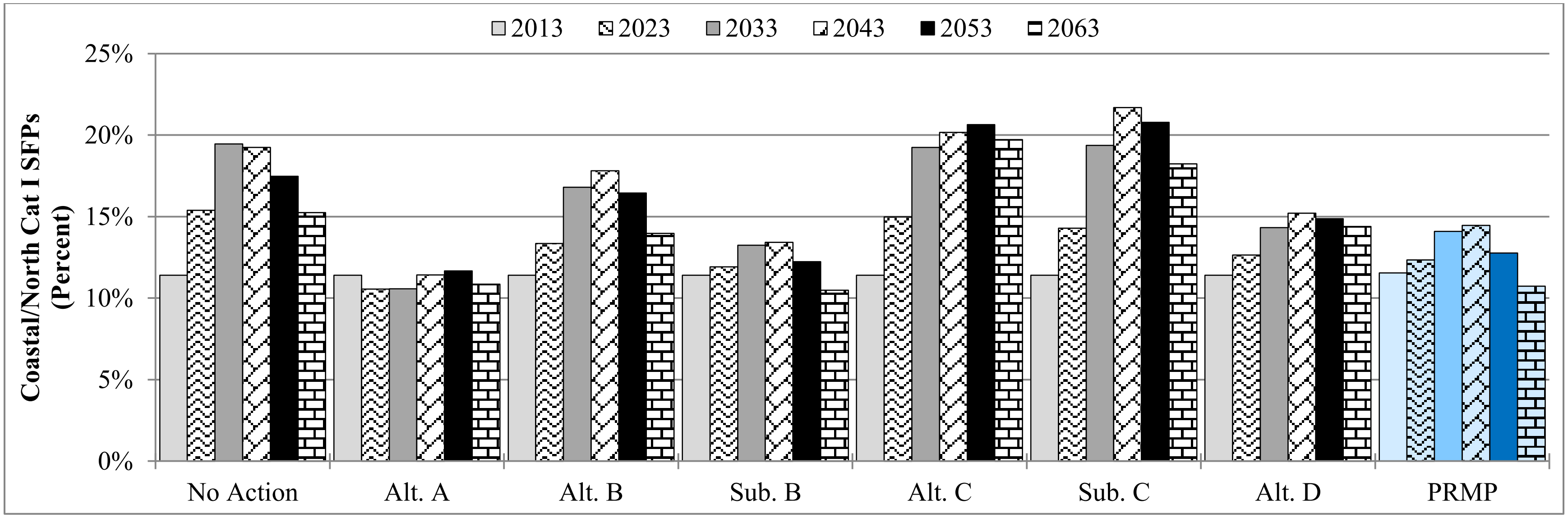


Figure 3-72. Percentage of forested acres available for the collection of Category I special forest products; coastal/north area

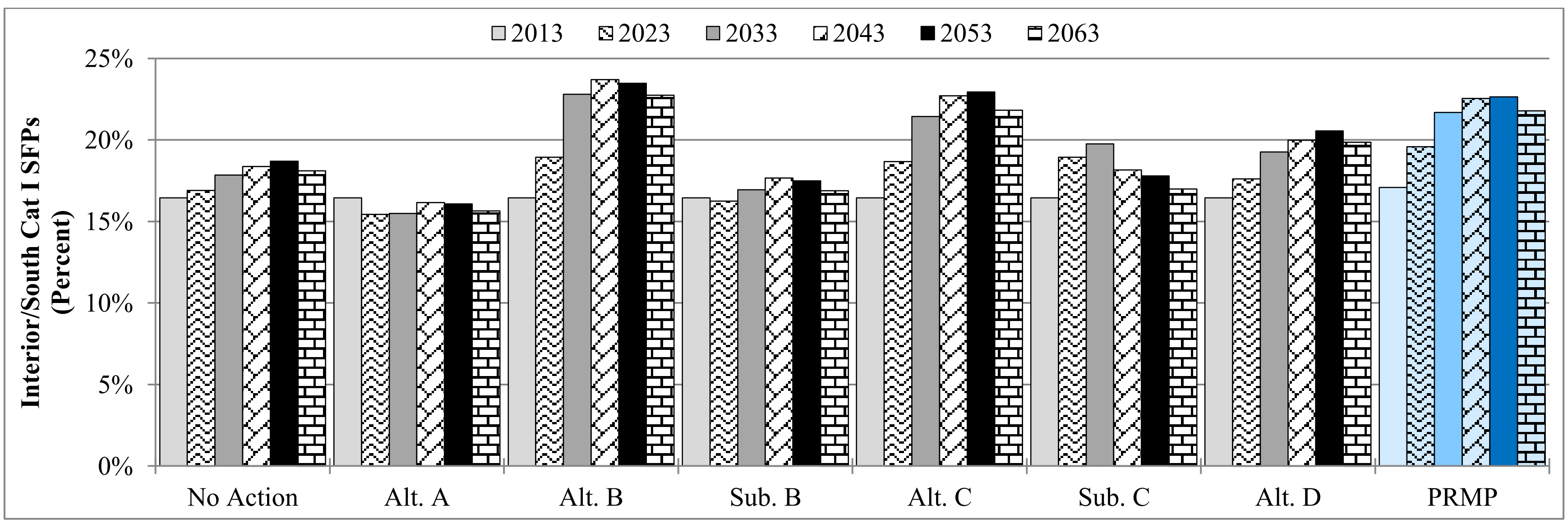


Figure 3-73. Percentage of forested acres available for the collection of Category I special forest products; interior/south area

In the coastal/north, Alternatives C and Sub-alternative C would have the largest acreage available for harvest of Category I special forest products, followed by the No Action alternative and Alternative B. Alternative A would have the smallest acreage suitable for these disturbance-related products. In fact, the acreage available for harvesting Category I special forest products would decline in the coastal/north in the first two decades from current conditions under Alternative A (**Figure 3-72**).

In the interior/south, Alternative B would have the largest acreage available for the collection of Category I special forest products, followed by Alternative C and the Proposed RMP. As in the coastal/north, Alternative A would have the smallest acreage available for the harvesting of these products. The acreage available for harvesting Category I special forest products in the interior/south would decline in the first five decades from current conditions under Alternative A (**Figure 3-73**).

Conversely, the coastal/north would consistently have more acreage available for the collection of Category II special forest products. Regardless of alternative or the Proposed RMP, decade, or region, the proportion of the forested lands available for the collection of Category II special forest products would be above 75 percent of the forested acres in the decision area (**Figure 3-74** and **Figure 3-75**).

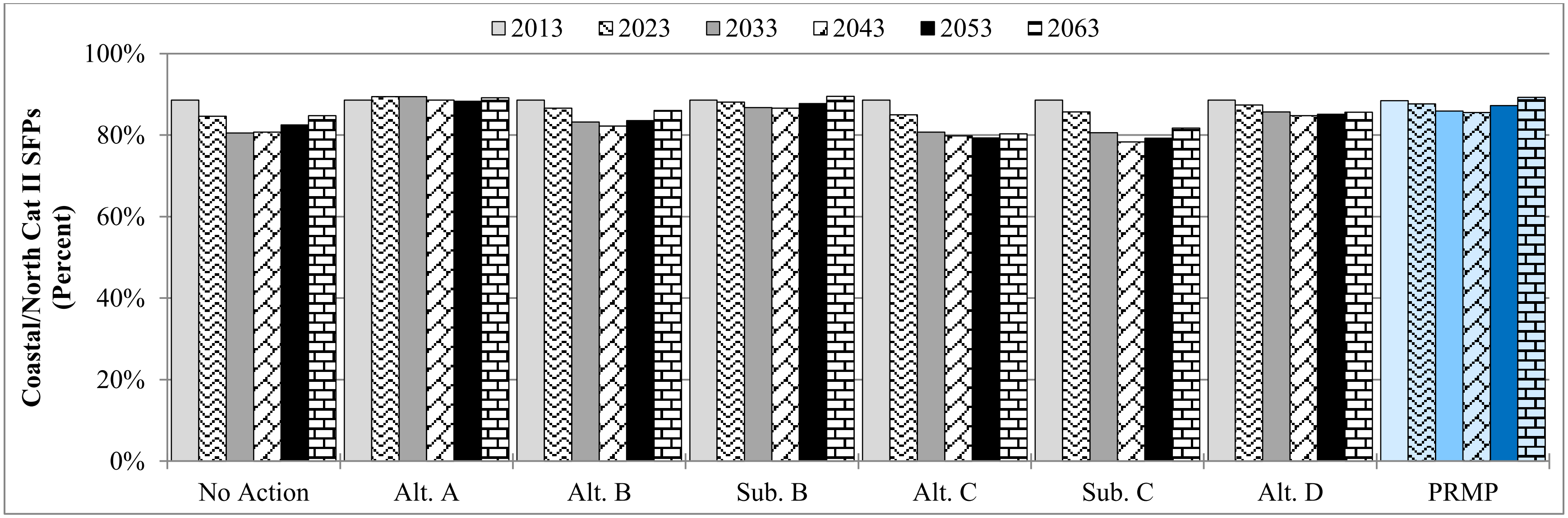


Figure 3-74. Percentage of forested acres available for the collection of Category II special forest products; coastal/north area

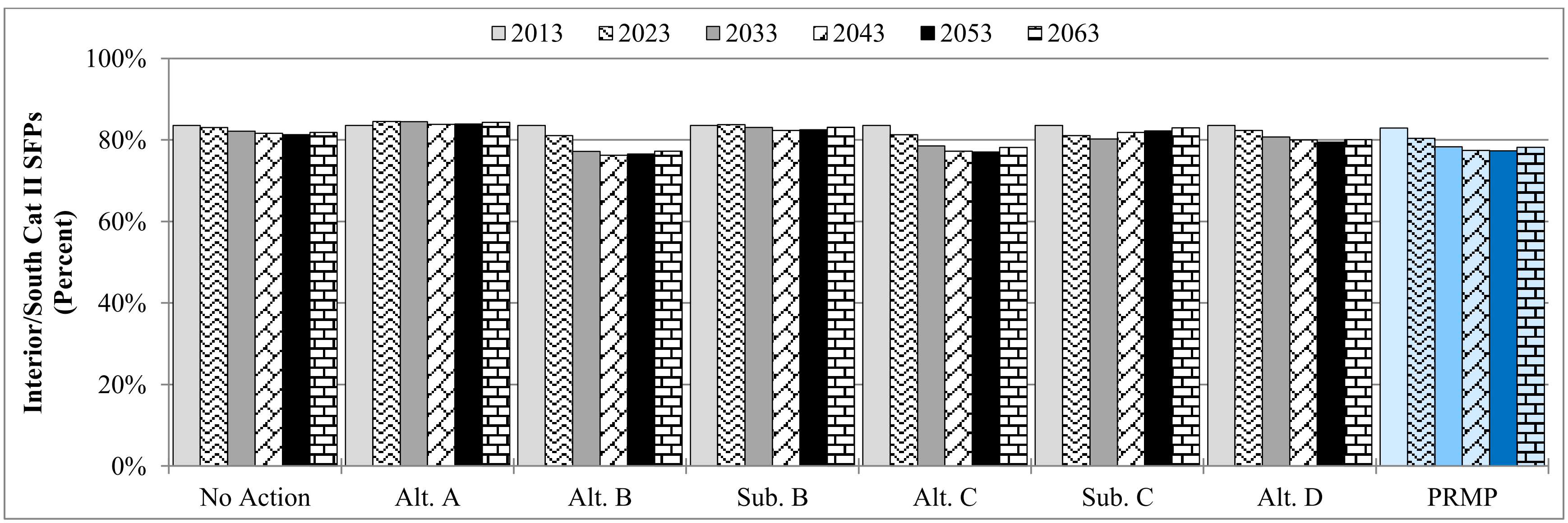


Figure 3-75. Percentage of forested acres available for the collection of Category II special forest products; interior/south area

In summary, the acreage of forests available for the harvesting of Category II (disturbance-averse) special forest products would remain abundant in all alternatives and the Proposed RMP, especially in the coastal/north areas. The acreage of forests available for the harvesting of Category I (disturbance associated) special forest products would be more limiting than Category II special forest products, and consistently higher in the interior/south than the coastal/north due to disturbed acres associated with timber harvest, prescribed fire, and wildland fire. Availability of these forest conditions in the coastal/north areas would be almost completely dependent on harvesting practices. Therefore, the alternatives that have the largest timber harvest acreage would also produce the largest number of acres available for the collection of Category I special forest products. In the coastal/north, Alternative C and Sub-alternative C would have the largest acreage available for harvest of Category I special forest products, followed by the No Action alternative and Alternative B. In the interior/south, Alternative B would have the largest acreage suitable for the collection of Category I special forest products, followed by Alternatives C and the Proposed RMP.

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Hydrology

Key Points

- The BLM analyzed stream shading using two methods. By Method A, all alternatives and the Proposed RMP would avoid any measurable increases in stream temperature. Method B identified a small percentage of streams where forest management in the outer Riparian Reserve under Alternatives B and C would potentially affect stream temperature.
- Less than 1 percent of the decision area would be susceptible to peak flow increases under each alternative and the Proposed RMP. The No Action alternative, Alternatives A and D, and the Proposed RMP would result in slight decreases and Alternatives B and C would result in slight increases in the number of subwatersheds susceptible to peak flow increases.
- Less than 1 percent of the Harvest Land Base would be susceptible to landslides with the potential to deliver sediment to streams under each alternative and the Proposed RMP. Alternative C would have the highest acreage of regeneration harvest in areas susceptible to landslides, and Alternative D would have the lowest acreage.
- Under all alternatives and the Proposed RMP, potential sediment delivery to streams from new road construction would result in less than a 1 percent increase above current levels.

Summary of Notable Changes from the Draft RMP/EIS

In the analysis of landslide risk, the BLM adjusted the threshold for steep slopes from 70 percent to 75 percent based on information from the Oregon Department of Forestry. The analysis of how road construction would affect disturbance and sources of fine sediment that may be delivered to stream channels corrects an error in the calculation of the sediment delivery from existing roads. Specifically, the Draft RMP/EIS analysis overlooked the sediment contribution of existing paved roads. The updated analysis also uses new data for the estimates of new road construction for commercial thinning under each alternative and the Proposed RMP (see the Trails and Travel Management section of this chapter).

Issue 1

To what extent would each alternative maintain effective shade along streams?

Summary of Analytical Methods

This analysis addresses stream shading along each side of perennial and fish-bearing streams on BLM-administered lands. This analysis evaluates existing and projected forest vegetation that provides shade and maintains cool stream temperatures. Primary components of shade (forest tree height, canopy density, and the Riparian Reserve width) form the basis of the analysis, rather than measuring stream temperature variation along watercourses directly. The physics of stream temperature gain or loss within forest streams is highly correlated to the extent and quality of shading vegetation (discussed further under Background of this section).

All action alternatives and the Proposed RMP define overall Riparian Reserve widths, which are divided into an inner zone and an outer zone. Management direction addresses a variety of actions for both zones, which varies by action alternative and the Proposed RMP. This analysis assumed that there would not be any harvest in the inner zone and that the outer zones would be maintained with thinning, under the action alternatives and the Proposed RMP. In light of the differences in management direction for the outer zone, the analysis assumed that riparian thinning would occur over a greater percentage of stands suitable for thinning and the BLM would thin stands to a lower density in Alternatives B and C than in Alternatives A and D, and the Proposed RMP.

The No Action alternative defined interim Riparian Reserve widths that could be modified after watershed analysis. For this analysis, the BLM assumed that the Riparian Reserve under the No Action alternative would remain at the interim widths: two site-potential tree heights for fish-bearing streams and one site-potential tree height for perennial, non-fish-bearing streams. Under the No Action alternative, thinning and other silvicultural treatments are allowed anywhere in the Riparian Reserve with no specific retention requirements. However, activities must meet the Aquatic Conservation Strategy objectives, which are often difficult to interpret at the site scale. Since 1995, the BLM has implemented thinning and other silvicultural treatments within the Riparian Reserve (see the Fisheries section of this chapter). Although not explicitly stated in the 1995 RMPs, under the No Action alternative this analysis assumed that a 60-foot-wide, inner zone along each side of a stream would not be thinned due to any combination of stream temperature concerns and maintenance of streamside shade; large and small wood recruitment needs over time; sediment filtering; and channel stability where steep and unstable inner gorges must be protected to prevent landsliding. Although implementation of Riparian Reserve thinning has been highly variable since 1995, this analytical assumption that no thinning would occur within 60 feet of streams under the No Action alternative represents an approximate average of past and current implementation practices. The BLM makes this assumption solely for the purposes of this analysis. In the outer portion of the Riparian Reserve, the BLM assumes that thinning would continue on young, overstocked stands under the No Action alternative to meet a variety of Aquatic Conservation Strategy objectives.

In this analysis, the BLM used two different methodologies to evaluate stream shade. Method A determines the width of Riparian Reserve by empirical relationships necessary to provide 80 percent effective shade and relies upon previous work in the 2008 FEIS (USDI BLM 2008, Appendix I – Water, pp. 250–253). Effective shade is the percentage of sunlight blocked by topography, forest trees, and vegetation during a solar day. Effective shade reaches an upper limit in the 80–90 percent range for normally stocked Young to Mature stands (USDA FS and USDI BLM 2012). During daylight hours in the summer months, when stream heating is a concern, the sun's altitude (vertical zenith angle) and horizontal position (azimuth) change constantly, directing solar radiation down to the earth's surface. Solar radiation intensity at the water surface varies with the sun's altitude, azimuth, and cloud cover, and is diminished with blocking by topography and reflected or adsorbed by forest tree crowns (Brazier and Brown 1972, Boyd 1996). The sun's path length through vegetation decreases transmissivity, particularly where leaf area is high (DeWalle 2010). Where the solar angle exceeds the forest shade angle from the tallest trees, solar radiation will reach the waterbody (Boyd 1996). When varying angular canopy density is summed for the primary daytime hours and weighted for the proportion of incoming solar radiation blocked for each time period, an estimate of effective shade is obtained. Angular canopy density is the sun-blocking vegetation in the path of the sun from 10 a.m. to 2 p.m. (Brazier and Brown 1972). For normally stocked Young to Mature stands, forest shade tends to reach a maximum (near 80 percent effective shade), where increasing the width of the Riparian Reserve would only marginally improve effective shade. Gaps in forest vegetation as well as the quality of shade from needles, leaves, tree-branches and boles, even in Mature stands, prevent much higher measures of effective shade. There is always some solar radiation transmissivity to the water surface through needles and leaves and over the tallest trees, especially near solar noon.

Method A compares the Riparian Reserve allocations in the alternatives and the Proposed RMP to a 60-foot-wide inner zone with no harvest and an outer zone with a 50 percent canopy closure that extends out to 1 site-potential tree height width[63] along each side of perennial and fish-bearing streams. Analytical

[63] Site-potential tree height generally varies from 140–240 feet width in the planning area.

conclusions determine the miles of perennial and fish-bearing streams that are not substantially similar by HUC 12 watershed.[64] Streamside stands reach a shade limit in the range of 60- to 100-feet of width from the waterbody. A wider Riparian Reserve would provide no further shade benefit, because the solar path lengths through forest vegetation are sufficiently long and direct solar radiation has already been extinguished (DeWalle 2010). A disadvantage of Method A is that it considers a uniform management prescription in the outer zone. The empirical relationships in Method A do not consider angular canopy density that blocks sunlight outside the 10 a.m. to 2 p.m. daily period. However, this design has a negligible effect on decreasing effective shade, because incoming solar radiation intensity is substantially lower during early morning and late afternoon hours, mountainous topography provides shade at these hours, and longer solar path lengths through the sides of forest trees are extinguishing available solar radiation (Boyd 1996, DeWalle 2010). Method A does not crosswalk with water quality studies or models to determine if temperature changes are occurring from management activities. Rather, Method A uses an approach that establishes effective shade that is near potential natural shade, based on empirical relationships by Brazier and Brown (1972) and Steinblums *et al.* (1984).

Method B, proposed by the Environmental Protection Agency (EPA), presents a mechanistic modeling approach that uses the Oregon Department of Environmental Quality (ODEQ) shade model to develop shade loss tables for each alternative and the Proposed RMP Riparian Reserve designs. The rationale uses a before-after-control-impact design, where observed changes in stream temperature are due to the difference between pre- and post-harvest (Groom *et al.* 2011). The EPA methodology considers whether various widths and canopy cover densities in inner and outer zones of the Riparian Reserve would result in shade loss associated with management that would increase stream temperature. Although Groom et al. (2011) determined that less than 6 percent shade loss per stream reach, pre-harvest to post-harvest (0.4-mile mean treatment reach length), would have no statistical effect on raising stream temperatures, the EPA has specifically proposed an analytical threshold of no greater than 3 percent shade loss, to provide "a margin of safety" (EPA 2013, p. 3). Therefore, in the analysis in this Proposed RMP/Final EIS, the BLM considers shade loss exceeding 3 percent (calculated for 0.25-mile perennial and fish-bearing stream reaches in the decision area and summed by mile) as representing a risk of stream temperature increases. This analytical threshold does not represent a specific requirement for management, but an analytical tool for interpreting the results of this analysis.

The BLM cross-walked canopy cover from the ODEQ shade model with canopy cover from the Woodstock model to provide a common attribute, in addition to Riparian Reserve widths, for evaluating the alternatives and the Proposed RMP using the EPA shade loss tables. The change is necessary because Woodstock-modeled canopy cover measures have removed tree-to-tree overlap that influences canopy density and shade. Results from Woodstock-modeled canopy cover underestimate field-measured canopy cover. Fiala *et al.* (2006) found that modeled canopy cover is consistently lower when compared to field measurements of canopy cover and suggest that a regression equation is best to compare measurements of canopy cover. McIntosh *et al.* (2012) compared modeled canopy cover results with a ground-based estimate and reported that equations underestimated canopy cover by 17 percent on average at high cover levels (greater than 70 percent) in wet conifer and wet hardwood stands. Using this approach, the BLM used field-measured canopy cover along selected streams from western Oregon districts to form a regression equation (**Figure 3-76**) between pre-harvest vegetation density (shown in the EPA shade loss tables) as canopy cover and the Woodstock-modeled canopy cover. The EPA reviewed this regression equation, and provided field-measured studies that support the interpretations. This is a modification of the analytical methodology described in the Planning Criteria (USDI BLM 2014, pp. 68–72).

[64] Hydrologic Unit Codes (HUCs) are a U.S. Geological Survey classification based on a hierarchy of nested watersheds.

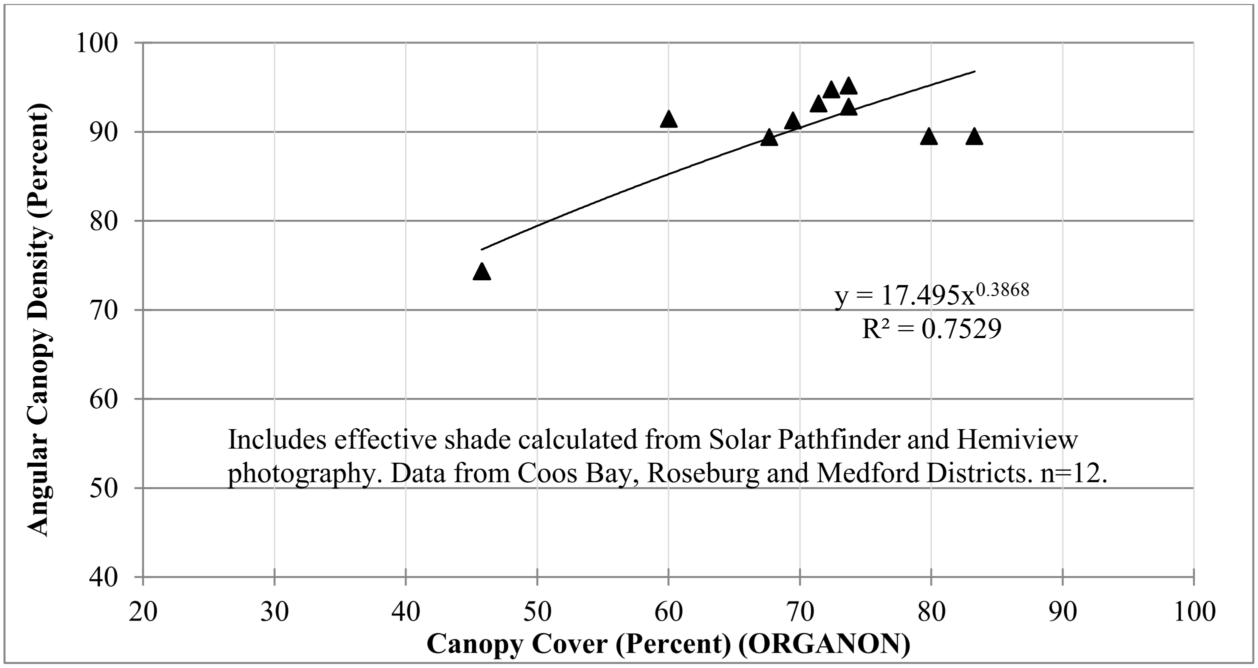

Figure 3-76. Canopy cover and angular canopy density in forest stands

In this analysis, the BLM (using EPA's methodology) calculated shade lost from the combination of the existing canopy cover of the inner zone and the outer zone with the management direction of each alternative and the Proposed RMP to retain a specific threshold of canopy cover (**Table 3-64**). The BLM divided perennial and fish-bearing streams into 0.25-mile segments and then merged those segments with the Woodstock-modeled canopy cover by decade until 2063 for the Riparian Reserve designs under each alternative and the Proposed RMP. This methodology ignores the small amount of canopy cover overlap at stream segment nodes and at stream junctions. To apply these shade loss tables spatially, the BLM tracked the changing inner zone canopy cover, along each side of perennial and fish-bearing streams for each decade until 2063, and then applied the outer zone canopy cover for purposes of reading the EPA shade loss tables. In this way, the BLM calculated the miles of perennial and fish-bearing streams that would exceed 3 percent shade loss until 2063 for each alternative and the Proposed RMP. This is a modification of the analytical methodology described in the Planning Criteria (USDI BLM 2014, pp. 73–75).

Table 3-64. Modeled shade loss* for a 150-foot-wide Riparian Reserve, with a 60-foot inner no harvest zone, at various thinning intensities and initial canopy conditions

Scenario (Two Sided Treatments)	Stream Aspect			
	North South	NW/SE	East West	Average
Pre-harvest Condition - 80% Canopy Cover				
30 ft Clearcut; 90 ft - Outer Thinning Zone 70CC; 60ft - Inner Zone 80CC; Stream	1.3	1.1	0.9	1.1
30 ft Clearcut; 90 ft - Outer Thinning Zone 50CC; 60ft - Inner Zone 80CC; Stream	2.6	1.9	1.3	1.9
30 ft Clearcut; 90 ft - Outer Thinning Zone 30CC; 60ft - Inner Zone 80CC; Stream	4.4	3.0	1.6	3.0
Pre-harvest Condition - 60% Canopy Cover				
30 ft Clearcut; 90 ft - Outer Thinning Zone 50CC; 60ft - Inner Zone 60CC; Stream	5.7	4.9	5.6	5.4
30 ft Clearcut; 90 ft - Outer Thinning Zone 30CC; 60ft - Inner Zone 60CC; Stream	9.7	7.7	6.9	8.1
Pre-harvest Condition - 40% Canopy Cover				
30 ft Clearcut; 90 ft - Outer Thinning Zone 30CC; 60ft - Inner Zone 40CC; Stream	13.8	12.7	16.2	14.2

* Yellow highlighted boxes are greater than or equal to the 3 percent shade loss analytical threshold.
Source: EPA 2014

Modeling design and constraints over such a large planning area prevent the varying of certain factors known to influence shade. With either method, assumptions about tree heights cannot vary spatially. The BLM calibrated Method A with tree heights for Mature to Structurally-complex stands. The BLM and EPA calibrated Method B with tree heights for Mature stands (50 to 70 years old). Neither method considers terrain slope and the positive effect of topographic shade during early morning and late afternoon hours. Method A ignores solar radiation outside of 10 a.m. to 2 p.m. In contrast, Method B may overestimate shade loss by not considering topographic shade. Method B tracks stream orientation in shade loss outputs, while Method A does not. However, Method A provides a design that averages all stream orientations where solar radiation can vary in the path of the sun. Both methods do not consider tree setback distance from the stream that may increase solar radiation or the shading effects of understory brush or stream incision. Method A uses a uniform Riparian Reserve design, emphasizing greater than 80 percent effective shade where there is at least a 60-foot inner zone, without any particular harvest prescription constraints in the outer zone. Method B accounts for variable management actions and variable canopy cover density in the inner and outer zone. Method B does not identify an actual reduction in stream shading, but a susceptibility to a reduction in stream shading if the BLM were to thin the outer zone along certain streams.

Both Methods A and B assume for analytical purposes that regeneration harvest has removed canopy cover outside of the Riparian Reserve. This assumption is unrealistic, because the majority of the decision area would be in reserves and planned regeneration harvest within the Harvest Land Base would be spread out temporally and spatially across the Harvest Land Base under all alternatives and the Proposed RMP. However, this assumption is unlikely to affect the analytical conclusions under Methods A or B; studies and modeling suggest that direct solar radiation from outside Riparian Reserve widths allocated in the alternatives and the Proposed RMP does not increase shade loss at the stream, because solar radiation has already been reflected, adsorbed, or otherwise extinguished by forest vegetation inside the Riparian Reserve.

The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which is incorporated here by reference (USDI BLM 2014, pp. 65–75).

Background

Most of the streams on BLM-administered lands are intermittent streams, as evidenced by the distribution of lands in mountainous headwaters, and the correspondingly high ratio (2:1) of intermittent to perennial streams as viewed in **Table 3-65.** The proportion of intermittent to perennial streams on other lands in the planning area is likely similar to the 2:1 ratio on BLM-administered lands. However, the data shown here yields a ratio of 1.5:1 for the planning area; the difference is likely due to variances in the mapping methods of other landowners.

Table 3-65. Miles of streams with BLM ownership within the planning area

Stream Periodicity	Planning Area Streams (Miles)	BLM Streams (Miles)	BLM Stream Miles (Percent)
Perennial*	57,893	6,711	12%
Intermittent†	86,990	13,311	15%
Totals	**144,884**	**20,023**	**14%**

* Perennial streams have varying but continuous discharge year round. Their base level is at, or below, the water table.
† Intermittent streams are a nonpermanent drainage feature with a dry period, normally for three months or more. Flowing water forms a channel feature with well-defined bed and banks, and bed-forms showing annual scour or deposition, within a continuous channel network.

Stream temperature variation depends upon a number of natural and management factors, including topography, forest vegetation, channel characteristics, streamflow, and climate (Caissie 2006, Leinenbach *et al*. 2013). Water volume and stream width are important as mechanisms by which stream temperatures can fluctuate (Kibler 2007). As stream discharge increases, a fixed amount of solar energy is diluted and the resultant temperature change is decreased. As streams widen, the wetted surface area increases, which results in a higher absorption per unit volume of stream with a corresponding temperature rise.

The interactions controlling stream temperature in mountainous, forested landscapes are complex, because simultaneous daily fluxes are occurring over a varying topography with steadily declining streamflow into summer. The temporal area of interest for this analysis is July and August, when clear sky days and solar radiation approach maximum levels. Direct solar radiation is the most important source of the energy budget affecting stream temperature gain at the water surface (Brown 1969, Beschta 1997, Moore and Wondzell 2005, Caissie 2006, Leinenbach *et al*. 2013). During July and August, the sun's altitude is high, and only the portion of forest canopy to the south of the waterbody, in line with the suns daily path, is involved. Stream banks or hill slopes in the path of the sun, as well as understory brush and trees with varying canopy layers and densities, produce shade for most daylight hours. There may be a few gaps where sunlight can reach the stream during the morning or afternoon hours, depending on specific stand characteristics. However, at mid-day when the sun is near its zenith, solar radiation may reach the stream through overhead canopy gaps in the forest or overtop the highest trees' shade angle, depending on tree height, setback distance, angular canopy density, and stream width. Small streams are generally well shaded because canopies spread over the channel. As watershed area increases and streams widen to rivers with floodplains, linear gaps appear over the stream channel.

There are important interactions simultaneously occurring, including stream direction (azimuth), topography, tree height, and stand density in blocking solar radiation. The natural environment poses an array of possibilities in assessing the transmission of solar radiation to a stream. The duration of shade depends upon shade-producing vegetation in the path of the sun at any given time during the day as the sun's path and altitude changes. The quality of shade depends upon solar radiation transmission through forest canopies, where solar radiation decreases as leaf area index and forest density increases.

The 2008 FEIS provides additional detailed background information on the effects of Riparian Reserve on stream shading and is incorporated here by reference (USDI BLM 2008, pp. 336–34; Appendix I – Water, pp. 250–252).

Affected Environment

Proportions of Riparian Reserve in the decision area by stand structural stage within 100-feet of perennial and fish-bearing streams are shown in **Figure 3-77**.

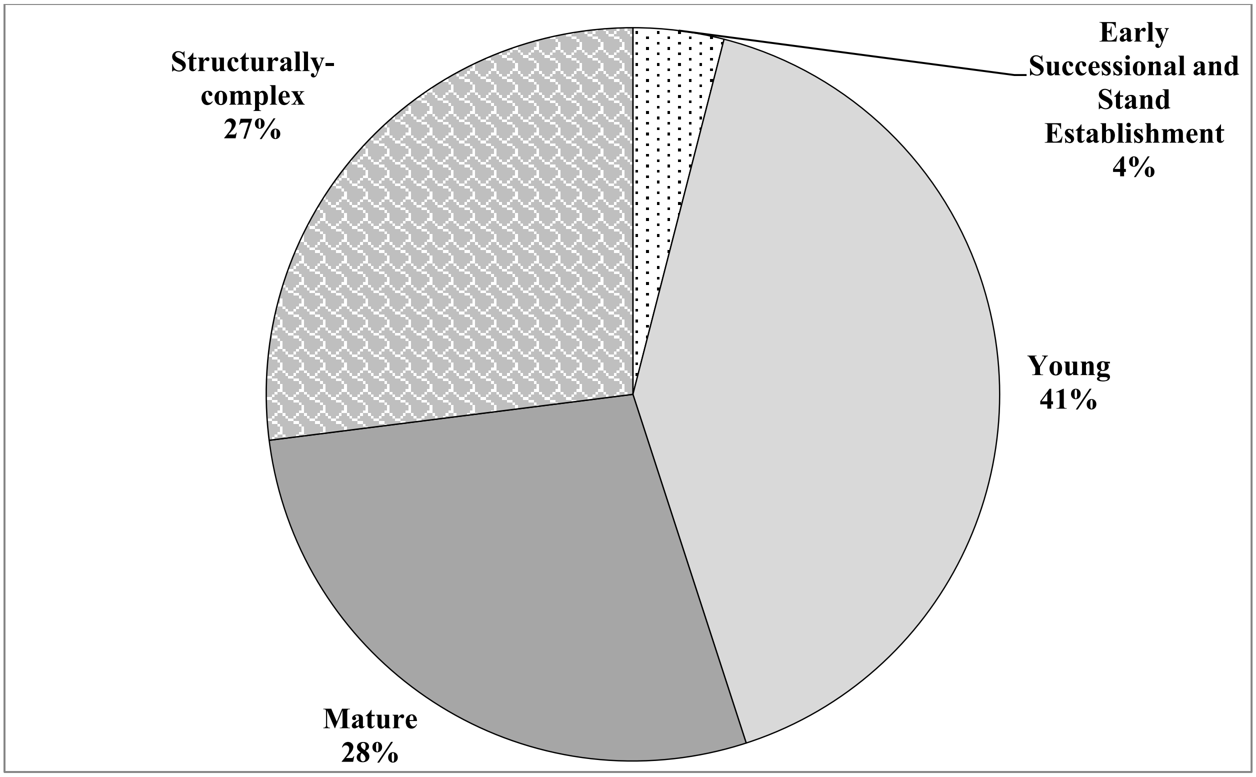

Figure 3-77. Structural stage proportions of the Riparian Reserve within 100 feet of perennial and fish-bearing streams in the decision area
Source: USDI BLM 2008, p. 341

More than half of the Riparian Reserve is currently in the Mature or Structurally-complex structural stages. There has been very limited regeneration harvest within 100 feet of perennial and fish-bearing streams in the last 30 years, leading to a decline in the Early Successional and Stand Establishment structural stages to 4 percent. Some portion of the Early Successional and Stand Establishment stands within the Riparian Reserve has resulted from natural disturbances, such as wildfire, flood, or disease. Under the 1995 RMPs, the BLM has thinned in the Riparian Reserve in Young stands along perennial and fish-bearing streams, but has typically left a 50- to 60-foot no-harvest zone along each side of the stream channel.

Figure 3-78 shows the current proportions of the entire Riparian Reserve (i.e., No Action alternative) by structural stage. The forest structural stage patterns are similar to the 100-foot inner stream zone, except there is more area in Early Successional and Stand Establishment stands further than 100 feet from the edge of streams.[65]

[65] This comparison assumes that the 8 percent with no data does not skew the current structural stage proportions.

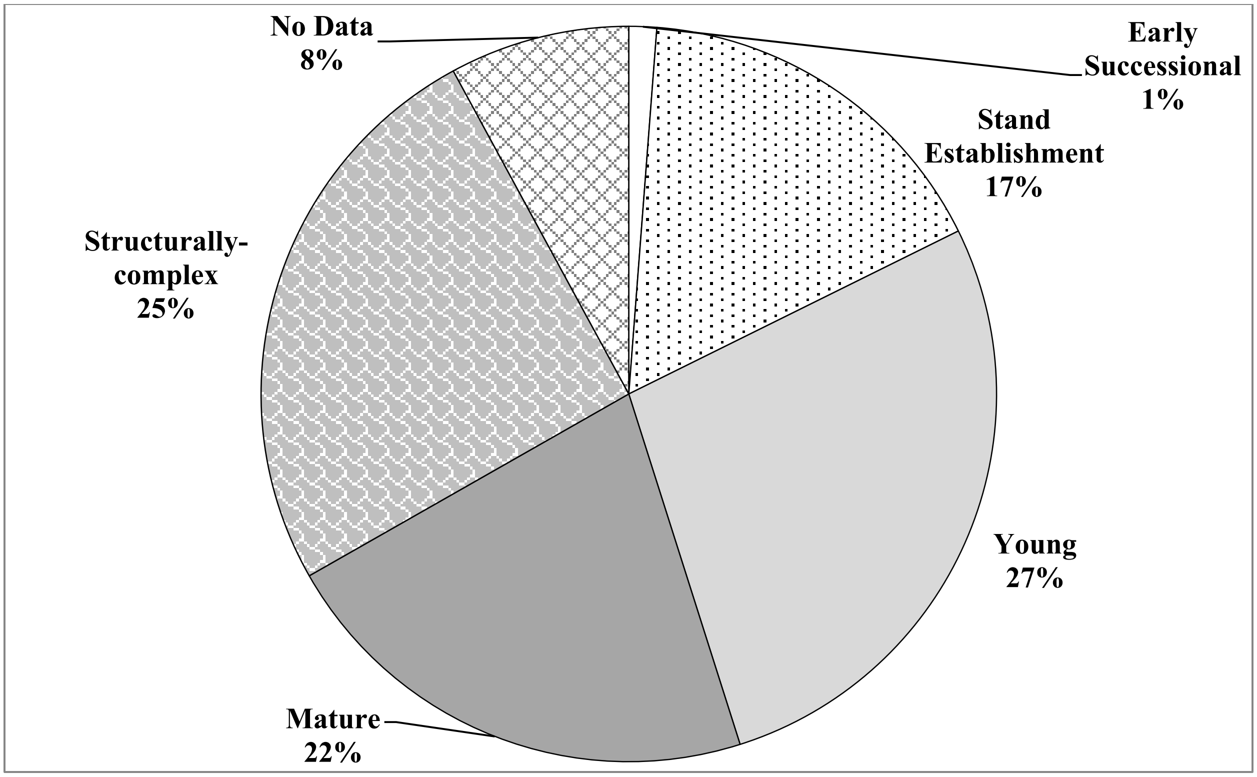

Figure 3-78. Structural stage proportions of the current Riparian Reserve (i.e., No Action alternative) along perennial and fish-bearing streams in the decision area

Monitoring results have documented a decrease in average maximum stream temperatures in the last 20 years for some streams within the decision area. Varying atmospheric conditions and antecedent precipitation result in substantial year-to-year variation in stream temperatures. However, as shown in **Figure 3-79**, average maximum summertime stream temperatures are clearly declining by as much as 4 °F in one coastal Oregon stream. Similar patterns are observed on other districts; Roseburg is shown in **Figure 3-80**.

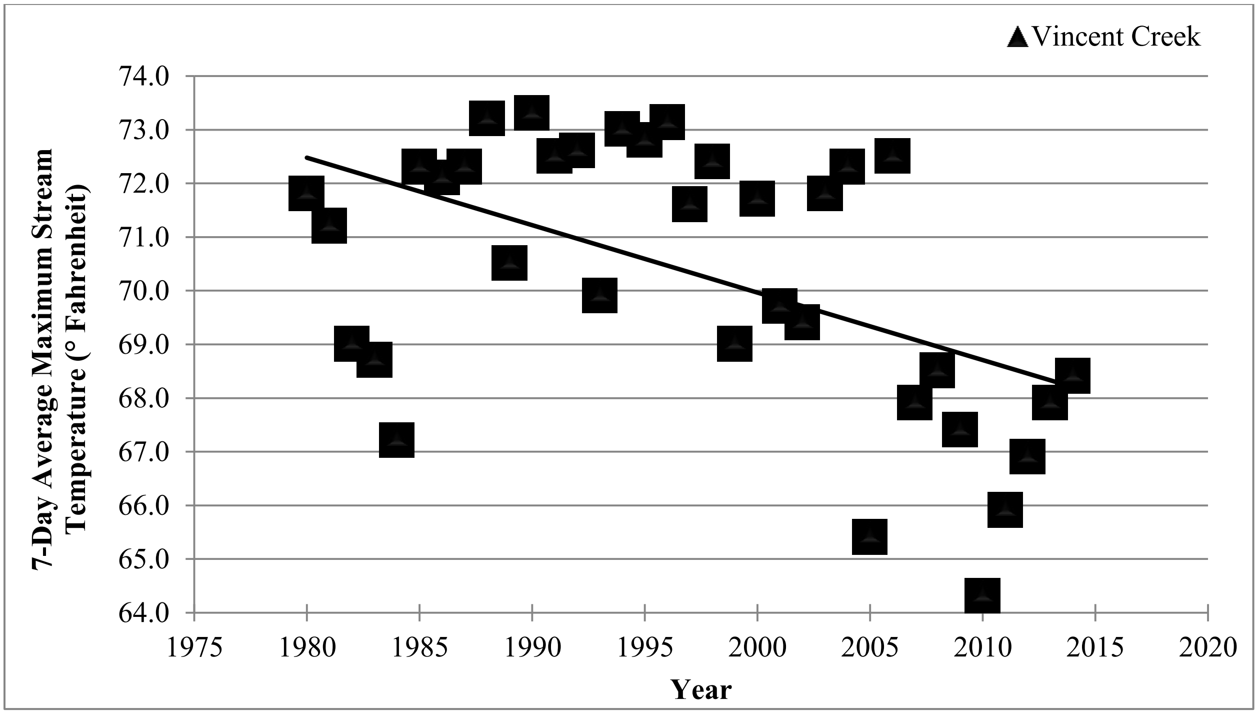

Figure 3-79. Seven-day average maximum stream temperatures (°F) Vincent Creek Gaging Station, Coos Bay District, for years 1990–2013

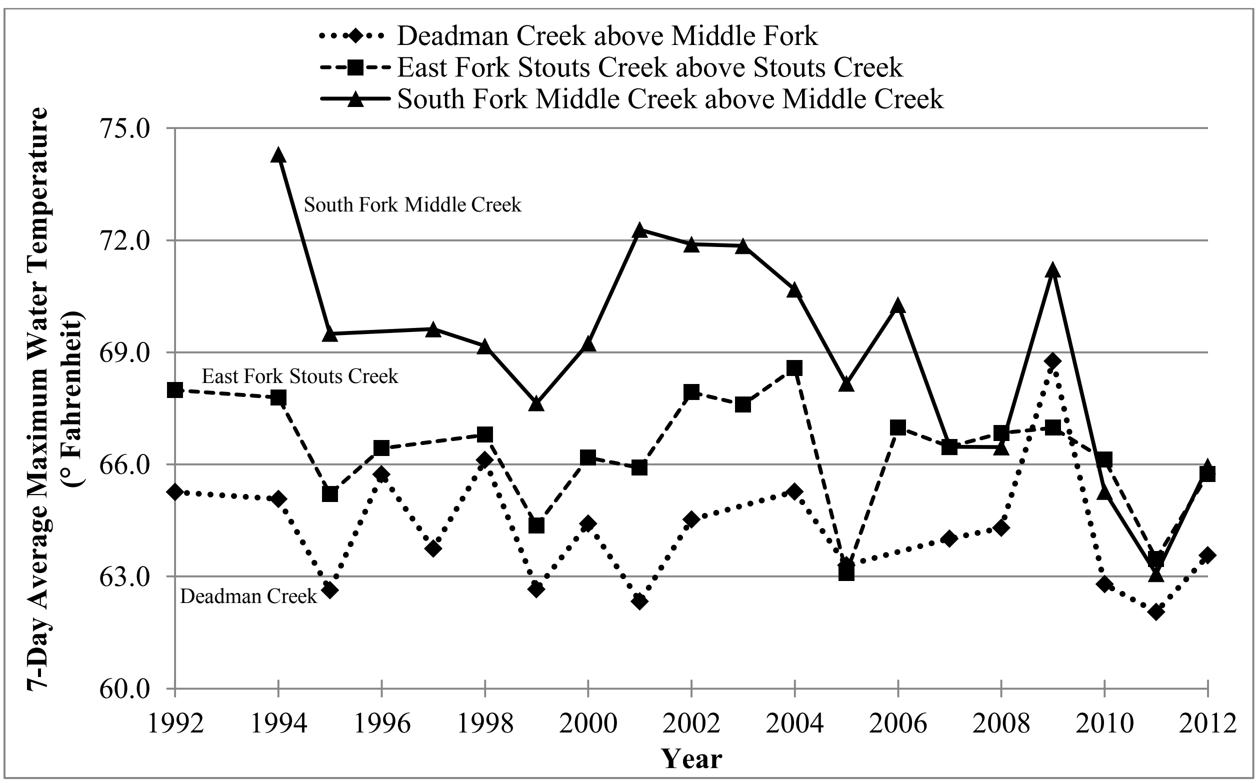

Figure 3-80. Seven-day average maximum stream temperatures (°F) at Deadman Creek, East Fork Stouts Creek and South Fork Middle Creek, Roseburg District, for years 1992–2012

Preliminary results of a density management study being carried out by the U.S. Forest Service and BLM show that the Riparian Reserve on BLM-administered lands is maintaining high measures of shade, even where thinning is conducted. This density management study took hemispherical photography in the field at stream centers along perennial steams with Mature mixed conifer/hardwood riparian stands, for five stream reaches in four BLM districts. The U.S. Forest Service's Pacific Northwest Research Station staff analyzed the data with Hemiview™ solar physics software. Preliminary results shows percent visible sky (openness) at stream center average from 3.0–5.9 percent, indicating relatively closed forest canopies. Shade values ranged from 91–95 percent.[66] Data from these sites further suggest maximum shading occurs at low solar angles and there is increased variability towards noon when radiation loads are higher (P. D. Anderson, U.S. Forest Service, Forestry Sciences Laboratory, personal communication, 2014).

Environmental Consequences

Figure 3-81 displays the total Riparian Reserve acres compared to Riparian Reserve acres bordering perennial and fish-bearing streams by alternative and the Proposed RMP.

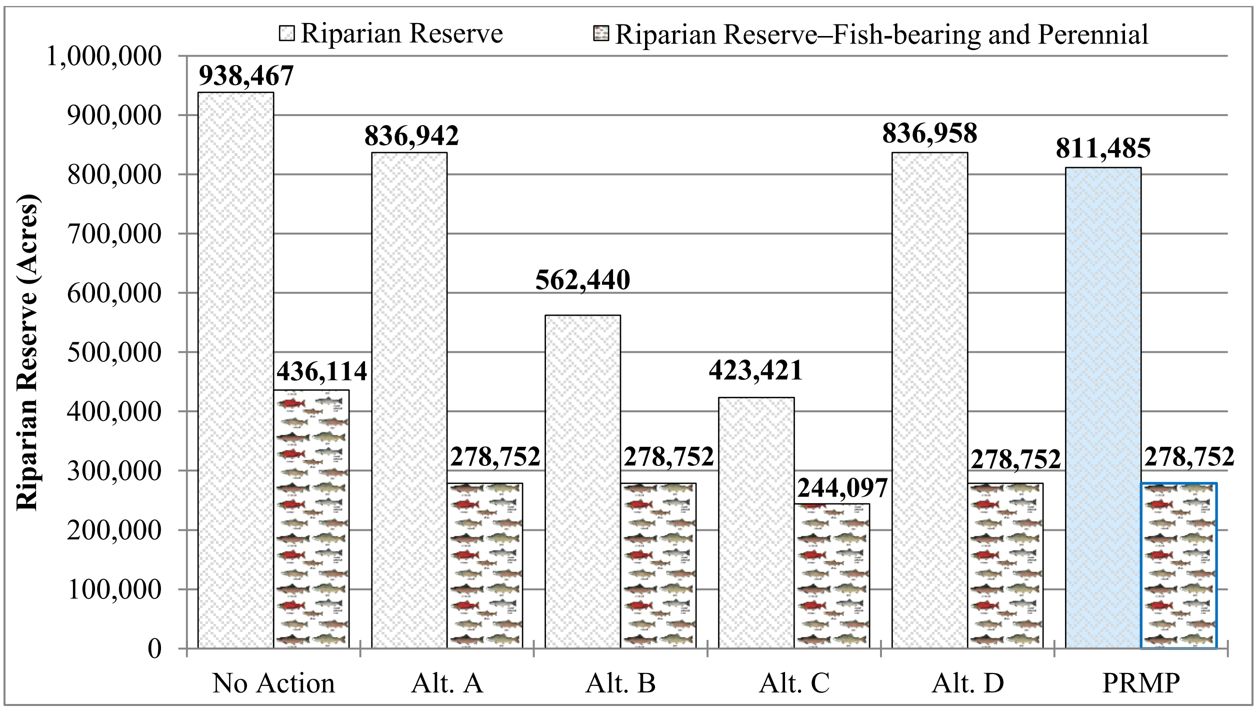

Figure 3-81. Total acres of the current Riparian Reserve compared to acres of the Riparian Reserve along perennial and fish-bearing streams*

* These acreage estimates have been corrected from the Draft RMP/EIS based on improved data using merged raster representations of stream vector datasets.

There are 6,970 miles of perennial and fish-bearing streams, where forest management in the outer zone of the Riparian Reserve would potentially affect stream temperature. The total Riparian Reserve acres vary among alternatives and the Proposed RMP based on management objectives and direction. Alternatives A, B, and D, and the Proposed RMP include one site-potential tree height along each side of the stream channel of all perennial and fish-bearing streams, and Alternative C includes 150 feet along

66 From Hemiview™ software, using 1-Global Solar Fraction (below canopy radiation/above canopy radiation) as a measure of shade

each side of the stream channel of all perennial and fish-bearing streams. In contrast, the No Action alternative includes two site-potential tree heights along each side of the stream channel of fish-bearing streams and one site-potential tree height along each side of the stream channel of perennial, non-fish-bearing streams. On perennial and fish-bearing streams, the outer management zone width varies from 2 site-potential tree heights under the No Action alternative (i.e., the entire Riparian Reserve), between 120 feet and 1 site-potential tree height under Alternatives A and D, and the Proposed RMP, between 60 feet and 1 site-potential tree height under Alternative B, and between 60 feet and 150 feet under Alternative C.

Method A

Implementation of Alternatives A and D, and the Proposed RMP would result in similar shading effects; therefore, they are grouped together for discussion. In the same manner, the effects of Alternatives B and C on shading are similar and are discussed together.

Under Alternatives A and D, and the Proposed RMP, the BLM would not thin within a 120-foot-wide inner zone along each side of the stream channel of all perennial and fish-bearing streams. This 120-foot inner zone width would overlay the primary shade zone and the secondary shade zone.[67] The inner zone alone would be sufficient to avoid reduction in stream shading under Method A. Nevertheless, Alternatives A and D and the Proposed RMP also include an outer zone of one site-potential tree height in which any thinning action would maintain at least 30 percent canopy cover and 60 trees per acre. The outer zone would provide protection to the inner zone, thwarting blowdown at the edge.

Under Alternatives B and C, the BLM would not thin within a 60-foot width inner zone, which would match the primary shade zone. Sixty feet is the minimum width found necessary to maintain high levels of shade quality if managed with an outer (secondary) zone of 100 feet with 50 percent canopy cover. The BLM would maintain at least 50 percent canopy cover and 80 trees per acre in the outer zone, to a distance of one site-potential tree height for Alternative B and 150 feet for Alternative C. These outer zone widths exceed the secondary shade zone width of 100 feet (where the combination of primary and secondary shade zones maintains 80 percent effective shade) under Method A by 50 feet for Alternative C and an average of 80 feet for Alternative B (i.e., widths are based on varying site-potential tree heights). Therefore, implementation of Alternatives B or C would maintain stream shading sufficient to avoid increases in stream temperature under Method A.

The No Action alternative would meet Method A criteria for stream shading, based on the Riparian Reserve width and assumptions about management actions described in analytical methods. However, there is an element of uncertainty related to stream shading under the No Action alternative compared to the action alternatives and the Proposed RMP. As explained in analytical methods above, thinning under the No Action alternative would be allowed anywhere in the Riparian Reserve with no specific retention requirements. However, activities must meet the Aquatic Conservation Strategy objectives, which are often difficult to interpret at the site scale. The 1995 RMPs do not define a 'no-thinning' zone, which makes the effects on stream shading less certain than under the action alternatives and the Proposed RMP.

In summary, all alternatives and the Proposed RMP would exceed Method A criteria for stream shading and would be substantially similar in their ability to provide high quality shade and avoid any measurable increases in stream temperature at this scale of analysis.

[67] Method A uses the same methodology used in the 2008 FEIS analysis (USDI BLM 2008, Appendix I – Water, pp. 250–253. The primary zone is defined as the area from the stream out to 60 feet. The secondary zone is defined as the area from the outer edge of the primary zone out to 100 feet.

Method B

As in Method A, implementation of Alternatives A and D, and the Proposed RMP would result in similar shading effects and are grouped together for discussion. In the same manner, the effects of Alternatives B and C on shading are similar and are discussed together (**Figure 3-82** and **Figure 3-83**). Under the No Action alternative, Alternatives A and D, and the Proposed RMP, there would be 30–34 miles of perennial and fish-bearing streams that would currently be susceptible to shade reductions that could affect stream temperature if the BLM were to apply thinning treatments in the outer zone of the Riparian Reserve. This is less than 0.5 percent of the total perennial and fish-bearing stream miles. This limited stream mileage reflects areas with currently low canopy cover in the inner zone, which are the stands that would be least likely to be thinned. This result does not reflect an actual reduction in stream shading, but a susceptibility to such a reduction in stream shading if the BLM thins the outer zone along these streams. If the BLM does not thin the stand in the outer zone on these particular 30–34 miles of perennial and fish-bearing streams, no reduction in stream shading would occur. Additionally, this result likely overestimates the risk of shade reductions resulting in water temperature increases: if treatments were to occur in the outer zone adjacent to inner zone stands with low canopy cover, not all of the susceptible reaches would be treated in a given year, and, as some reaches were treated, other reaches would recover, reducing the overall effect of canopy removal. This limited stream mileage susceptible to shade reductions would decline over time as the stands in the inner zone increase in canopy cover.
Implementation of the No Action alternative on stream shading would have very similar effects to Alternatives A and D, and the Proposed RMP, with the exception of a slight difference in the 2033 period. The stream mileage susceptible to shade reductions would decline to almost zero in 20 years under Alternatives A and D, and the Proposed RMP, and in 30 years under the No Action alternative.

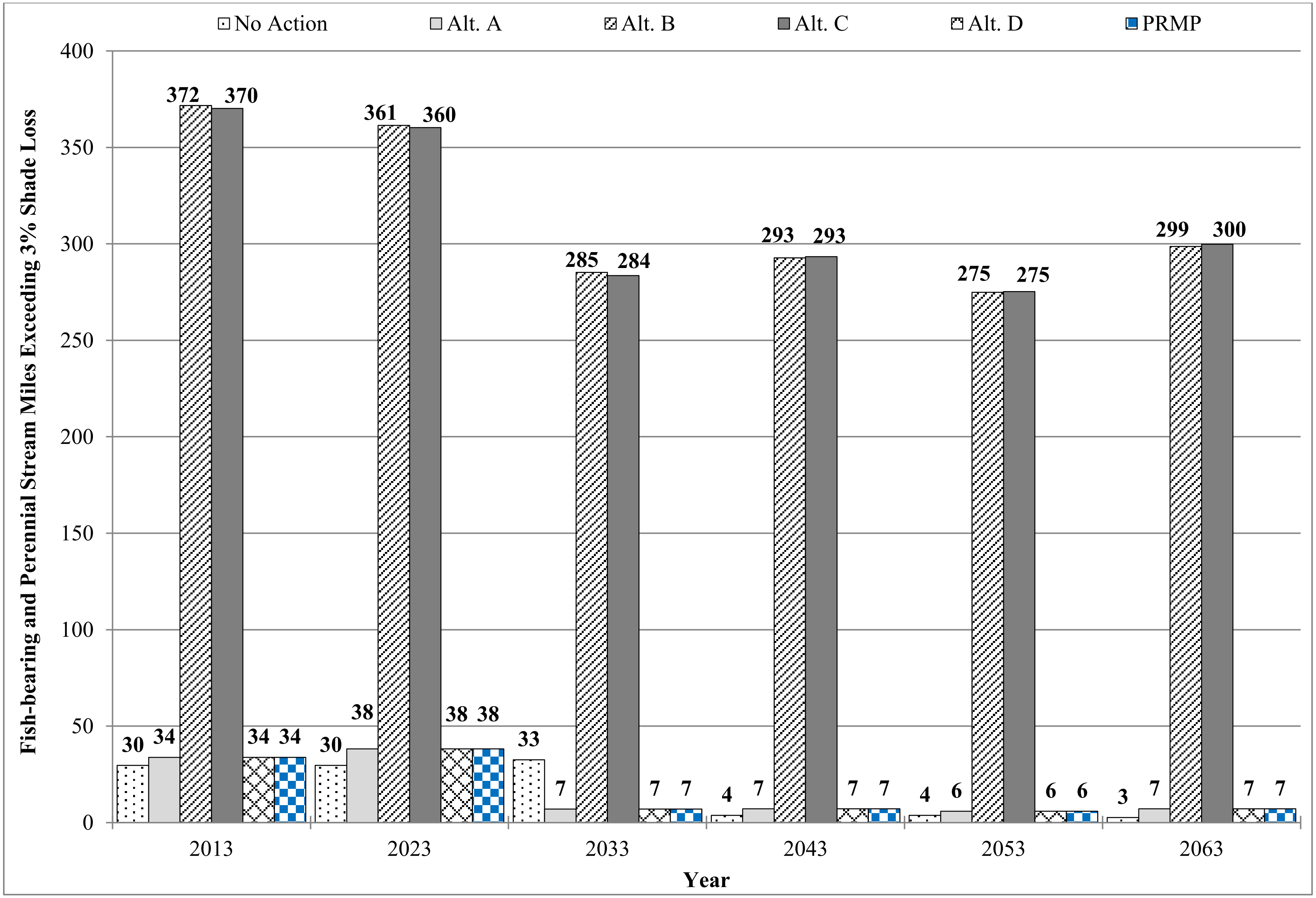

Figure 3-82. Perennial and fish-bearing stream miles exceeding 3 percent shade loss

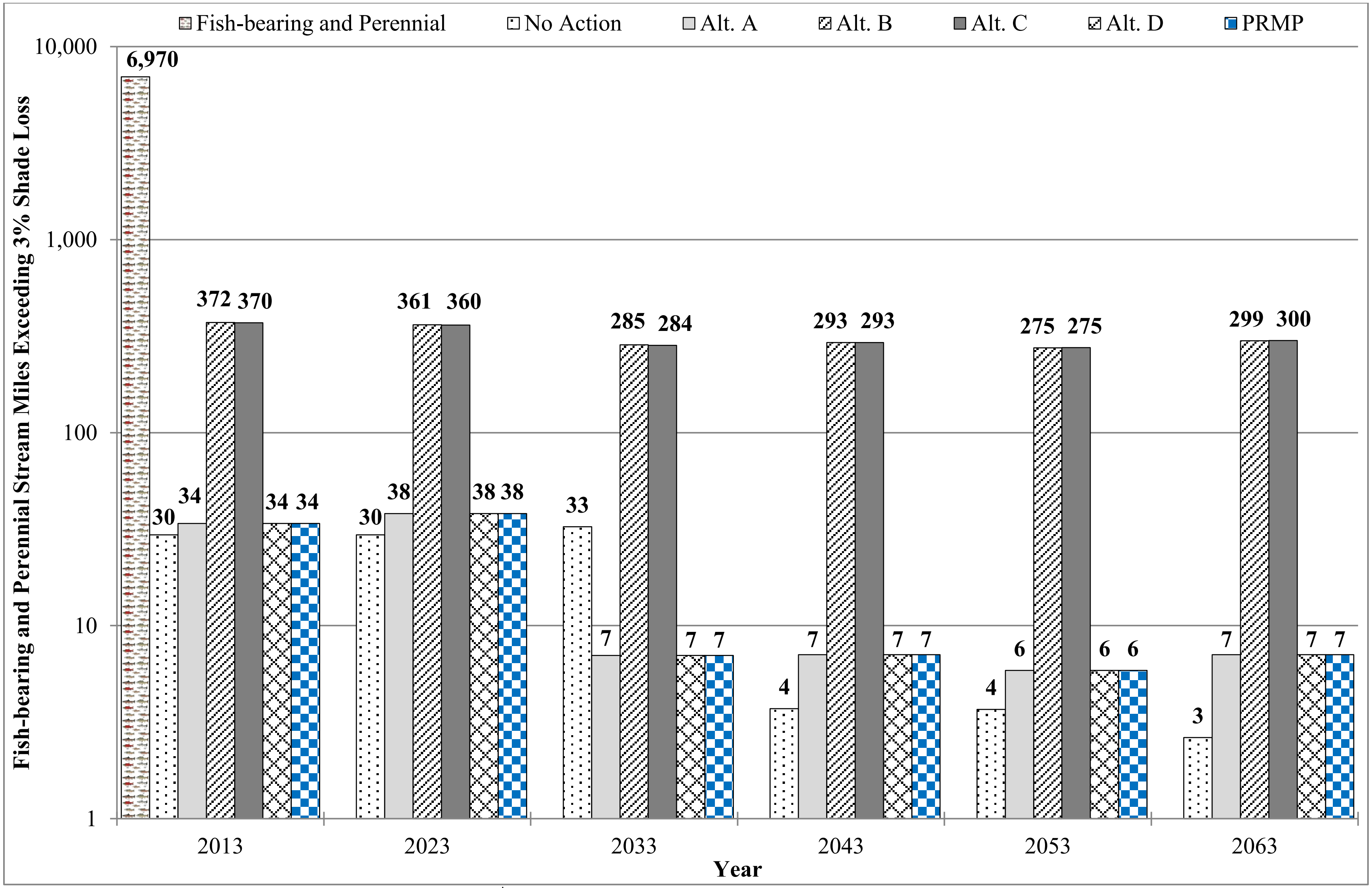

Figure 3-83. Perennial and fish-bearing stream miles* in the decision area compared to perennial and fish-bearing stream miles exceeding 3 percent shade loss

* The vertical axis is logarithmic to view the range of data.

Under Alternatives B and C, there would be 275–372 miles of perennial and fish-bearing streams susceptible to shade reductions that could affect stream temperature if the BLM were to apply thinning treatments in the outer zone of the Riparian Reserve, amounting to approximately 5 percent of the total perennial and fish-bearing perennial stream miles.

Using Method B, shade loss depends on the combination of the inner zone width and canopy cover, and the outer zone width and post-harvest canopy cover as shown in example **Table 3-64.** The shade loss thresholds, using Method B, would be exceeded most frequently where the canopy cover is less than 60 percent in the 60-foot inner zone under Alternatives B and C, and where the canopy cover is less than 40 percent in the 120-foot inner zone under Alternatives A and D, and the Proposed RMP. These results are consistent with Leinenbach *et al*. (2013), which concluded that the canopy cover of a no-cut buffer appeared to have an ameliorating effect on thinning activities outside of the buffer, with higher protection associated with greater canopy cover in the no-cut buffer. Maintaining an inner zone restricted from thinning, regardless of initial canopy cover, would reduce the miles of susceptible steams in future time periods, until a relatively constant canopy cover would be attained, commensurate with Mature or Structurally-complex Riparian Reserve stands. This is why stream mileage susceptible to shade reductions would decline within the first 20 years under Alternatives B and C (and a similar pattern under all alternatives and the Proposed RMP), and then would remain relatively constant in future decades. Method B does not model canopy cover increases that would occur in the outer zone between treatments, or the effect of those canopy cover increases in reducing potential shade loss. Under Alternatives B and C, if the BLM did not implement thinning treatments in the outer zone in stands with low canopy density and susceptible to shade loss, then all alternatives and the Proposed RMP would be substantially similar in their effect on stream shading. If treatments were to occur in the outer zone adjacent to inner zone stands with low canopy cover, not all of the susceptible reaches would be treated in a given year, and, as some reaches were treated, other reaches would recover, reducing the overall effect of canopy removal.

The results of Method A and Method B analyses show that the effects of the alternatives and the Proposed RMP on stream shading are very similar, though they show an increased risk of shade loss under Alternatives B and C. While all alternatives and the Proposed RMP would maintain shade quality along perennial and fish-bearing streams, Alternatives A and D, and the Proposed RMP would provide slightly better stream shading, in part because of wider inner zones and management direction for forest management activities in the outer zone. While the No Action alternative would meet Method A and Method B criteria for stream shading as explained in the analytical methods, there is an element of uncertainty related to stream shading under the No Action alternative compared to the action alternatives and the Proposed RMP, because the No Action alternative does not define an inner, no-treatment zone. However, the difference among the alternatives and the Proposed RMP in areas that provide sufficient stream shading would be small when considered as a percentage of the total miles of perennial and fish-bearing streams on BLM-administered lands.

Issue 2

How would timber harvest and road construction under the alternatives affect peak stream flows within the rain-on-snow dominated hydro-region?

Summary of Analytical Methods

Peak stream flows occur infrequently in the planning area, normally from November to February, but carry the majority of the sediment load with high stream energies that may erode and change channel form (Cooper 2005). Peak flows from storm events with a return interval of 1 year or greater have the capacity to mobilize sediment and bed-load transport (Andrews 1983 and 1984). Timber harvesting and associated activities alter the amount and timing of peak flows by changing site-level hydrologic processes, such as surface flow and sediment movement (Keppeler and Ziemer 1990, Wright *et al.* 1990, LaMarche and Lettenmaier 1998, Wemple and Jones 2003). Grant *et al.* (2008) concluded that field reviews did not provide evidence that timber harvest increases peak flows for storms with return intervals longer than 6 years, because the storm event is strong enough that forest management is not an influencing factor in peak flows. Therefore, peak flow storms with 1- to 6-year return intervals reflect the range for measuring the impacts on peak flows from timber harvest.

Hydroregions are a classification of landscapes based on the precipitation type and longevity. These are shown in **Figure 3-84** for the planning area. Hydroregions in western Oregon distinguish predominant precipitation types during the winter months that generally correspond to elevation and latitude. Within the planning area, there are three hydroregions: rain, rain-on-snow, and snow. The rain hydroregion is generally below 2,000 feet in elevation in the Coast Range. This hydroregion includes valleys up to 1,200 feet in elevation in the north and up to 3,600 feet in elevation in the south along the western Cascades. The rain-on-snow hydroregion, where shallow snow accumulations come and go several times each winter, are 1,200–3,600 feet in elevation in the northern Oregon Cascades, gradually rising to 2,500–5,000 feet in elevation in the southern Oregon Cascades. The snow hydroregion is generally above 3,600 feet in elevation and is centered along the Cascades crest.

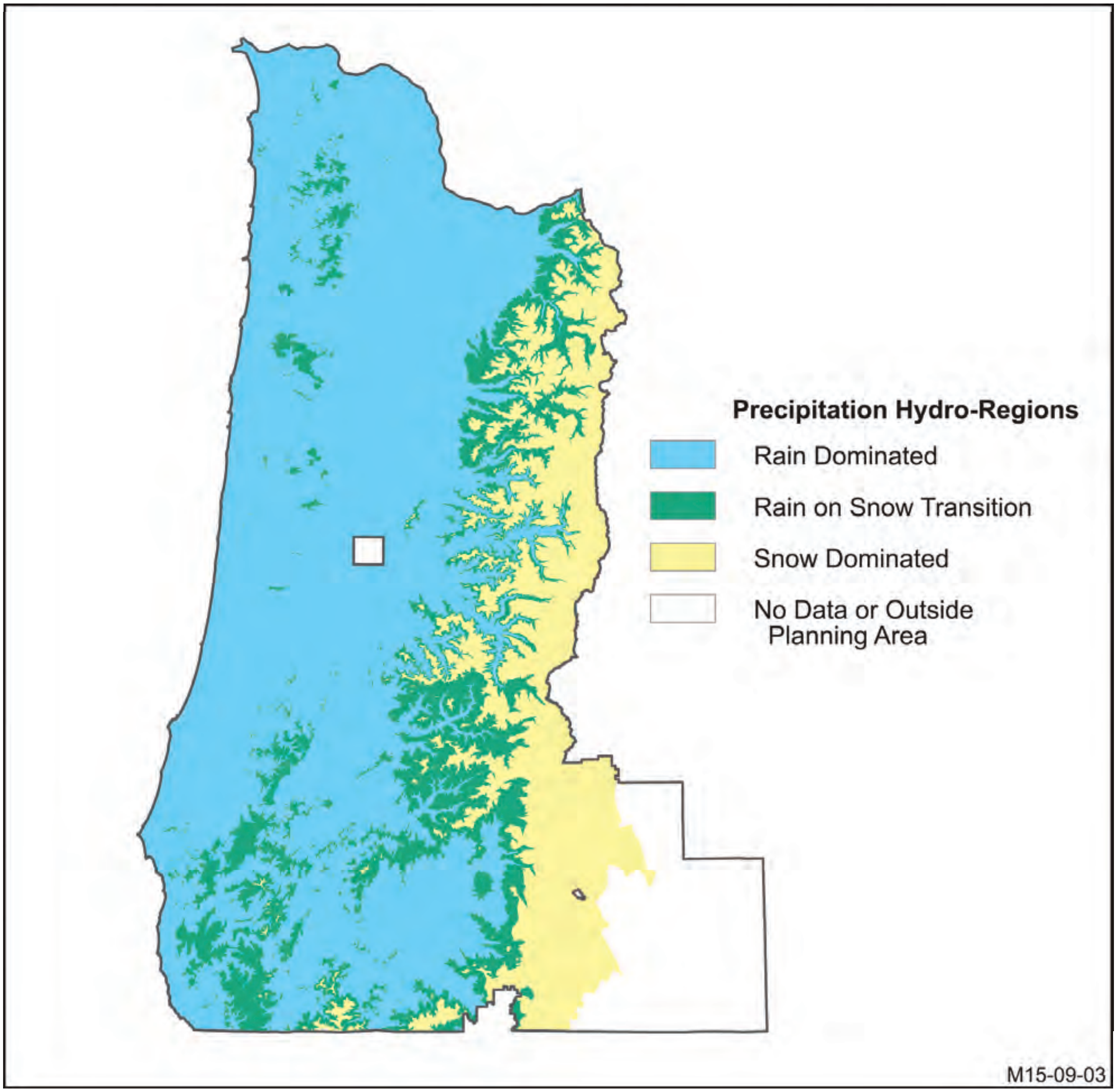

Figure 3-84. Hydroregions within the planning area

This issue presents an analysis of the cumulative effects on peak stream flows of past, present, and reasonably foreseeable future actions, including management actions on both BLM-administered lands and non-BLM-administered lands.

In this analysis, the BLM addressed effects on peak flows in the rain-on-snow hydroregion only, because there is little evidence that timber harvest activities can elevate peak flows in the rain or snow hydroregions (Grant *et al.* 2008). The 2008 FEIS includes a more detailed discussion of the effects of timber harvest in the rain-dominated watersheds (USDI BLM 2008, pp. 352–354), which is incorporated here by reference.

The BLM addressed effects on peak flows at the subwatershed level (HUC 12, previously termed a 6th field watershed). Subwatersheds are generally 10,000–40,000 acres in size and have a single outlet. The

BLM selected the subwatershed scale for this analysis, as it is more sensitive to vegetation and runoff-related changes. In this analysis, the BLM addresses subwatersheds that meet the following three criteria:

- BLM-administered lands are more than 1 percent of the subwatershed.
- The subwatershed has more than 100 acres of BLM-administered lands in the rain-on-snow hydroregion.
- More than 60 percent of the subwatershed is in the rain-on-snow hydroregion.

In this analysis, the BLM calculated the total open area from timber harvest and roads for all lands in rain-on-snow subwatersheds as a percent of the total subwatershed area by decade for the alternatives and the Proposed RMP. The BLM then refined open area percentage by factoring harvest unit opening percentages based on treatment type in the rain-on-snow hydroregion and compared these to the response curve (Grant *et al.* 2008). Total open area in this analysis was comprised of the following:

- Early Successional structural stage from the Woodstock model for BLM-administered lands
- Early Successional stands from the Landscape, Ecology, Modeling, Mapping, and Analysis (LEMMA) for non-BLM-administered lands
- Road area for all lands

The BLM has made three modifications from the analytical methodology described in the Planning Criteria.

First, the BLM only addressed subwatersheds that are predominately rain-on-snow, with more than 60 percent of the subwatershed in the rain-on-snow zone. This is a change from Step 1 of the analytical methods in the Planning Criteria, which included all subwatersheds with any amount of the rain-on-snow hydroregion. Only subwatersheds that are predominately rain-on-snow are appropriately compared to the Grant *et al.* (2008) response curve.

Second, the BLM used change detection methods rather than the rule set described in Step 3 in the Planning Criteria to calculate the Early Successional forest on non-BLM-administered lands. Using the LEMMA satellite imagery and vegetation classification the BLM identified clearcut forest areas on non-BLM-administered lands for the base period with available imagery (1996–2006) for each identified rain-on-snow subwatershed. The BLM projected this rate of clearcut harvest forward in 10-year increments for 50 years.

Third, the BLM added the acres of roads in rain-on-snow subwatersheds to the acres of Early Successional forest for BLM-administered lands and non-BLM-administered lands. The BLM calculated the area of roads from GIS spatial data for each subwatershed by assuming an average road cut of 15 feet, road width of 15 feet, and road fill of 15 feet, and multiplying that width by the total road length. Including the area of roads allows a direct comparison with the Grant *et al.* (2008) response curve of reported percentage change in peak flow with percent area harvested in the rain-on-snow hydroregion. This is an addition to Step 4 described in the Planning Criteria.

The BLM compared the total open area for each rain-on-snow subwatershed by time period to the rain-on-snow response curve from Grant *et al.* (2008) for each alternative and the Proposed RMP. Response curves for the rain-on-snow hydroregion developed by Grant *et al.* (2008) were constructed from data at the site scale (few to hundreds of acres); those response curves indicate that a mean of 19 percent of a watershed area with roads would need to be harvested to detect a change in peak flow response.

Interpretation of measured peak flow increases at the site scale to larger scales, including the subwatershed scale, poses a scale problem. Changes in peak streamflow are influenced by timber harvest, but also by the age and pattern of forested stands within a larger watershed, the location and extent of roads, the width of Riparian Reserve, and the watershed condition. Very few studies, such as Jones and Grant (1996), and Bowling and Lettenmaier (2001), address peak flow response in larger watersheds, or the effects of a varying suite of forest management activities. These studies have shown that peak flow increase from timber harvest decreases with increasing watershed area. Proceeding downstream, flood peaks become flattened due to channel resistance, transmission losses, floodplain storage, and storm size variation over the watershed. Further, timing of tributary inputs typically desynchronizes peak flows, causing reductions in unit stream flows of 50 percent or greater (Woltemade and Potter 1994). Jones and Grant (1996) describe that, in larger watersheds (15,000–150,000 acres), peak flow increases in adjoining watersheds with different forest stand structural stages were less than the year-to-year natural variability of stream flows. This suggests that stream channels are adjusted to a range of peak flows that is greater than a land use variation.

The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which is incorporated here by reference (USDI BLM 2014, pp. 76–80).

Background

There is an ongoing and abundant supply of available moisture for rainfall over western Oregon in winter, as greatly moderated maritime air masses move across the Pacific Ocean toward the Pacific Northwest. At times, continental air masses displace the warm fronts, producing snow in the higher elevations. Ongoing low intensity storms are common in the planning area, but occasional intense storms will produce a storm depth of more than 6” of precipitation in 24 hours (NOAA 1973). These storms generate peak flows that may overflow banks and cause channel changes, with a return frequency of 2–100 years.

Experimental subwatershed studies in hydrology demonstrate elevated peak flows during flood-producing storms when a high proportion of timber basal area has been removed by timber harvest (**Figure 3-85**), particularly within rain-on-snow watersheds (Grant *et al.* 2008). As the proportion of timber harvest increases within a watershed, evapotranspiration, direct interception, and potential for fog drip declines, while the potential for snow accumulation and melt increases. Snow accumulates faster in openings and is also susceptible to elevated snowmelt rates compared to forested lands (Harr 1981, Harr and Coffin 1992). Storm flow causes runoff along road surfaces into drainage ditches or upon fills, while subsurface routes may be day-lighted in road cuts or flow paths cut off or modified under the road surface. This can result in quicker storm runoff into stream channels where ditch lines connect, compared to slower subsurface flow routes (Harr 1976, Harr *et al*. 1979, Megahan *et al.* 1992, Wemple *et al.* 1996). As storm intensity increases, runoff would more fully synchronize, contributing to peak flows (Megahan and Kidd 1972, LaMarche and Lettenmaier 2001, Luce 2002, Wemple and Jones 2003).

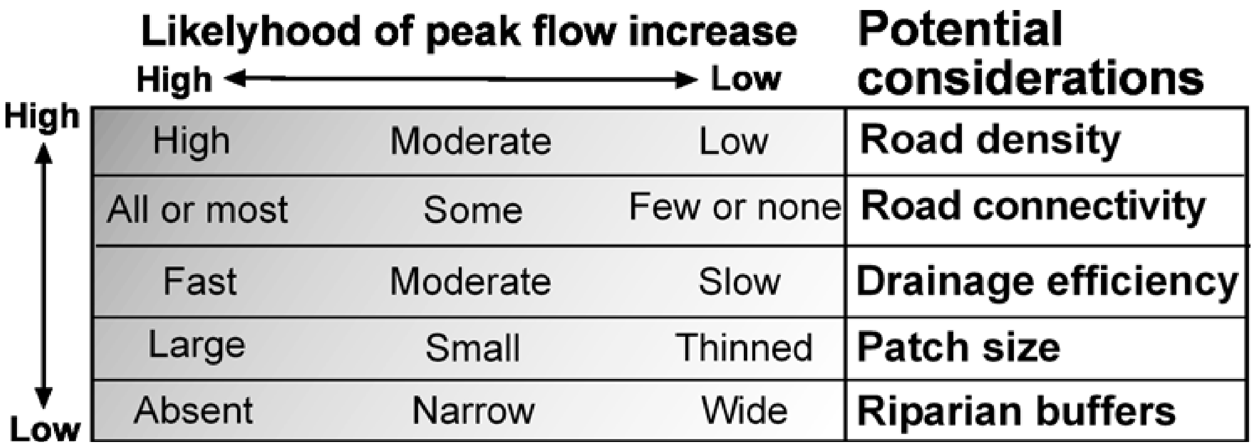

Figure 3-85. Site conditions and treatments for risk of peak flow increase
Source: Grant *et al*. 2008 PNW-GTR-760, p. 40

There has been a long debate regarding the magnitude of peak flows resulting from timber harvesting and road construction. Much of the discussion has centered on the timing and scale at which peak flows are detected, as well as the type, size, and intensity of management activities that result in channel-changing peak flows. There is conflicting research on how much harvesting within a watershed would result in measurable changes to peak flows and at which watershed scales, and the role of road construction in changes in peak flows. Furthermore, there is insufficient information on the effect of partial harvesting on peak flows. The 2008 FEIS contained a review of the research and debate over peak flows (USDI BLM 2008, pp. 357–359), which is incorporated here by reference.

There are 1,203 subwatersheds within the planning area. When separated by hydroregion, 679 subwatersheds are predominately rain-dominated, 96 subwatersheds are predominately rain-on-snow-dominated (38 with BLM-administered lands), 163 subwatersheds are predominately snow-dominated and 265 subwatersheds have proportions of each hydroregion. **Figure 3-86** shows the proportion of subwatersheds by hydroregions in the planning area.

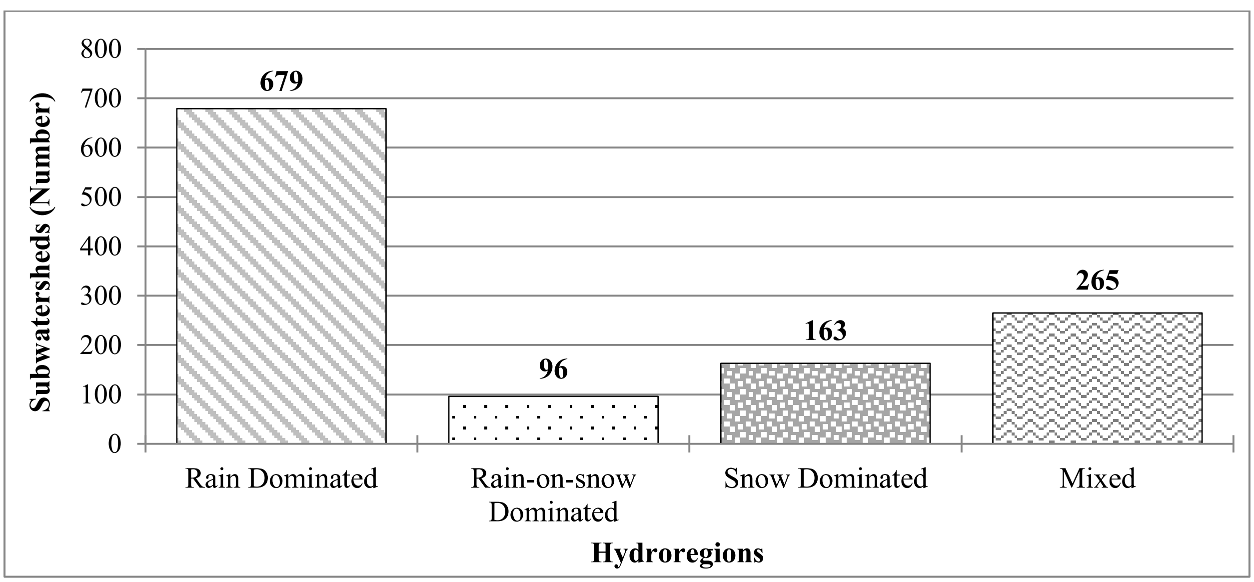

Figure 3-86. Proportions of hydroregions in the planning area

Gravel bed channel types with a 1–2 percent gradient are most likely to be affected for any detectible peak flow increase from forest management and roads shown in **Figure 3-87**. Generally, these gravel bed stream types are a small proportion of total stream miles (less than 10 percent) in any subwatershed in the decision area. Most streams in the decision area are cascade or step-pool channel types. The predominance of cascade or step-pool channel types and the general absence of sand-bed channel types in the decision area reduces the likelihood that any peak flow increases would result in changes to channel structure in the decision area.

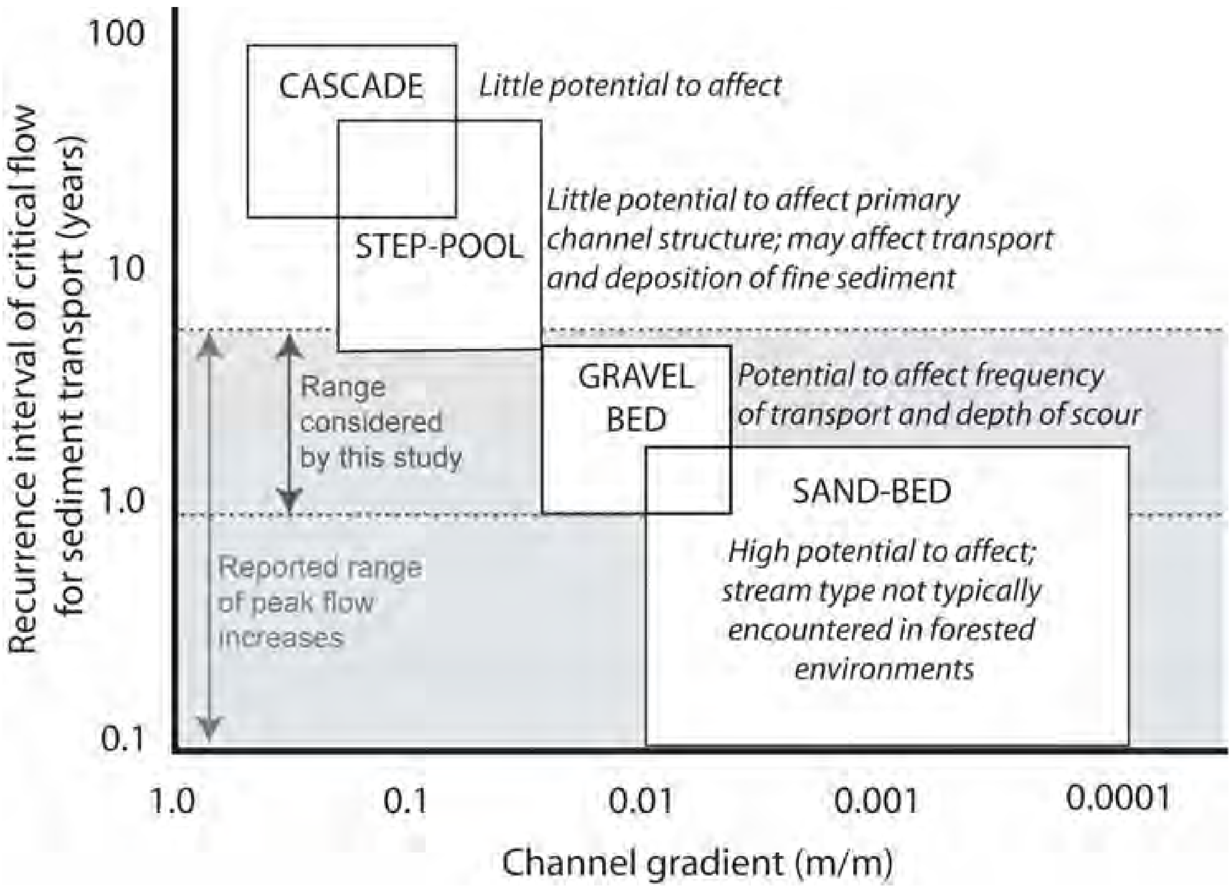

Figure 3-87. Sediment transport by return period and stream type
Source: Grant *et al*. 2008 PNW-GTR-760, p. 43

Figure 3-87 shows the potential sediment transport and channel scour by channel gradient and stream type for 1- to 6-year recurrence interval peak flows from forest management and roads. Notice that 1–2 percent gravel bed streams have the highest potential for effects.

Affected Environment and Environmental Consequences

Ninety-six subwatersheds (3 percent) in the decision area are rain-on-snow dominated (**Figure 3-88**). From this selected set of subwatersheds, 38 subwatersheds include BLM-administered lands, totaling 197,709 BLM-administered acres. These intermediate elevations in rain-on-snow subwatersheds are analyzed with the methodologies presented in the Planning Criteria, and they range in area from 3,300 to 27,400 acres, with a mean size of 15,500 acres and an area of 591,626 acres. **Figure 3-89** displays the rain-on-snow subwatersheds with BLM-administered lands by decade across the range of alternatives and the Proposed RMP. **Figure 3-88** also shows the 7 out of 38 subwatersheds with BLM-administered lands (8,780 acres) where more than 19 percent of the subwatershed is currently in an open condition with clearcut areas and roads. According to Grant *et al.* (2008), these 7 subwatersheds would be susceptible to detectable change in peak flow response.

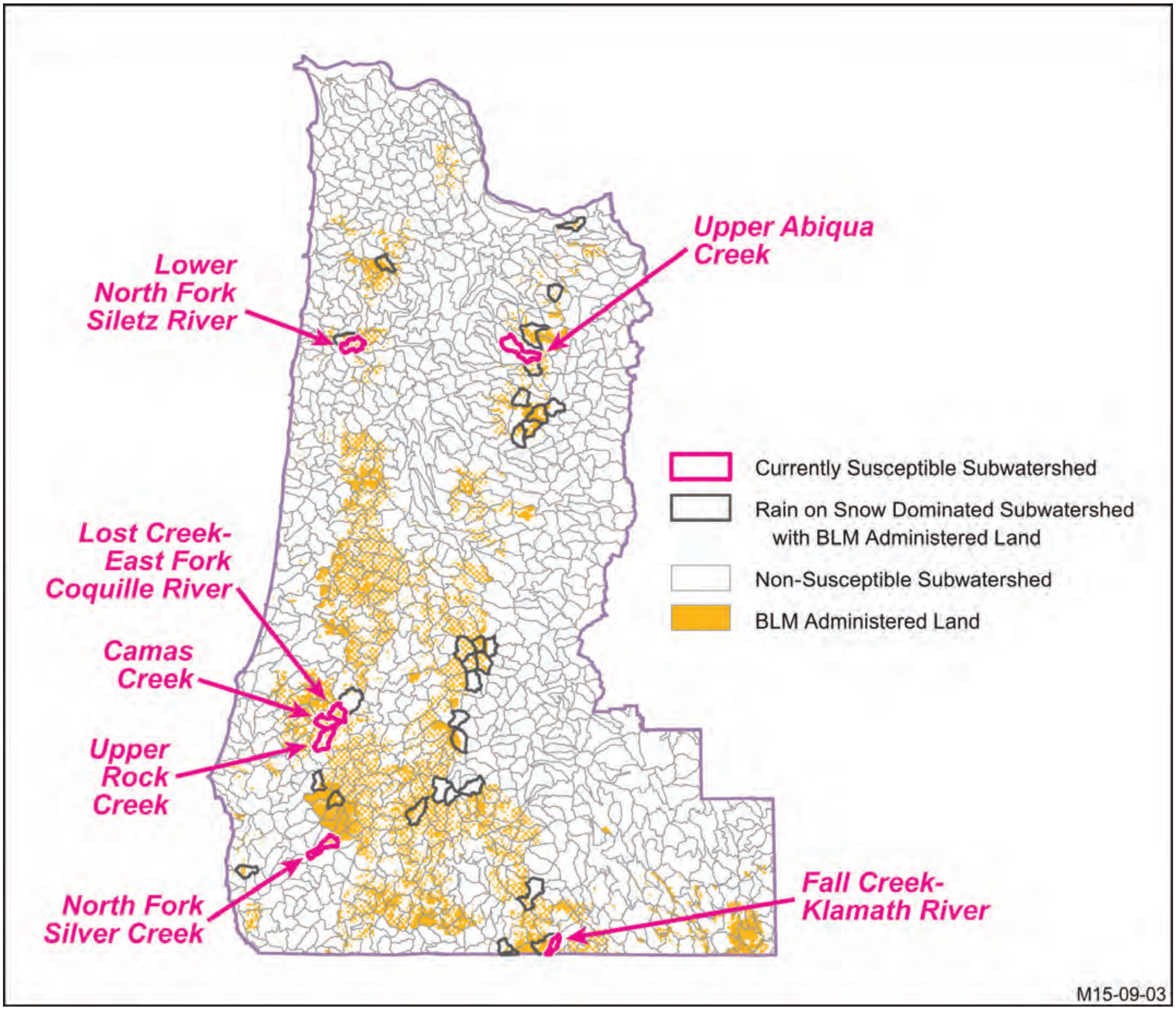

Figure 3-88. Rain-on-snow dominated subwatersheds and subwatersheds currently susceptible to a peak flow increase

Under all alternatives and the Proposed RMP, the number of subwatersheds with BLM-administered lands that would have more than 19 percent of the subwatershed with clearcut harvest units and roads and be susceptible to a peak flow increase would vary from 6–10 subwatersheds in any period to 2063. In future decades, the No Action alternative, Alternatives A and D, and the Proposed RMP would result in slight decreases in the number of subwatersheds susceptible to peak flow increases after a slight increase in the 2023 period (in more than 19 percent open condition). In contrast, Alternatives B and C would result in slight increases in the number of subwatersheds susceptible to peak flow increases over the next

50 years. In those subwatersheds susceptible to peak flow increases, the open area from clearcut harvest units and roads would vary from 19–29 percent of the subwatershed among all ownerships. The acreage of affected BLM-administered lands would increase through 2033, with the smallest increase under the Proposed RMP and the largest increase under Alternative C as shown in **Figure 3-89**. When all ownerships are analyzed together, **Figure 3-90** shows a slightly different picture of peak flow susceptibility in the rain-on-snow subwatersheds that would have more than 19 percent of the subwatershed in clearcut harvest units and roads. This figure shows that the alternatives and the Proposed RMP would increase the open area with recently harvested areas and roads across all ownerships through 2023 and decrease slowly until 2063, although an average of approximately 30,000 acres would continue to be susceptible to peak flow increases. Generally, Alternatives B and C would have the highest peak flow susceptibility and Alternative D the lowest peak flow susceptibility through 2063.

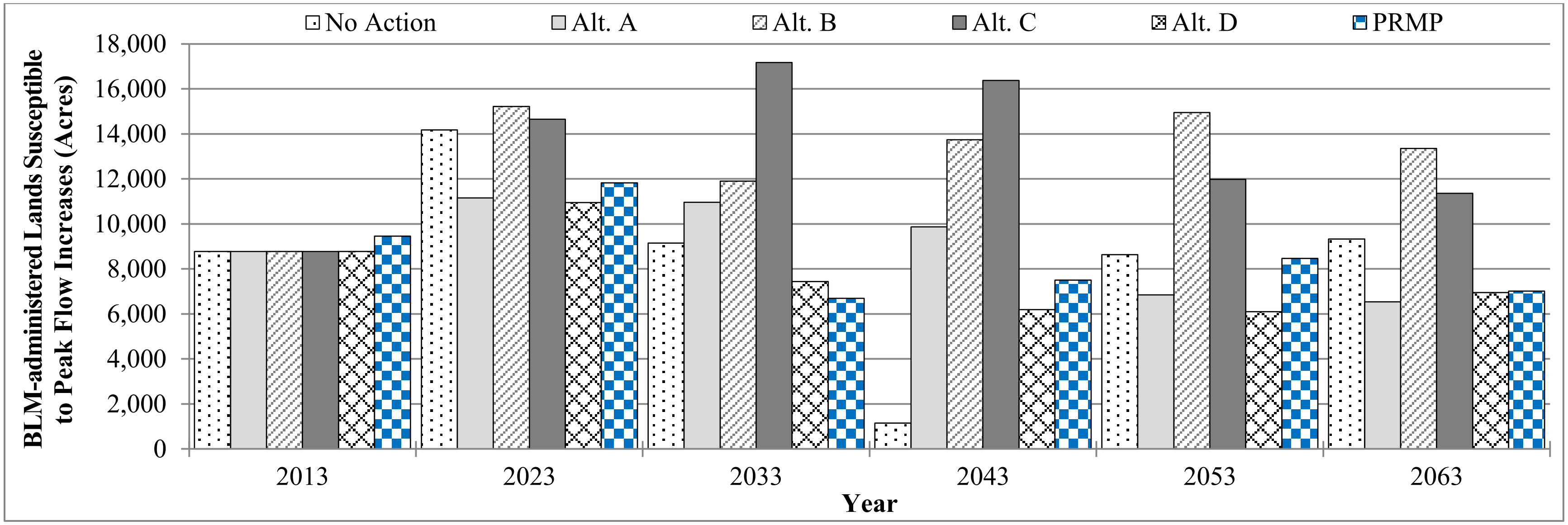

Figure 3-89. Subwatershed area (acres) on BLM-administered lands susceptible to peak flow increases by decade

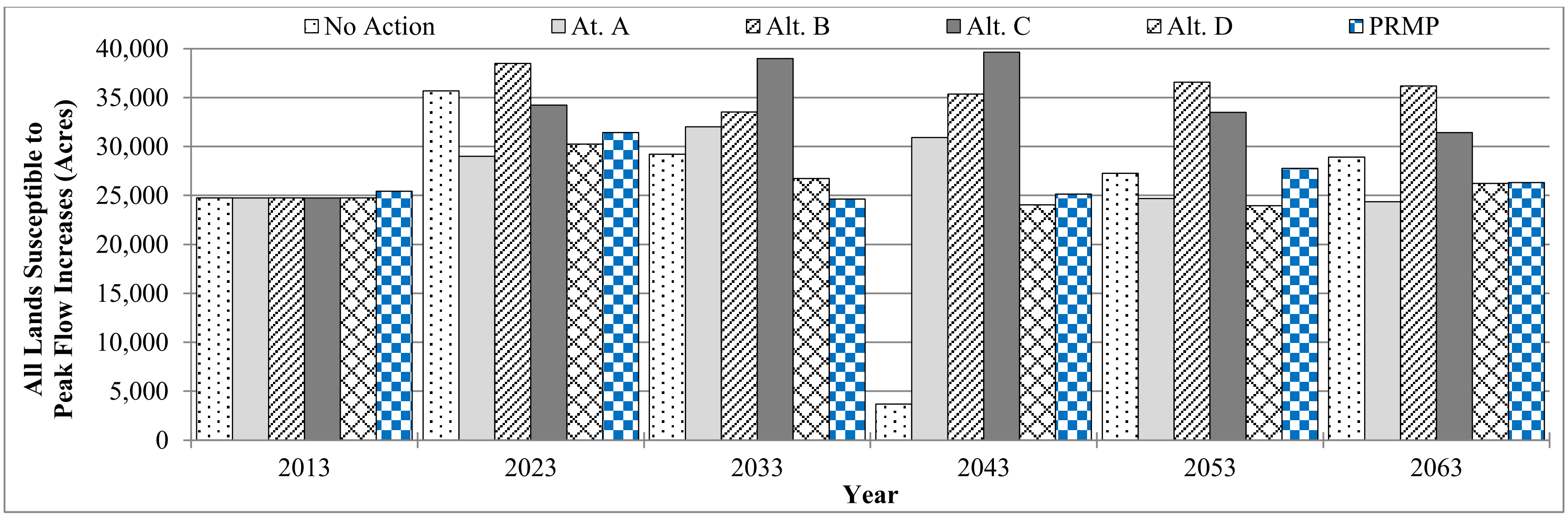

Figure 3-90. Subwatershed area (acres) for all lands susceptible to peak flow increases

The affected harvest area on BLM-administered lands would vary from 621–10,173 acres in any time period, which is less than 0.4 percent of the BLM-administered lands within the decision area and less than 1 percent of the Harvest Land Base under any alternative and the Proposed RMP.

Issue 3

How would timber harvest affect the risk of landslides that would deliver sediment to stream channels under the alternatives?

Summary of Analytical Methods

Shallow, rapidly moving landslide[68] initiation normally requires some combination of steep and convergent slopes, shallow soils overlying semi-impervious bedrock, and heavy or prolonged precipitation. Removing forest cover can elevate susceptibility to landsliding. Because of the multiple factors affecting landslide occurrence, including stochastic factors, it is not possible for the BLM to predict landslide occurrence. Instead, this analysis presents a depiction of risk of landslides and the effect of timber harvest under the alternatives and the Proposed RMP on that risk.

In this analysis, the BLM evaluated the risk of landslides by measuring relative landslide density using the GIS mass wasting hazard model within NetMap (Miller 2003, Miller and Benda 2005, and Miller and Burnett 2007a). The NetMap model produces a naturally occurring landslide susceptibility from geologic and landform factors, but independent of vegetation factors. The modeling is based on landslide inventories from the Coast Range, Western Cascades, and Klamath physiographic provinces. The model produces a spatially distributed estimate of landslide density by mathematically matching observed landslide locations with topographic attributes including slope, convergence (bowl-shaped landforms), and watershed area, using a digital elevation model. The BLM used the channelized mass wasting delivery model in NetMap to determine susceptible areas from the hill slope relative landslide density that could deliver to any stream channel.

The BLM calibrated this modeling for heavy precipitation represented by the 1996 storms (70- to 100-year return period). Extreme storms are highly correlated with increased rates of landsliding on susceptible sites. For the 1996 storms, observed landslide size and density in the Coast Range were the highest for forest stands less than 10 years old, lower for stands between 10–100 years old, and lowest for forested areas over 100 years old (Robison *et al*. 1999, Miller and Burnett 2007a).

The BLM added forecasts of future timber harvest under each alternative and the Proposed RMP to the NetMap model outputs. In this analysis, the BLM assumed that clearcut harvest would increase the relative landslide density. After regeneration harvest, cut trees root strength rapidly declines, and shallow soils lose mechanical strength. Landslide susceptibility lowers substantially 10 years after clearcut harvest and becomes similar to mixed forests or hardwood stands (Ziemer 1981, Miller and Burnett 2007b). In this analysis, the BLM assumed that commercial thinning would not affect landslide risk. After thinning, residual live trees with intertwined roots promote slope stability. Live trees also transpire water, which helps to lower soil water, a causative factor in slope failures. In this analysis, the BLM grouped together the following harvest methods:[69]

- Regeneration in the High Intensity Timber Area in Alternatives A and C
- Variable retention harvests in—

[68] A shallow, rapidly moving landslide is a mass of soil, rock, or debris that rapidly moves down a slope or stream channel at a velocity that is difficult for people to outrun or escape.
[69] This grouping is necessary to compare harvested areas between the alternatives that are either clearcut or have a high degree of openness with low to variable retention.

- The Matrix, Connectivity/Diversity Blocks, and Adaptive Management Areas in No Action alternative;
- The Moderate Intensity Timber Area and Low Intensity Timber Area in Alternative B and the Proposed RMP; and
- The Moderate Intensity Timber Area in Alternative D.

It is possible that retention trees in variable retention harvests would reduce the effect of clearcut harvest on landslide risk. However, the BLM cannot distinguish this potential effect of retention trees on landslide risk at this scale of analysis. The BLM derived spatial locations of modeled regeneration harvest under each alternative and the Proposed RMP from the Woodstock model outputs (see the Vegetation Modeling section earlier in this chapter).

The BLM evaluated relative landslide density only within the Harvest Land Base under each alternative and the Proposed RMP, because the BLM would implement harvest only within the Harvest Land Base. This is a change from the methodology described in the Planning Criteria and streamlines the analytical procedure by focusing on the areas where timber harvest may have a measureable effect on the naturally occurring landslide density. The BLM did not account for the continuing effect of clearcut harvests that the BLM has conducted within the past ten years. As described in the Forest Management section of this chapter, the BLM has conducted only a very small acreage of clearcut harvests in the past ten years.

Not all steep slopes are at high risk of landslides. Steep slopes in the Harvest Land Base can be up to 80 percent or more, such as those on smooth side slopes or competent rock, and have a low risk of landsliding. These areas are typically outside of headwalls or steep, dissected topography, which is usually found in the Riparian Reserve. An exception, based on slope steepness alone, is in the Tyee sandstone bedrock core area in the Coast Range and primarily on the Coos Bay District, where slopes > 75 percent slope are considered a landslide risk threshold (ODF 2003). Comparatively, similar landslide initiation risk inside Riparian Reserve in steep and convergent topography occurs on lower slopes (70 percent, except for the Tyee area, where 65 percent slopes are considered a threshold) (ODF 2003). Based on slope alone, the BLM used 75 percent slope as a threshold for landslide risk in the Harvest Land Base (instead of 80 percent) to account for the Tyee sandstone bedrock core area on Coos Bay District, even though it is only a small portion of the decision area.

This analysis within the Harvest Land Base does not account for areas that the BLM has identified or will identify through the Timber Production Capability Classification (TPCC) system as unsuitable for sustained yield timber production, such as low-productivity woodlands, unstable landforms, rock bands, talus slopes, meadows, and waterlogged soils (USDI BLM 1986). This inventory is ongoing, and the BLM reviews each proposed timber harvest area during interdisciplinary project planning. The BLM will periodically add additional areas to those areas reserved through updates to the TPCC system, when examinations indicate that an area meets the criteria for reservation, consistent with BLM Manual 5251 – Timber Production Capability Classification (USDI BLM 1984). Because this modeling does not account for these areas, it overestimates the potential effect of timber harvest on relative landslide risk in these areas. However, these areas unsuitable for sustained-yield timber production would be identified and reserved similarly under all alternatives and the Proposed RMP, and the failure of the modeling to account for these areas does not change the relative outcomes under the alternatives or the Proposed RMP.

In regeneration harvest areas under each alternative and the Proposed RMP, the BLM multiplied the naturally occurring landslide density by factor of three, to represent the additive risk from regeneration harvest. The BLM derived this factor from the relationship of observed landslides in varying forest age classes on the Siuslaw National Forest during the 1996 storms; the landslide density in stands less than 10 years old was approximately 3 times the average of stands over 10 years old (Miller and Burnett 2007a).

The BLM did not include potential increases to relative landslide risk from new road construction in this analysis. This is a change from the methodology described in the Planning Criteria (USDI BLM 2014, p. 81). Roads do have the potential to increase landslide risk (Weaver and Hagans 1996, Miller and Burnett 2007a). However, under all alternatives and the Proposed RMP, the BLM would construct few miles of new roads relative to the existing road system (see Trails and Travel Management in this chapter). Furthermore, most new roads under all alternatives and the Proposed RMP would be built on stable areas such as ridge top locations, and would mostly be short spurs to the existing collector roads.

The BLM evaluated the effects of timber harvest on relative landslide density over 50 years. This long period is appropriate, given the importance of stochastic events with long return-intervals (i.e., heavy precipitation) to the underlying landslide risk. Furthermore, this long period is necessary in the analysis to distinguish differences in timber harvest implementation and provide basis for meaningful comparison of the effects of the alternatives and the Proposed RMP.

The BLM used combined landslide density and delivery models in NetMap to calculate the relative susceptibility for direct debris-flow impacts to all stream channels. The BLM classified the traversal proportion grid in NetMap to determine the top 80 percent of debris flow risk areas that would transverse stream segments, based on the cumulative distribution of values. The BLM intersected the regeneration harvest projected in the Woodstock model by alternative and the Proposed RMP and by decade with the debris flow risk proportions data layer from NetMap. From this intersection, the BLM determined the potential area of debris flow susceptibility by alternative and the proposed RMP and decade that may be further elevated by regeneration harvest.

The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which is incorporated here by reference (USDI BLM 2014, pp. 80–82).

Background

Mountainous topography in western Oregon includes steep slopes, shallow soils, and underlying rock types that may trigger shallow, rapidly moving landslides under high rainfall conditions. Observed differences in the spatial density of landslides are explained in part by variations in geology, topography, and vegetation (Dragovich *et al.*1993). Forests on steep slopes provide partial stability by roots spreading providing mechanical strength and binding of the soil. The important distribution of roots is in the lateral-horizontal direction. Vertical distribution of roots is less important for shallow landslides, because few roots cross the shear plane of the landslides (Schwarz *et al.* 2012). The density of tree roots, especially coarse roots and branching, is important in maintaining slope stability. Tree-to-tree root grafting further improves slope stability for selective harvest types. Eis (1972) found that 45 percent of selectively cut Douglas-fir trees were root grafted, and approximately half of the stumps from cut trees were still alive 22 years later.

Not all landslides result in effects on streams, as only 30–70 percent of landslides actually deliver sediment and other material to streams (Miller and Burnett 2007a). A rapidly moving landslide in a stream channel (also called debris torrent or sluice-out) is high velocity slurry of soil, rock, vegetation debris, and water that can travel long distances from an initiation site through steeply confined mountain channels. The travel distance of channelized debris torrents depends upon slope gradient, valley width, and high angle tributary junctions. As debris torrents move downhill, they entrain additional sediment and organic debris that can expand the original volume by 1,000 percent or more, being more destructive with distance traveled (Benda and Cundy 1990). Debris torrents lose energy and terminate at high angle stream tributary junctions and low gradient valley floors.

Figure 3-91 shows the proportion of slopes that are greater than 75 percent by alternative and the Proposed RMP in the Harvest Land Base. These steep slopes occur on 2–4 percent of the Harvest Land Base (8,000–27,000 acres) among the alternatives and the Proposed RMP.

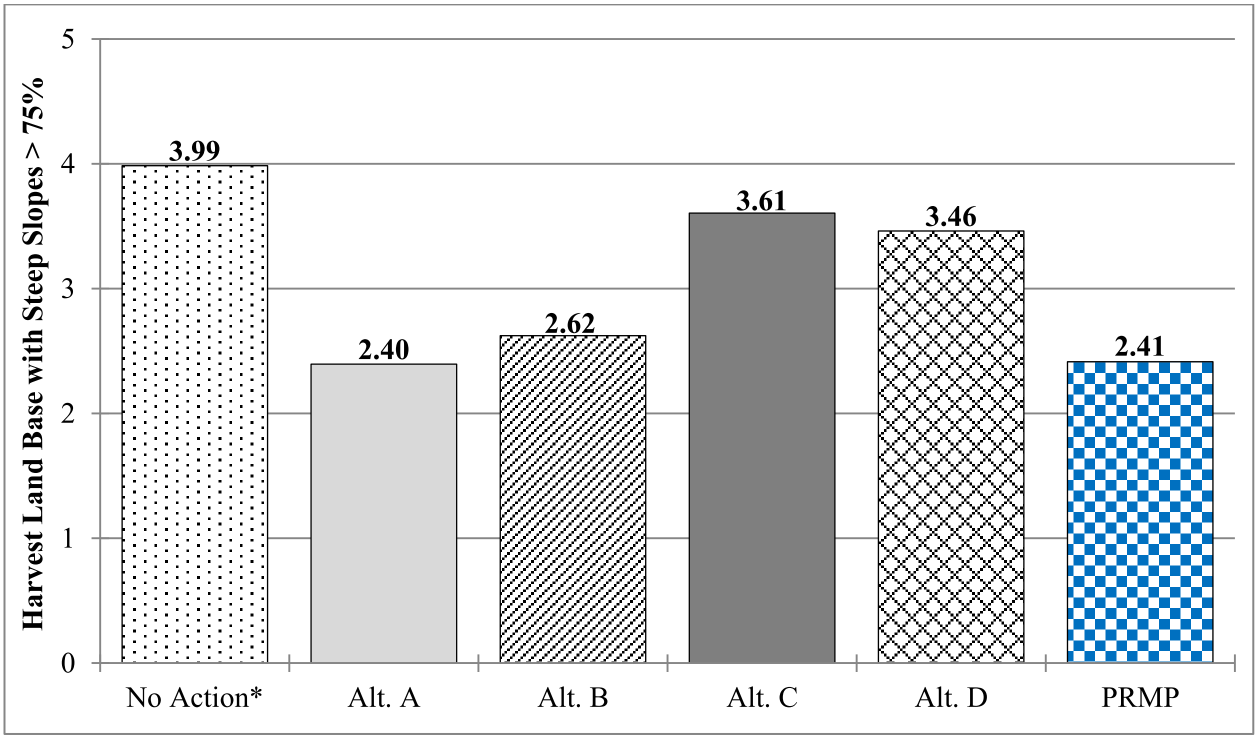

Figure 3-91. Proportion of the Harvest Land Base with steep slopes > 75 percent

* The No Action alternative includes the Matrix and Adaptive Management Area acres, where regeneration harvest treatment would occur, to compare with the Harvest Land Base in the action alternatives and Proposed RMP.

The naturally occurring relative landslide density within the Harvest Land Base is similar among the alternatives and the Proposed RMP, although not identical (**Figure 3-92**). The differences are a result of the proportion of decision area that would be allocated to the Harvest Land Base under each alternative and the Proposed RMP. Among all alternatives and the Proposed RMP, almost half of the Harvest Land Base would have a relative landslide density of zero, meaning there would effectively be no risk of landslides. The BLM would include a slightly higher percentage of the Harvest Land Base under Alternative A with a relative landslide density of zero, compared to the other alternatives and the Proposed RMP. The alternatives and the Proposed RMP would all have a similar percentage of the Harvest Land Base, approximately 2 percent, with the highest relative landslide density (greater than 1 per square mile). As noted in the 2008 FEIS, the Harvest Land Base under the No Action alternative (i.e., Matrix and Adaptive Management Areas) is the portion of the decision area with the lower naturally occurring landslide density. In contrast, the Riparian Reserve, Late-Successional Reserve, and non-forested lands have more than twice the area where modeled naturally occurring landslides exceed 1 per square mile (USDI BLM 2008, p. 349).

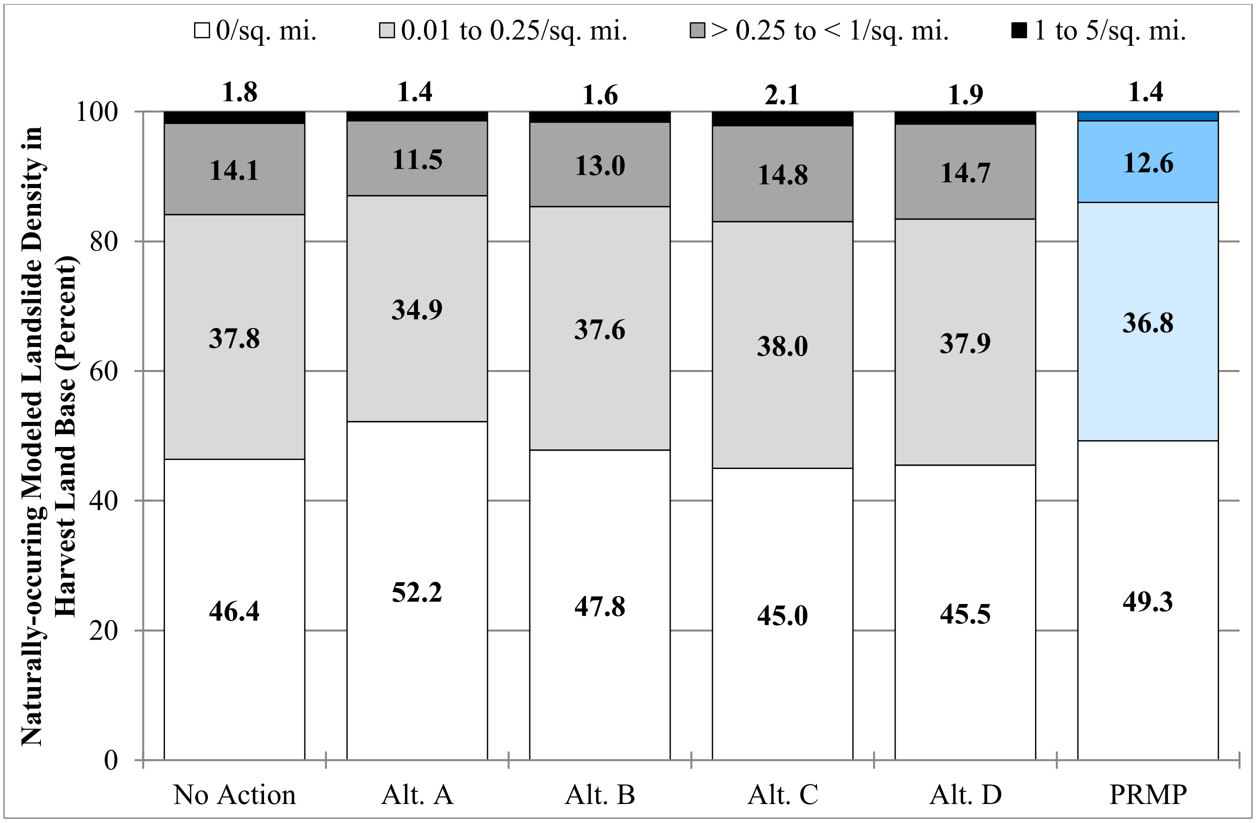

Figure 3-92. Cumulative area of naturally occurring modeled landslide density within the Harvest Land Base, number/square mile

Over 50 years, the average landslide density in the Harvest Land Base would increase by varying amounts among the alternatives and the Proposed RMP. Alternative C would have the highest average landslide density, and the Proposed RMP and Alternative A would have the least (**Figure 3-93**). Alternatives A and C would have the most increase in average relative landslide density from the naturally occurring landslide density, and Alternative D would have the least. In descending order, Alternatives A, the No Action alternative, the Proposed RMP, and Alternative B would have less increase in average relative landslide density from the naturally occurring landslide density than Alternative C, but more than Alternative D.

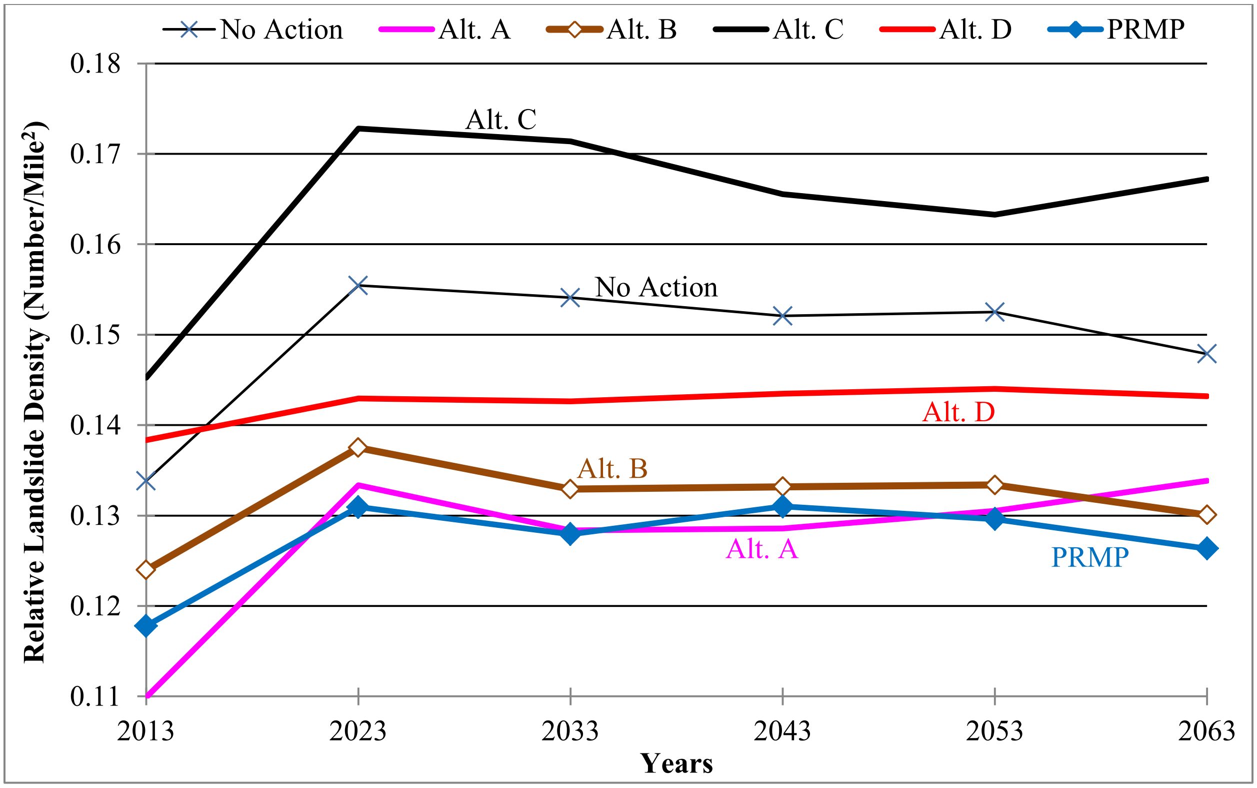

Figure 3-93. Relative landslide density in the Harvest Land Base compared to intrinsic potential at 2013

The alternatives and the Proposed RMP would vary in the levels of regeneration harvest, and consequently in the potential effect on landslide density. Over 50 years, under Alternative A, the BLM would implement regeneration harvest on the largest percentage of the Harvest Land Base at 10 percent, followed by Alternative C at 9 percent, the No Action alternative at 9 percent, the Proposed RMP at 7 percent, Alternative B at 5 percent, and Alternative D at 3 percent.

The differences in relative landslide density among the alternatives and the Proposed RMP are a result of a combination of (1) the naturally occurring relative landslide density that is included in the Harvest Land Base and (2) the amount and specific locations of regeneration harvest. Within the Harvest Land Base, Alternatives C and D have approximately 30 percent more acres of steep slopes (**Figure 3-91**), compared to Alternatives A and B, and the Proposed RMP, and a corresponding higher natural relative landslide density. The No Action alternative, Alternatives B and D, and the Proposed RMP would retain live trees within the regeneration harvest units, in contrast to clearcut harvest under Alternatives A and C. This retention within regeneration harvest units may reduce the average relative landslide density towards what is naturally occurring, but the degree of improvement is not known. The highest risk of landslides is restricted to 2 percent of the Harvest Land Base upon steep slopes, where modeled naturally occurring landslides would exceed 1 per square mile. The average relative landslide density differences among the alternatives and the Proposed RMP in **Figure 3-93** are slight and similar to what would naturally occur. Contrasted to regeneration harvest areas, a small percentage of Young, Mature, and Structurally-complex stands would naturally fail over time, regardless of forest management.

The size and placement of the Harvest Land Base is as important as the intensity of regeneration harvest. For example, as shown in **Figure 3-93**, Alternatives A and B, and the Proposed RMP would have lower average landslide density with regeneration harvest than the naturally occurring landslide density of the

No Action alternative, indicating the importance of included or excluded lands in the Harvest Land Base and where suitable stands are available for regeneration harvest. During project planning, the BLM would evaluate project areas for slope stability and would reserve unstable areas under the TPCC system.

Under all alternatives and the Proposed RMP, portions of the Harvest Land Base would be susceptible to deliver sediment to a channel by shallow landsliding, whether managed or not. In the context of extreme storms, an average of 8 percent of the regeneration harvest areas under all alternatives and the Proposed RMP (ranging from 4 percent under Alternative D in 2023 to 13 percent in Alternative C in 2063) would have some measure of susceptibility to deliver to a channel over the next 50 years. The remaining regeneration harvest areas would have essentially no susceptibility at all. **Figure 3-94** shows the acres of channelized debris flow susceptibility for Alternative C by decade would be approximately twice the acreage under the No Action alternative, while the acreage under Alternatives A and B, and the Proposed RMP would be approximately 50 percent of the acreage under the No Action alternative. The acres of channelized debris flow susceptibility by decade under Alternative D would be approximately 25 percent of the acreage under the No Action alternative.

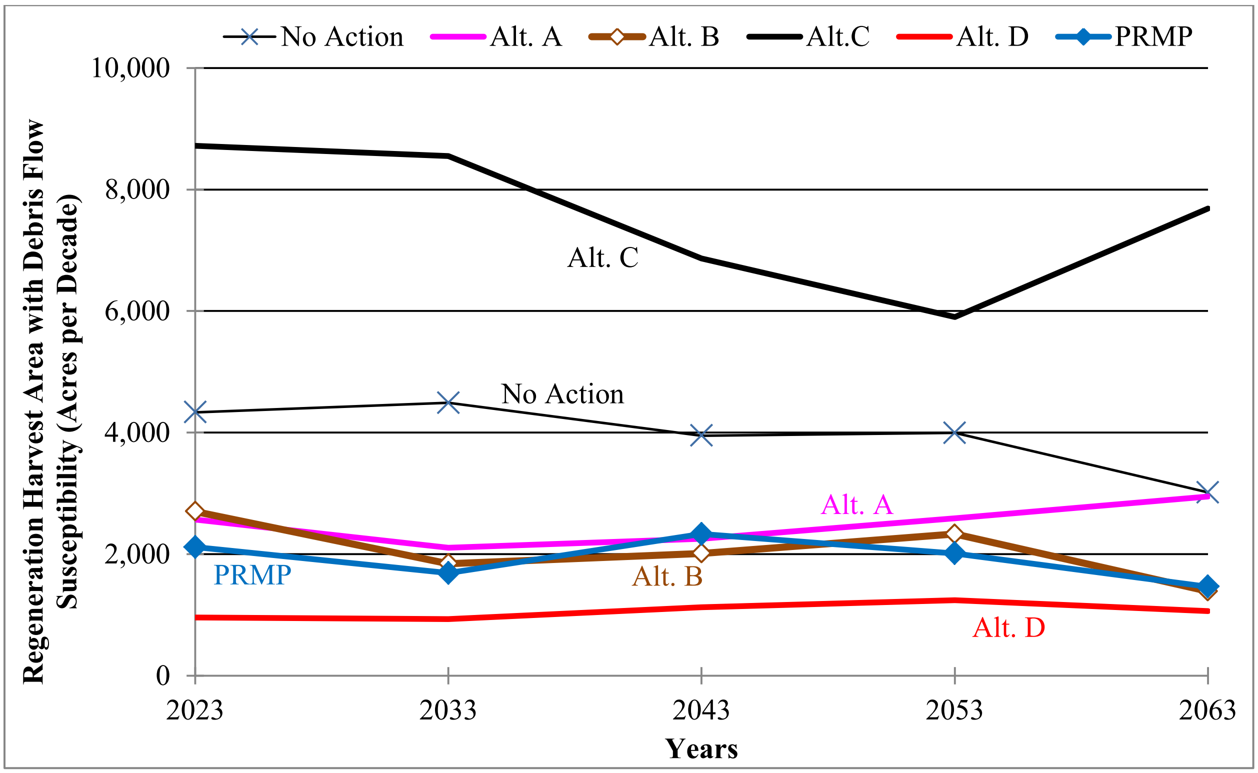

Figure 3-94. Regeneration harvest area with debris flow susceptibility, acres per decade

Shallow landsliding may contribute sediment, rocks, and forest debris to stream channels from susceptible portions of regeneration harvest areas during extreme storms, and from other unmanaged areas of the Harvest Land Base. There is increased risk for landsliding where the combination of steep slopes and geomorphic factors lower hill slope stability. Removal of vegetation by regeneration harvest would lower the strength of live roots binding the soil. If an extreme storm would occur during the Early Successional structural stage, the susceptibility of landsliding would be increased compared to forests where basal area would be maintained. Under all alternatives and the Proposed RMP over the next 50 years, the area of increased landsliding susceptibility with potential to deliver to streams would average no more than 8 percent of the regeneration harvest area and less than 1 percent (0.57 percent) of the Harvest Land Base.

Issue 4

How would new BLM road construction and road decommissioning under the alternatives affect disturbance and sources of fine sediment that may be delivered to stream channels?

Summary of Analytical Methods

This analysis compares surface erosion for existing roads and the projected new roads under each alternative and the Proposed RMP. Sediment delivery from roads can result from surface erosion, gullying, and mass wasting. However, due to limitations of model capability and geospatial processing across the planning area, this discussion is restricted to surface erosion from roads.

The empirical basis for this analysis is the Washington Road Surface Erosion Model (WARSEM; Dube *et al.* 2004). In this analysis, the BLM used the WARSEM methodology combined with BLM GIS data layers to derive estimates of annual long-term sediment production. Factors affecting surface erosion include geologic parent material, surface type, age of the road, road drainage, degree of vegetative cover on cut and fill slopes, and traffic factors such as winter haul. In this analysis, the BLM evaluated watersheds (approximately 60–300 miles^2; U.S. Geological Survey hydrologic unit code 10, which had previously been termed 5th field watersheds).

In this analysis, the BLM used projected timber volume and road ratios by harvest type as described in the Planning Criteria (USDI BLM 2014a, pp. 127–128, Tables 28–31) to determine miles of new temporary and permanent road construction for natural and aggregate surfaced road for forest treatment types other than commercial thinning under each alternative and the Proposed RMP (USDI BLM 2008, Appendix I – Water, pp. 239–240). For new temporary and permanent road construction for commercial thinning, the analysis used actual new road construction ratios derived from six years (FY2007–FY2012) of harvest volume sold data and timber sale contract data, rather than the estimated new road construction ratios for commercial thinning from the 2008 FEIS (see the Trails and Travel Management section of this chapter). The BLM used these road estimates to calculate miles of existing and new, permanent BLM road construction by surface type within a 200-foot sediment delivery distance to streams using selected WARSEM parameters (formally DNR Reference Road model).

The modeled sediment delivery distance (200 feet) takes into account existing roads paralleling streams and existing roads with inside ditches that carry concentrated flow farther away from a stream due to lack of ditch relief culverts. This modeled distance is of little relevance to thinning activities and new road construction in the Riparian Reserve, because these roads are farther than the mean sediment travel distance to a stream and are separated by the no-harvest portions of the Riparian Reserve.

This analysis calculated potential fine sediment delivery (tons/year) from new temporary and permanent roads by alternative and the Proposed RMP through 2023. Although the Planning Criteria displayed calculations over a longer period, this analysis is restricted to a ten-year time span because estimations of road construction beyond ten years become speculative. After ten years of implementation of any alternative or the Proposed RMP, the road system would be fully developed for the most part. That is, the BLM would have built most of the road network necessary to provide access to the actively managed forest stands, and road construction would decline over time. In addition, new road construction, logging technology, and changing harvest types would continue to reduce the road construction necessary to provide access to the actively managed forest stands. Therefore, potential fine sediment delivery from new roads in future decades would be lower than the sediment delivery calculated for the first decade.

The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which is incorporated here by reference (USDI 2014, pp. 82–88).

Background

Soil erosion is a natural occurrence in a forested landscape, aided by water, climate, gravity, soil properties, and lack of vegetative cover. Forest roads are unnatural, compacted surfaces and offer opportunities for accelerated erosion and potential sediment delivery to stream channels from a variety of sources, including small slumps and slides into the roadway from the cut bank; water channeling from the road or ditches if not properly directed and controlled; and blocked culverts and road fill washouts during floods. Sediment sources from roads are described in more detail in the 2008 FEIS, which is incorporated here by reference (USDI BLM 2008, pp. 343–346).

Roads can deliver up to 90 percent of the total sediment production from forestry activities. This especially occurs on older roads where mid-hillslope construction and side casting of excess soil material was common (EPA 2005). Roads built in the last 30–40 years typically use ridge top locations or full-bench construction practices across steep slopes, removing excess soil material to offsite waste areas and managing drainage effectively. In general, modern road construction practices produce less sediment from forest roads than older road construction practices (Copstead 1998).

The distance that sediment travels along roadways depends upon a number of factors, including underlying geology, age of road since construction, road gradient, road drainage, and ground cover. The average sediment travel distance from seven studies in different geologies, including highly relevant studies in western Oregon, is 40 feet, with a range of 0–639 feet. Sediment travel distances from roads are described in more detail in the 2008 FEIS, which is incorporated here by reference (USDI BLM 2008, p. 345).

There are 14,330 miles of inventoried BLM-controlled roads in the planning area, of which 1,390 miles have a paved surface (10 percent), 10,242 miles have a gravel surface (71 percent), and 2,698 miles have a natural surface (19 percent). There are a higher proportion of paved roads in the precipitation-dominated Coast Range province than in the drier Klamath province. When evaluating all BLM-controlled roads, the highest potential sediment yield is from natural surface roads, which average 9.61 tons/mi^2/year. The lowest yield is from paved roads, which average 1.58 tons/mi^2/year (USDI BLM 2008, p. 346).

Approximately 36 percent of all existing BLM-controlled roads on BLM-administered lands are within a 200-foot delivery distance (5,096 miles of 14,330 total miles). The average potential fine sediment delivery yield to streams from existing BLM-controlled roads within the 200-foot sediment delivery distance is 2.26 tons/mi^2/year as shown in **Table 3-66** (USDI BLM 2008, p. 347, Table 3-59).

Table 3-66. Potential fine sediment delivery from existing roads

Existing Roads*	Roads Within Fine Sediment Delivery Distance (Miles)†		Potential Fine Sediment Delivery (Tons/Year)‡		Watershed Potential Fine Sediment Delivery (Tons/Mile²/Year)‡	
	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**

* Includes BLM-controlled roads and private roads within the decision area from BLM GIS GTRN (roads) coverage
† Includes road segments within 200 feet of a stream channel, where ditch flow carrying fine sediment could enter streams
‡ Planning criteria estimate in which calculations are based on surface type for each HUC 10 watershed and summed for the planning area

Implementation of best management practices (BMPs;[70] **Appendix J**) is a primary reason that BLM-controlled roads currently result in a minor portion of the total sediment delivery to streams from roads. The BLM has decommissioned about 900 miles (6 percent) of the road system (i.e., the BLM has closed the road to vehicles and left the road in an erosion-resistant condition). A small percentage of these decommissioned roads are within the 200-foot sediment delivery distance. The process of decommissioning includes the application of BMPs, including blocking the road, out-sloping and adding waterbars for drainage control, applying erosion control, and ensuring stream hydrologic conductivity, all features that reduce the potential sediment delivery from roads.

Forest management activities require adherence to management direction and the application of applicable BMPs in designing and constructing permanent and temporary roads under all alternatives and the Proposed RMP to maintain or improve water quality. The BMPs include methods that either avoid or minimize the delivery of sediment to streams. Specific BMPs have been developed for timber harvest, road construction, maintenance, and decommissioning, energy and mineral development, fuel reduction treatments, and other forest activities. Examples of the important BMPs that involve road construction and use are shown in **Table 3-67**.

[70] Best management practices (BMPs) are methods, measures, or practices selected based on site-specific conditions to ensure that the BLM would maintain water quality at its highest practicable level to meet water quality standards and TMDL allocations as set by the State of Oregon, Department of Environmental Quality (**Appendix J**).

Table 3-67. Best management practices for road and landing construction*

Best Management Practice	Oregon Department of Forestry (ODF)/ Oregon Administrative Rules (OAR) Forest Roads - Division 625
Locate temporary and permanent roads and landings on stable locations (e.g., ridge tops, stable benches, or flats, and gentle-to-moderate side slopes). Minimize construction on steep slopes, slide areas, and high landslide hazard locations.	(OAR) 629-625-0200 (3) ODF, Road Location
Locate temporary and permanent road construction or improvement to minimize the number of stream crossings.	(OAR) 629-625-0200 (3-4) ODF, Road Location
Design roads to the minimum width needed for the intended use.	(OAR) 629-625-0310 (3) ODF, Road Prism
Place sediment-trapping materials or structures such as straw bales, jute netting, or sediment basins at the base of newly constructed fill or side slopes where sediment could be transported to waters of the State.	(OAR) 629-625-0440 ODF, Stabilization
Retain ground cover in ditch lines, except where sediment deposition or obstructions require maintenance.	(OAR) 629-625-0600 ODF, Road Maintenance
Retain low-growing vegetation on cut- and fill-slopes.	(OAR) 629-625-0600 ODF, Road Maintenance

* BLM BMPs are cross-walked to applicable Oregon Forest Practices and Oregon Administrative Rules

The BLM implements BMPs as a program of practices, rather than as individual practices. The BLM will select BMPs based upon site-specific conditions, technical feasibility, resource availability, and the water quality of those waterbodies potentially impacted. As such, it is not possible at this scale of analysis, to analyze the effectiveness of each individual BMP for each site and project. The BLM presents BMPs as a program of practices because the appropriateness, feasibility, and effectiveness of an individual BMP depends on the individual site and project. Nevertheless, the BLM has evaluated the effectiveness of BMPs through monitoring, plan evaluation, and consideration of research, and has concluded that the application of BMPs is effective as a program of practices. Implementation monitoring, documented in annual program summaries, has evaluated whether BMPs are properly designed and applied in projects, and has concluded that application of BMPs is appropriate, necessary, and effective (e.g., USDI BLM 2012a, p. 12; USDI BLM 2013, p. 14; and USDI BLM 2014b, p. 52). The BLM considered the application of BMPs in the 2012 plan evaluation and concluded that plan maintenance would be appropriate to incorporate new BMPs, but that application of BMPs is adequate to meet resource needs and is meeting expected outcomes (USDI BLM 2012b, p. 4). A U.S. Forest Service review of BMP monitoring concluded that BMPs protect surface waters and are implemented correctly at least 86 percent of the time and are effective in 85–99 percent of applications (USDA FS 2012, pp. 9–10).

The Proposed RMP includes management direction for several key preventative measures that the alternatives present as BMPs for road and landing construction and maintenance (see **Appendix B**). Examples of the Proposed RMP management direction are shown in **Table 3-68** as well as how they meet applicable Oregon Administrative Rules.

Table 3-68. Proposed RMP key management direction for road and landing construction and maintenance*

Appendix B – Management Direction for the Proposed RMP	ODF/ Oregon Department of Environmental Quality (ODEQ) OARs*
Implement road improvement, storm proofing, maintenance, or decommissioning to reduce or eliminate chronic sediment inputs to stream channels and waterbodies. This could include maintaining vegetated ditch lines, improving road surfaces, and installing cross drains at appropriate spacing.	OAR 629-625-0600-ODF, Road Maintenance ODEQ-Water Pollution: Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1), (7) Turbidity OAR 340-041-0036
Suspend commercial road use where the road surface is deteriorating due to vehicular rutting or standing water, or where turbid runoff may reach stream channels.	OAR 629-625-0700-ODF, Wet Weather Road Use ODEQ-Water Pollution: Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1), (7) Turbidity OAR 340-041-0036
Decommission roads that are no longer needed for resource management and are at risk of failure or are contributing sediment to streams, consistent with valid existing rights.	OAR 629-625-0650-ODF, Vacating Forest Roads ODEQ-Water Pollution: Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1), (7) Turbidity OAR 340-041-0036
Design culverts, bridges, and other stream crossings for the 100-year flood event, including allowance for bed load and anticipated floatable debris. Culverts shall be of adequate width to preclude ponding of water higher than the top of the culvert. Design stream crossings with ESA-listed fish to meet design standards consistent with existing ESA consultation documents that address stream crossings in the decision area.	OAR 629-625-0600-ODF, Road Maintenance OAR 629-625-0320-ODF, Stream Crossing Structures ODEQ-Water Pollution: Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1), (7) Biocriteria OAR 340-041-0011 Turbidity OAR 340-041-0036

* Management direction for the Proposed RMP is cross-walked to applicable Oregon Forest Practices, Oregon Department of Environmental Quality, and Oregon Administrative Rules.

Affected Environment and Environmental Effects

The 5,096 miles of existing BLM-controlled roads within the 200-foot sediment delivery distance produce 60,265 tons/year of fine sediment that could be delivered to streams.

The alternatives and the Proposed RMP would include new road construction that would increase the amount of potential fine sediment delivery through 2023. The incremental increase in potential fine sediment delivery from new road construction over the next 10 years would range from 93 tons/year under Alternative D to 369 tons/year under the No Action alternative, as shown in **Figure 3-95.** Under all alternatives and the Proposed RMP, this would constitute less than a 1 percent increase above current levels of fine sediment delivery from existing roads (note the logarithmic scale of **Figure 3-95**). Although the absolute values for increased potential fine sediment delivery through 2023 vary, these differences do not represent a substantial difference in effects, because the increases in sediment delivery and the differences among the alternatives and the Proposed RMP in future increases in sediment delivery are inconsequential in comparison to the existing sediment delivery.

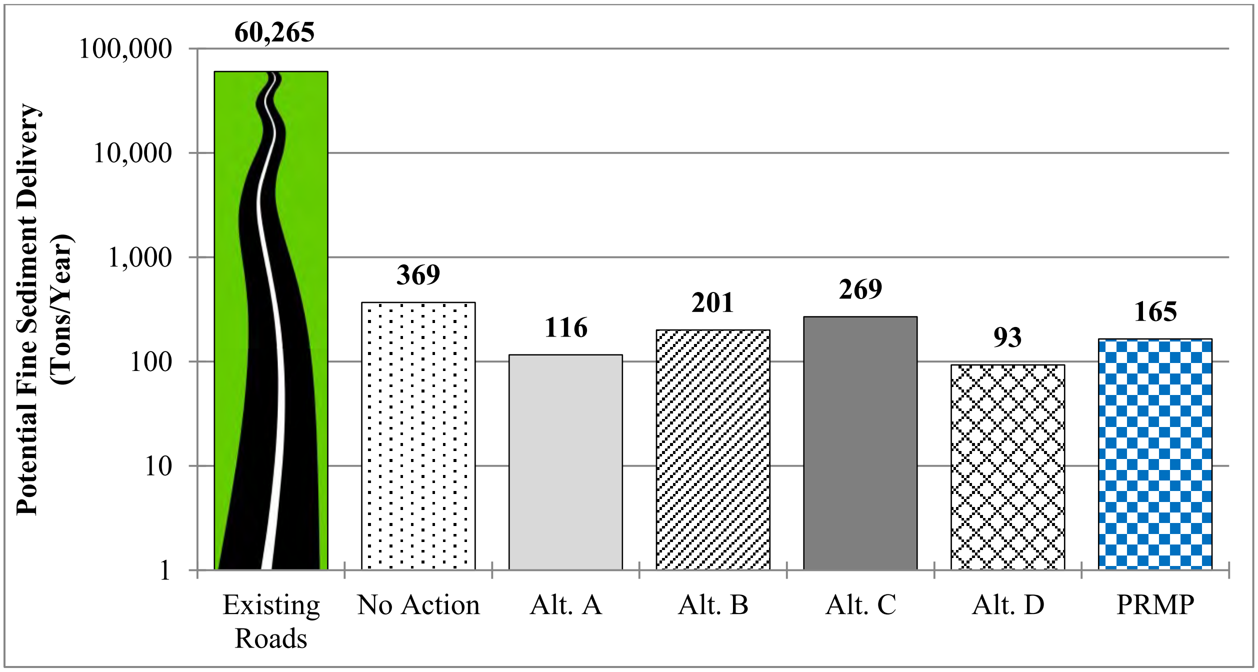

Figure 3-95. Potential fine sediment delivery,*† to streams from new roads by 2023.

* The vertical axis is logarithmic to view the range of data.

† A numerical error was corrected for existing roads, to correspond to **Table 3-66**. Specifically, existing roads potential fine sediment delivery to streams was modeled at 60,265 tons/year rather than 51,988 shown in this figure in the Draft RMP/EIS. This correction includes the effects of paved roads within the sediment delivery buffer that were previously overlooked.

This increase in potential fine sediment delivery would vary under the alternatives and the Proposed RMP with the amount of new road construction within the sediment delivery distance as shown in **Figure 3-96**. Under all alternatives and the Proposed RMP, fewer new roads would be located inside the 200-foot sediment delivery distance, because many transportation routes that parallel streams within a sediment delivery distance to streams are existing, permanent roads. Under Alternatives A and D, and the Proposed RMP, there would be an average of a 1 percent increase for new permanent and temporary roads within a sediment delivery distance to streams channels while the No Action alternative, and Alternatives B and C would average no more than 2 percent increase. Comparatively, upland areas outside a sediment delivery distance would average a 7 percent increase for new permanent and temporary roads under Alternatives A, B, and D, and the Proposed RMP, while Alternative C and the No Action alternative would average a 14 percent increase, as shown in **Figure 3-96**.[71]

[71] The road ratios for harvest type and volume are proportioned inside the sediment delivery buffer at the same rate as upslope, which overestimates newly constructed permanent roads.

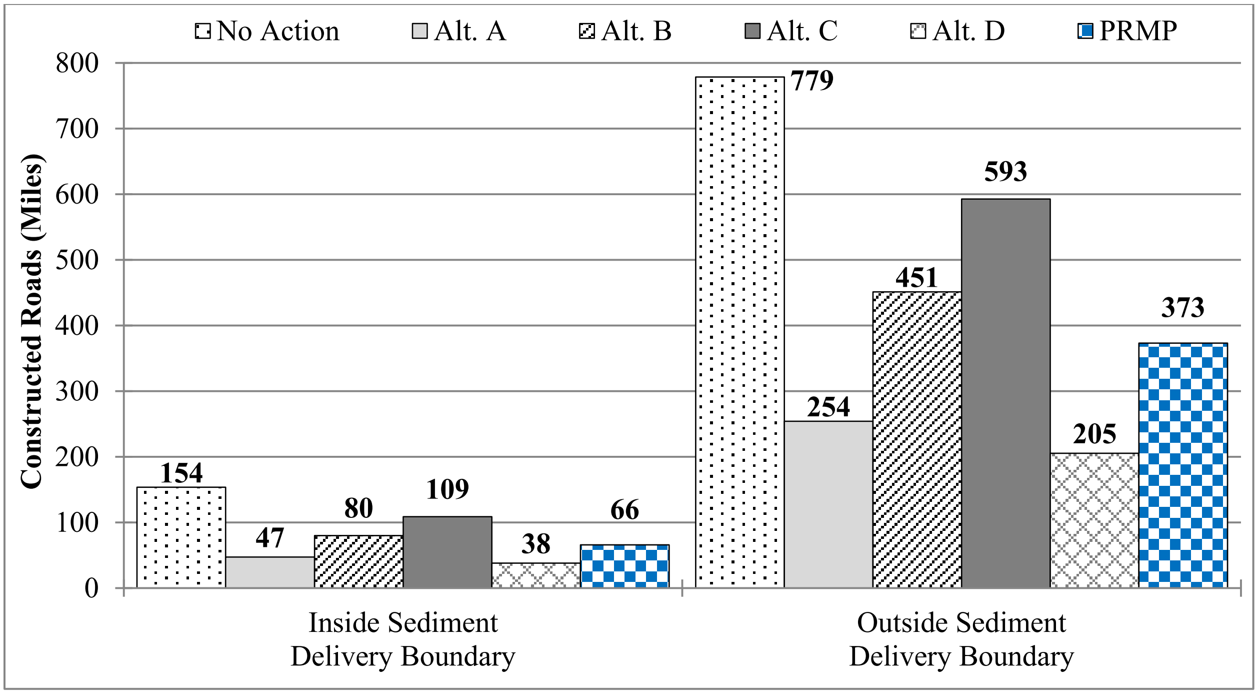

Figure 3-96. Projected newly constructed roads within a sediment delivery distance compared to newly constructed roads outside a sediment delivery distance by 2023*
* Includes permanent and temporary roads

Under the action alternatives and the Proposed RMP, the BLM would not thin the inner zone of the Riparian Reserve, which would substantially reduce the need for road construction in the sediment delivery distance and ensure that the Riparian Reserve would maintain an effective sediment filtration area along streams. This inner zone would vary in width by alternative and the Proposed RMP for stream periodicity and fish presence, from 50–120 feet along each side of a stream. New construction would intrude into the 200-foot sediment delivery distance only where there would be no other reasonable routes to access upslope forest stands. Except for roads very near the stream channel or stream crossings (with connected ditches to the first upslope cross-drain), this no-harvest, inner zone of the Riparian Reserve would result in effective sediment filtration, when compared to the mean sediment travel distance of 40 feet (USDI BLM 2008, p. 345, Table 3-58).

Under Alternative D and the Proposed RMP in Class I subwatersheds, the BLM would only thin stands in the outer zone of the Riparian Reserve to provide trees that would function as stable wood in the stream, which would require fewer roads than under the No Action alternative and Alternatives A, B and C. Under the No Action alternative, Alternatives B, C, and D, and the Proposed RMP in Class II and Class III subwatersheds, the BLM would thin stands in the outer zone of the Riparian Reserve to promote the development of large, open grown trees, develop layered canopies, and multi-cohort stands, which would require comparatively more roads than Alternative D and the Proposed RMP in Class I subwatersheds. Additionally, under Alternative A, the BLM would not commercially thin stands in the outer zone of the Riparian Reserve in moist forests and only for the purpose of fuels reduction in the dry forests, further reducing the need for roads within the sediment delivery distance.

There is an element of uncertainty related to road construction within the sediment delivery boundary under the No Action alternative compared to the action alternatives and the Proposed RMP. As explained earlier in analytical methods, under the No Action alternative the BLM is allowed to thin anywhere in the Riparian Reserve with no specific retention requirements. This results in greater uncertainty when estimating the effectiveness of Riparian Reserve in providing a sediment filtration area along streams for the No Action alternative.

Under all alternatives and the Proposed RMP, the BLM would decommission 372 miles of permanent road by 2023, bringing the total road mileage in long-term storage to 1,272 miles (8 percent of the entire road system). Decommissioning includes a variety of practices, ranging from simply blocking access to the road to full decommissioning, which may include re-establishing drainage by removing culverts, and re-contouring and planting the roadbed. The BLM estimates that approximately 0.25 percent of the roads decommissioned would be fully decommissioned, which would typically reduce potential fine sediment delivery by 11–13 tons/mile/year, based on the data used to derive **Table 3-66**. For all decommissioned roads, potential fine sediment delivery would decline over time, but the amount of improvement would be difficult to estimate. The reduction in potential fine sediment delivery following decommissioning would depend on site-specific and road-specific factors, proximity to streams, and the level of decommissioning, which cannot be predicted and evaluated at this scale of analysis. The BLM may reopen these decommissioned roads in the future if needed to provide access for management, such as when timber stands in the Harvest Land Base reach harvestable age. Unneeded roads would remain decommissioned. Which roads would be decommissioned and whether they would remain decommissioned would depend on site-specific and road-specific conditions related to whether the road would be needed to provide access for future management actions.

Issues Considered but not Analyzed in Detail

How would timber harvest under the alternatives affect annual water yields?

The effect of timber harvest on annual water yield was not analyzed in detail, because none of the alternatives or the Proposed RMP would have a substantial effect on annual water yield. Timber harvest can increase annual water yield and streamflows by reducing evapotranspiration; changes to annual yield are generally proportional to the amount of vegetation removed (Harr *et al.* 1982, Bosch and Hewlett 1982, Satterlund and Adams 1992). Harvested areas do not permanently change annual water yield. As trees are replanted and grow, evapotranspiration would increase over time, thereby reducing annual water yield to pre-harvest levels. The majority of the decline in annual water yield occurs in the first 10 years after harvest (Jones and Grant 1996, Thomas and Megahan 1998, Jones 2000). A summary of past small basin studies undertaken in the Oregon Cascades show that an annual water yield increase of 26–43 percent is possible when small catchments are entirely clearcut, including the riparian area. However, clearcut harvesting of up to 25 percent of these small catchments, including the Riparian Reserve, showed no substantial change in annual water yield (Moore and Wondzell 2005). Stednick (1996) found that approximately 25 percent of a watershed in western Oregon rain-dominated hydroregions needed to be clearcut to detect a measurable increase in annual water yield. Because of the limited extent of the Harvest Land Base, none of the alternatives or the Proposed RMP would regenerate more than 25 percent of a watershed in a single decade. Furthermore, the no-harvest Riparian Reserve under all alternatives and the Proposed RMP would avoid or reduce any effect of timber harvest on annual water yield, intercepting any additional flow of water before it could reach the stream network. Timber harvest associated with the alternatives and the Proposed RMP would produce an inconsequential change in annual water yield.

How would timber harvest under the alternatives affect low water flows?

The effect of timber harvest on low water flows was not analyzed in detail, because none of the alternatives or the Proposed RMP would have a measurable effect on low water flows at the subwatershed or watershed scale. Many hydrologic studies summarized by Moore and Wondzell (2005) show that summer low water flows can be increased in magnitude where riparian vegetation has been harvested. The data are inconsistent between studies, and, where studies found increases in flow, the increases in absolute volumes were small. Comparatively, an important difference between these studies and this analysis is that riparian vegetation would not be removed under any of the alternatives or the Proposed RMP. Even though the alternatives and the Proposed RMP would include thinning in some portions of the Riparian Reserve, none would remove stands located along streams. Given that no stands along streams would be completely removed and the limited extent of the Harvest Land Base under all alternatives and the Proposed RMP, there is no reasonably foreseeable measurable effect of harvesting outside of riparian areas on low water flows.

The Climate Change section of this chapter describes that changing climate conditions could result in decreasing summer stream flows over the next century. However, this forecast in decreasing low water flows is describing a trend in the resource condition, rather than an effect of BLM management.

How would timber harvest and road construction under the alternatives affect water flow duration and timing?

The effect of timber harvest and road construction on water flow duration and timing was not analyzed in detail, because none of the alternatives or the Proposed RMP would have a measurable effect on water flow duration and timing at the subwatershed or watershed scale. Streamflow duration and timing are guided by the frequency, magnitude, and duration of maritime precipitation, interacting with varying watershed features (e.g., basin orientation, relief, drainage density, vegetative cover, soil depth, and soil properties). Flow duration and timing of runoff at progressively higher to lower volumes closely follow the winter storm season and summer dry season. Research has found differences in timing of water flow on an experimental watershed basis, but only under extreme circumstances restricted to the site scale, (e.g., areas with high proportion of regeneration harvest on highly compacted sites and high road density with many road stream connections (Moore and Wondzell 2005)). This section does analyze in detail how timber harvest and road construction under the alternatives or the Proposed RMP would affect peak stream flows within the rain-on-snow dominated hydro-region. Timber harvest and road construction under the alternatives and the Proposed RMP would not have measurable effects on other aspects of water flow duration and timing at the subwatershed or watershed scale because of the overwhelming influence of climate and intrinsic watershed characteristics.

How would timber harvest under the alternatives affect nutrient loading in streams?

The effect of timber harvest on nutrient loading in streams was not analyzed in detail because none of the alternatives or the Proposed RMP would have a significant effect on nutrient loading in streams. The nutrients of potential concern for streams are nitrogen and phosphorus. Nitrate, dissolved inorganic nitrogen, can enter aquatic ecosystems via point sources (e.g., farm and aquaculture wastewater, and municipal and industrial sewage) and nonpoint sources (e.g., cultivation of nitrogen-fixing crops, use of animal manure and inorganic nitrogen fertilizers, and logging and fuels management treatments that remove vegetation and increase leaching from forest soils). Streamside areas can remove dissolved nitrogen from subsurface water by denitrification, plant uptake, and microbial uptake (Sweeney and Newbold 2014 and references therein). Phosphorous as phosphate can be lost through soil erosion and, to a lesser extent, to water running over or through soil. Because phosphate is relatively immobile in soils, erosion control practices minimize phosphate loading to streams.

Under all alternatives and the Proposed RMP, allocation and management of Riparian Reserve would reduce or avoid nutrient loading of streams from upslope forest practices. Sweeney and Newbold (2014) compared the nitrate removal efficiency and buffer width from 30 studies worldwide, half with forest vegetation, and concluded that effective nitrogen removal at the watershed scale probably requires buffers at least 100 feet wide, and the likelihood of high removal efficiencies continues to increase in buffers wider than 100 feet. Nieber *et al.* 2011 suggest that average nitrogen and phosphorus retention is around 80 percent for 100-foot buffers. The authors calculated the percentage removal of nitrogen and phosphorus into wetlands based on two literature reviews that covered 55 nationwide research papers. The Riparian Reserve under all alternatives and the Proposed RMP for perennial and fish-bearing streams would range from 150 feet to one site-potential tree height, which compare favorably with effective buffer widths in these references, indicating that the Riparian Reserve under all alternatives and the Proposed RMP would provide effective nutrient filters on these streams.

Riparian Reserve widths of 50 feet on non-fish-bearing intermittent streams in Alternatives B and C and in Class III subwatersheds in the Proposed RMP may not, in and of themselves, be sufficient to prevent nutrient loading to streams on all sites. Several factors that control buffer effectiveness (e.g., vegetation characteristics, slope, soil compaction and texture, percent organic matter, and subsurface water flux) are dependent on site-specific conditions (Nieber *et al.* 2011, Sweeney and Newbold 2014) that cannot be fully assessed at the scale of this analysis. However, the potential for nutrient loading in these streams is highly limited. The majority of the acreage upslope of the Riparian Reserve would be allocated to other reserve land use allocations, limiting the extent and intensity of upslope timber harvest. Under the Proposed RMP, Class III subwatersheds would constitute a small percentage of the decision area (see Chapter 2). Timber harvest and manual application of fertilizer upslope of non-fish-bearing intermittent streams would be staggered in space and time, minimizing the potential for cumulative effects from nutrient loading within the analysis area. In addition, trees remaining in upland thinned stands and retention trees in regeneration and selection harvests would increase their growth rate and uptake of nutrients and water following harvest (Reiter and Beschta 1995, Chan *et al.* 2004, Ruzicka *et al*. 2014).

Maintenance of continuous forest cover and sources of large wood on all streams under all alternatives and the Proposed RMP, together with continued in-stream habitat restoration, would ensure effective nutrient processing in the decision area, which would further minimize any nutrient loading in streams. Peterson *et al.* (2001) studied nitrogen in headwater streams in North America and found that the most rapid uptake and transformation of inorganic nitrogen occurred in the smallest streams where large streambed to water volume ratios favor rapid nitrogen uptake and processing. Streams with greater complexity, including low-order streams with log and boulder steps and higher order streams enhanced with boulders and wood for fish habitat, are more effective at nitrogen uptake than those lacking obstructions and backwaters, because the complexity provides more opportunities for water to come into contact with stream organisms that process and remove nitrogen (Johnson 2009).

As a result of the Riparian Reserve providing an effective nutrient filter on most or all streams, the limited extent and intensity of timber harvest and fertilization upslope of the Riparian Reserve, and the effective nutrient processing in riparian and aquatic systems, none of the alternatives or the Proposed RMP would have a substantive effect on nutrient loading in streams.

How would timber harvest and road construction under the alternatives affect source water watersheds?

The effect of timber harvest and road construction on source water watersheds was not analyzed in detail, because the relevant effects are analyzed in detail in other issues. The ODEQ's mapped source water watersheds for Oregon are very general. Source water assessments for individual public water systems show the area of interest is within an 8-hour travel time above a purveyor's intake. The public water systems for BLM-administered lands have been previously identified (USDI BLM 2008, Appendix I – Water).[72]

The BLM's primary water quality protection strategy is composed of the Riparian Reserve land use allocation, especially the inner zone along streams, management direction for the Riparian Reserve and hydrology, and the BMPs. These preventative measures have complementary goals with Oregon's drinking water protection program. **Table 3-69** shows a risk analysis linking potential contaminants with causal mechanisms, management activities, and control.

[72] This summary includes public water system ID, name, source, population served, BLM-administered acres, and other acres.

Table 3-69. Source water protection

Contaminant	Causal Mechanism	Activity	Control
Temperature	Decrease in stream shade affected by canopy removal	Thinning in Riparian Reserve outer zone, along each side of perennial and fish-bearing streams	Riparian Reserve no-treatment zones along streams and waterbodies* Management Direction
Sediment	Sediment delivery from roads to streams	New road construction, maintenance of existing roads	Riparian Reserve unmanaged inner zones Management Direction BMPs
	Landslides and debris torrents	Regeneration harvest, new road construction	Avoid unstable areas withdrawn under TPCC Riparian Reserve buffer to the extent of the unstable area Management Direction
	Surface erosion	New road construction, forest harvest, broadcast burning	Riparian Reserve unmanaged inner zones Management Direction BMPs
	Concentrated livestock grazing in riparian areas leading to erosion or streambank collapse	Livestock grazing	Term permit conditions meeting Rangeland Health Standards Management Direction BMPs
Bacteria	Improper waste disposal, failing sewage systems	Recreation	Management Direction BMPs
	Livestock within riparian areas, on-stream watering	Livestock grazing	Term permit conditions meeting Rangeland Health Standards Management Direction BMPs
Nutrients	Erosion, fertilizer entering watercourses	Road construction, forest fertilization, recent burns	Riparian Reserve inner zones BMPs
Herbicides	Application to non-target areas by drift or runoff	Forest herbicide application	BLM Vegetation Treatments Using Herbicides on BLM Lands in Oregon ROD (USDI BLM 2010)
Petroleum Products	Spills	Refueling of equipment, transportation and fuel storage	Riparian Reserve inner zones BMPs

* Under the No Alternative there would be no defined no-treatment zones along streams and waterbodies.

Potential effects of the alternatives and the Proposed RMP on source water watersheds are related to water temperature and sediment delivery to streams. The alternatives and the Proposed RMP would not have effects related to the other potential contaminants. Effects on temperature and sediment are analyzed in detail in this section, and the effects of the alternatives and the Proposed RMP in source water watersheds would be no different from the effects in other watersheds. Segregating these analyses for source water watersheds would not improve the quality of the analysis or reveal any additional differences in the effects of the alternatives or the Proposed RMP.

How would public motorized vehicle use under the alternatives affect water quality?

The effect of public motorized vehicle use on water quality was not analyzed in detail, because although public motorized vehicle use has the potential to affect water quality, there is no basis to evaluate any differences in effects among the alternatives or the Proposed RMP due to—

- The limited nature of the RMP decisions on public motorized vehicle travel;
- The lack of comprehensive site-specific information on public motorized vehicle trail conditions relevant to water quality effects; and
- The lack of comprehensive site-specific information on intensity of public motorized vehicle use.

The BLM would be better able to address the effects of public motorized vehicle use on water quality as the BLM prepares implementation-level transportation management plans subsequent to the adoption of the RMP.

Public motorized vehicle use on low-volume roads, partially decommissioned roads, and trails (collectively referred to as trails) can affect the water quality of streams and waterbodies by increased sediment delivery and contamination from vehicle fluids. Public motorized vehicle trail use is unlikely to have any effect on stream temperature, because overstory trees casting shade are generally not removed because of public motorized vehicle activities.

Public motorized vehicle use can potentially cause sediment delivery to streams and waterbodies, but the effects are highly dependent upon site-specific trail conditions. Public motorized vehicle trails typically differ from roads in that they are narrow, conform to the topography (instead of excavating into the subgrade), and many lack drainage improvements. Compaction of the trail surface can limit water infiltration, which can lead to runoff and channeling. Where a trail approaches a stream, sediment can be delivered from an eroding trail surface if not diverted or filtered by vegetation. Sediment delivery to waterbodies from public motorized vehicle trails in the Riparian Reserve and at unimproved stream crossings (also called low water crossings or unvented fords)[73] depend upon varying factors, including geology, valley form, stream type, soils, vegetation, trail design and condition, season of use, allowed motorized vehicle class, and intensity of public motorized vehicle use. These factors affecting sediment delivery make it difficult to make broad generalizations.

Marion *et al*. (2014) studied upstream/downstream effects of 15 high-traffic public motorized vehicle stream crossing sites that have been active on the Ouachita National Forest for 20 years. Effects included increased bank erosion, channel widening, mud coatings on substrate, and in-channel fine-sediment accumulations at the crossings and a short distance downstream. However, individual effects are small[74]

[73] Fords are considered ‘unvented’ when the stream flows over the roadway and ‘vented’ when culverts are placed in the ford and used to convey normal levels of streamflow under the roadway.
[74] Sediment delivery from trails in Marion *et al*. (2014) (reported in pounds of sediment) was orders of magnitude smaller than the sediment delivery from roads in this analysis (reported in tons of sediment).

and strongly related to local, climate, channel, and valley geomorphology. Sensitive areas for sediment delivery to waterbodies include steep trails near streams, erosion-prone trail surfaces that are not resistant to motorized vehicle traffic, and unimproved stream crossings (Brown 1994, cited in Marion *et al.* 2014). Unimproved stream crossings have more effects on water quality than do culverts or bridges, with some reported sediment deposition downstream (Taylor 1999). Compared to an unimproved low water crossing, a hardened low water crossing (i.e., where the streambed has been excavated and replaced with compacted rock and gravel) showed much less sediment downstream (Sample *et al.* 1998). The BLM lacks comprehensive site-specific information on trail conditions relevant to evaluating sediment delivery from trails. Unlike existing roads, the BLM does not have a workable, comprehensive inventory showing trail locations, stream crossings, trail design, and trail condition.

The intensity of public motorized vehicle use on a trail also influences the potential for sediment delivery to streams and waterbodies. The amount of public motorized vehicle traffic and the type of use affect trail compaction and erosion.

Compared to highway vehicles, many off-highway vehicles (i.e., all-terrain vehicles, four-wheelers, quads, side-by-sides, and off-highway motorcycles) are much lighter with low ground pressure tires, distributing weight, and minimizing impact. The small erosion surface of trails and persistence of varying amounts of rock, vegetation, duff, and woody material in the roadway, contribute to decreased on-site soil loss. The BLM lacks comprehensive information on the amount of traffic and the type of public motorized vehicle use on trails in the decision area.

Public motorized vehicle use can potentially cause contamination of streams and waterbodies from vehicle fluids. Oil, grease, and other chemical pollutants can wash off motorized vehicles driving through streams, depending on streamflow and condition of the vehicle. Vehicle pollutants that have been identified on highways include lead, zinc, cadmium, and polychlorinated biphenyls from tire wear; asbestos, copper, chromium, and nickel from brake-lining wear; and oil and grease (Hyman and Vary 1999). However, there is no information regarding whether or not these pollutants have been identified at fords accessible to public motorized vehicle use at detectable levels.

The alternatives and the Proposed RMP would designate all lands in the decision area as *open, limited,* or *closed* for public motorized access. Under all of the action alternatives and the Proposed RMP, the BLM would not designate any areas as *open* for public motorized access. The RMP would not make decisions about public motorized vehicle use beyond these area designations (see the Trails and Travel Management section of this chapter). Given the site-specific nature of water quality effects from public motorized vehicle use, it is not possible to equate these area designations with any specific effects of public motorized vehicle use on water quality. In areas designated as *limited*, the BLM would make individual trail designations through implementation-level transportation management planning, subsequent to adoption of the RMP. In that implementation-level transportation management planning, the BLM would be able to evaluate whether individual trails are having effects on water quality and could consider restrictions of public motorized vehicle use on individual trails. Under all alternatives and the Proposed RMP, the BLM would apply BMPs for trail management as needed to maintain water quality, both on an interim basis until implementation-level travel management planning is completed and in individual route designations in travel management planning (see **Appendix J**).

Although the BLM has some site-specific and anecdotal information about illegal public motorized travel activities, the BLM does not have a basis for predicting the location or effects of any widespread or systematic, illegal public motorized travel activities. In addition, much of the decision area has physical limitations to potential, illegal public motorized travel activities, including dense vegetation, steep slopes, and locked gates. Terrain, vegetation, and a greater amount of open spaces in most of the interior/south can lead to degradation and erosion in a greater proportion than the coastal/north where vegetation is denser and terrain is steeper. However, the BLM lacks a basis for characterizing current, illegal public motorized travel activities or for forecasting potential, illegal public motorized travel activities in the future under any of the alternatives and the Proposed RMP at this scale of analysis. In this analysis, the BLM assumed that members of the public participating in motorized travel recreation would operate vehicles consistent with BLM decisions about public motorized travel opportunities.

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Invasive Species

Key Points

- The risk of introducing and spreading invasive plant species would be lowest under Alternative D and highest under Alternative C.
- The risk of introducing and spreading invasive aquatic species would be lowest under Alternative A and highest under Alternative C.
- The No Action alternative, Alternatives C and D, and the Proposed RMP would result in the smallest increase in sudden oak death infestation, because the BLM would treat all detected infestations. Alternative A would result in the largest increase in sudden oak death infestation.

Summary of Notable Changes from the Draft RMP/EIS

The BLM replaced the discussion of long-term effects on introduction and spread of invasive plant species and invasive aquatic species with a qualitative summary of the overall risks for each alternative and the Proposed RMP. As described in the Draft RMP/EIS, the uncertainties associated with the effectiveness of future prevention and treatment measures, as well as uncertainties related to future invasive species introductions, render discussion of long-term trends speculative. To the extent it is possible to forecast future introduction and spread of invasive plant species and invasive aquatic species, it is reasonably foreseeable that the alternatives and the Proposed RMP would have the same relative effects in the first decade as in future decades.

Issue 1

How would the alternatives affect the risk of invasive plant introduction and spread?

Summary of Analytical Methods

The BLM compared the relative risk of introducing and spreading invasive species resulting from the land use allocations and planned management activity levels under the alternatives and the Proposed RMP, taking into consideration the collective distribution of a representative set of invasive plant species. Invasive species are non-native species whose introduction does, or is likely to, cause economic or environmental harm or harm to human health. The species selected for this analysis characterize the general distribution and condition of invasive species occurrences on BLM-administered lands in western Oregon. They represent a variety of strategies for introduction, spread, and resistance to certain treatment methods. The alternatives' and Proposed RMP's differing approaches to land use allocations (including designations for public motorized access), timber harvest levels, harvest methods, Riparian Reserve widths and management direction, new road construction, and livestock grazing drives the variation in the effects on invasive species.

In this analysis, the BLM measured the effects of management actions on the introduction and spread of invasive plant species in terms of susceptibility and risk. Susceptibility is the extent to which an area is vulnerable to the introduction and spread of invasive species. Risk accounts for both susceptibility to introduction and the existing distribution and abundance of invasive species in a given area. The higher the susceptibility and the higher the distribution and abundance of invasive species in a particular area, the higher the risk is of introducing and spreading invasive species.

The BLM measured the effects of timber harvest, road management activities, and public motorized access designations on the introduction and spread of invasive plant species at the scale of HUC 10[75] watersheds (formerly known as 5th field watersheds). The BLM measured the effects of livestock grazing on the introduction and spread of invasive plant species at the scale of the district or field office. In this analysis, the BLM reports effects using the watershed or the district/field office as the basic analytical unit in much the same way as a site-specific analysis may report effects in terms of acres, rather than the smaller increments representing the extent of the infestations. Even though BLM-administered lands constitute a small percentage of many watersheds, BLM management actions could still affect susceptibility and risk for the introduction and spread of invasive plant species. Therefore, the BLM included all watersheds within the decision area in this analysis.

The BLM used the following factors to assess the relative levels of risk for the inadvertent introduction of invasive plant species on the BLM-administered lands:

- Distribution and abundance of invasive plant species
- Types of timber harvest and logging methods
- Proximity of harvest activity to streams
- Intensity and distribution of management activities
- Designations for public motorized access
- Availability for livestock grazing

The analysis assumed that actions on other ownerships and BLM management actions other than timber harvest, road management activities, public motorized access designations, and livestock grazing on BLM-administered lands would continue to contribute to invasive plant species introduction and spread at current levels. These actions include BLM management of special forest products, rights-of-way agreements, road maintenance, and fuels reduction treatments. Any future changes in the contribution from these other activities to the risk of introduction and spread of invasive plant species would be speculative and depend largely on site-specific factors that are inappropriate to analyze at this scale. There is no basis for speculating that such changes would vary among the alternatives and the Proposed RMP. Therefore, information on the contribution of these other management actions to the risk of introduction and spread of invasive plant species is not necessary for a reasoned choice among the alternatives and the Proposed RMP.

Illegal public motorized travel activities could potentially contribute to the introduction and spread of invasive plant species. Although the BLM has some site-specific and anecdotal information about illegal public motorized travel activities, the BLM does not have a basis for predicting the location or effects of any widespread or systematic illegal public motorized travel activities. In addition, much of the decision area has physical limitations to potential illegal public motorized travel activities, including dense vegetation, steep slopes, and locked gates. Terrain, vegetation, and a greater amount of open spaces in most of the interior/south can lead to degradation and erosion in a greater proportion than most of the coastal/north where vegetation is denser and terrain is steeper. However, the BLM lacks a basis for characterizing current illegal public motorized travel activities or forecasting such potential illegal public motorized travel activities in the future under any of the alternatives or the Proposed RMP at this scale of analysis. Therefore, in this analysis, the BLM assumed that members of the public participating in motorized travel recreation would operate vehicles consistent with BLM decisions about public motorized travel opportunities (see the Trails and Travel Management section of this chapter).

[75] Hydrologic Unit Codes (HUCs) are a U.S. Geological Survey classification based on a hierarchy of nested watersheds.

The Planning Criteria provides detailed information on the invasive plant analysis and assumptions, including the representative invasive plant species selected for this analysis, which is incorporated here by reference (USDI BLM 2014, pp. 90–98).

Determining Species Distribution Categories

The BLM pooled representative invasive plant species occurrence data from BLM corporate datasets and iMapInvasives (ORBIC 2013). **Figure 3-97** displays reported infestations of representative invasive plant species within the planning area. The BLM evaluated the collective pool of reported sites to determine representative invasive plant presence for each square mile in a grid applied to the planning area. Invasive plant species distribution categories of Abundant, Limited, and Low are based on the known representative species' distribution in watersheds:

- Abundant – the representative invasive species reported from more than 25 percent of the square miles within the watershed
- Limited – the representative invasive species reported from more than 1 percent and less than 25 percent of the square miles within the watershed
- Low – the representative invasive species reported in no more than 1 percent of the square miles within the watershed

Watersheds in the Abundant species distribution category are more likely to have invasive species introduction and spread associated with management and human activities than those in the Limited and Low species distribution categories, because there are already relatively more infestations within them.

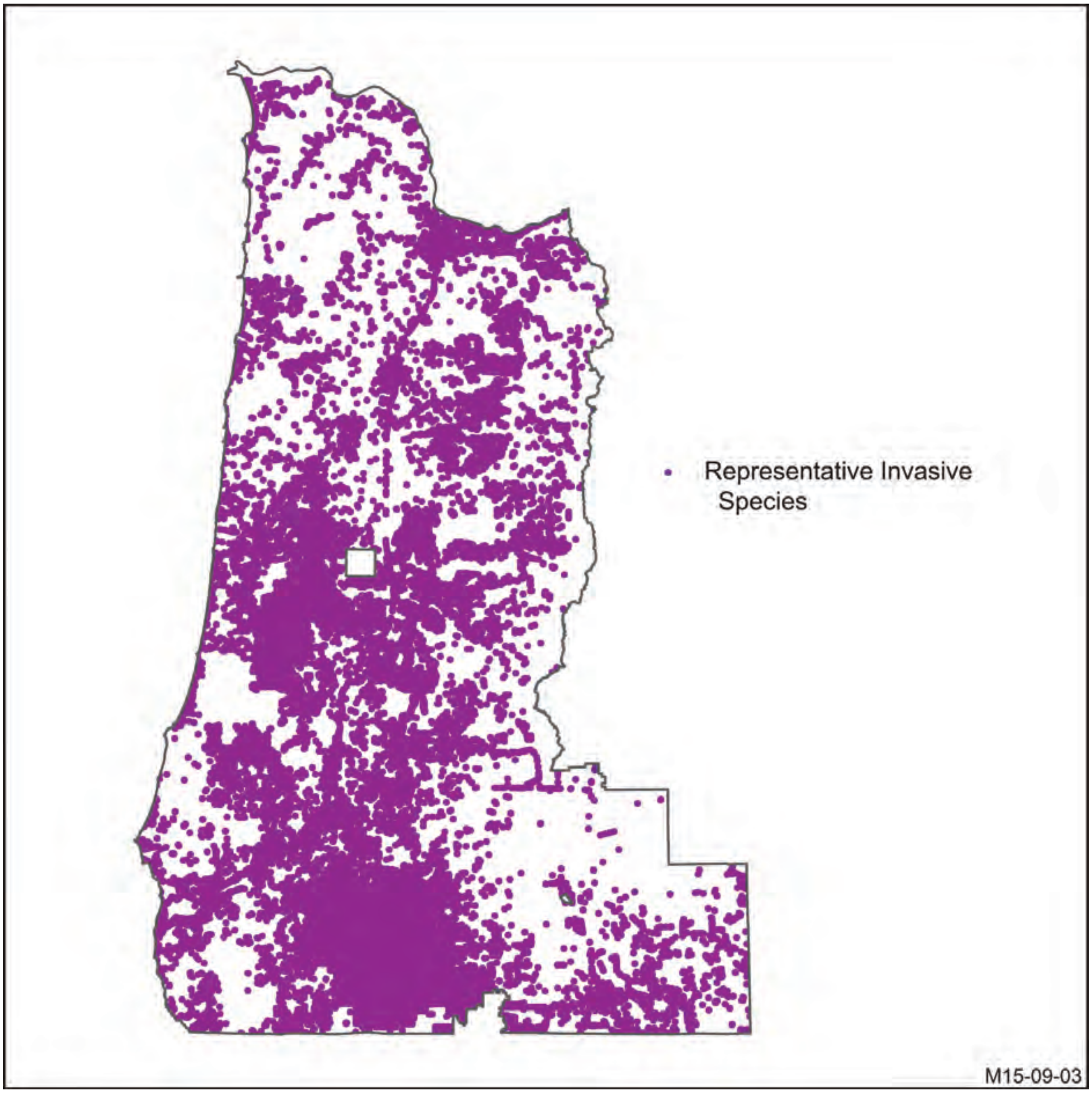

Figure 3-97. Reported infestations of representative invasive plant species within the planning area

Assessing Risk of Introduction and Spread of Invasive Plant Species Associated with Timber Harvest

The risk of introducing invasive plant species over the next 10 years as a result of timber harvest activities would vary by alternative and the Proposed RMP. The BLM used the invasive plant distribution categories, the acres of the different timber harvest types (thinning, regeneration harvest, and uneven-aged management), and the methods of logging to determine the relative risk of introducing invasive plant species in each alternative and the Proposed RMP. For the purposes of this analysis, the BLM assumed:

- Regeneration harvests would create higher light levels than commercial thinning and uneven-aged management. Lower or no retention levels in regeneration harvests would create higher light levels after harvest than regeneration harvests with higher retention levels.
- Ground-based logging methods would disturb more soil, cable skyline systems would disturb less soil, and aerial logging systems would disturb the least amount of soil. Although the BLM does not generally prescribe specific logging methods in the alternatives or the Proposed RMP, the BLM

has made analytical assumptions about reasonably foreseeable logging methods under each alternative and the Proposed RMP based on assumptions developed for the 2008 FEIS.

The BLM determined the susceptibility of watersheds to invasive species introduction associated with timber harvest by analyzing estimates of timber harvest volumes under the alternatives and the Proposed RMP from the Woodstock vegetation model and the timber harvest type and harvest method coefficients developed for the 10-year scenarios in the 2008 FEIS (**Appendix C**). The geographic arrangement of timber harvests is a modeling product used solely for the purpose of this analysis and is not a product of actual site-specific project planning or decision-making.

For each alternative and the Proposed RMP, the BLM estimated the acres of timber harvest activities for watersheds in the planning area for the next 10 years using the generated harvest volumes. Each timber harvest type received a relative weight of 1 or 5, based on its respective post-harvest light levels (5 having a higher light level than 1). Each logging method received a relative weight of 1, 3, or 5, based on its respective levels of soil disturbance. The BLM assumed the non-commercial thinnings in the moist forest reserves would neither increase the light levels nor disturb the soil enough to create susceptibility for invasive species introduction and spread. Multiplying the weighted values by the watersheds' estimated acres for the timber harvest types and methods over the next 10 years allowed the BLM to generate a combined timber harvest activity weighted value for each watershed.

Dividing these combined timber harvest values into three groups (Low, Moderate, and High) allowed the BLM to assign each watershed to one of these three susceptibility categories for introduction of invasive plant species from timber harvest activities.

The BLM determined the risk for invasive species introduction associated with timber harvest by considering both the susceptibility category and the presence of invasive plant species. Watersheds with a low distribution of invasive plant species and that are in the Low susceptibility category would have the lowest risk of invasion. The greatest risk of invasion would be in watersheds that are both in the High susceptibility category and where invasive plant species are abundant. Watersheds with no reported sites for the representative sample set of invasive plant species in the analysis, no BLM-administered lands, or no timber harvest activity susceptibility in the first 10 years do not have an assigned risk category.

Assessing Risk of Introduction and Spread of Invasive Plant Species in Riparian Habitats Associated with Timber Harvest

The BLM assessed the susceptibility of invasive plant species introduction into riparian habitats associated with each alternative and the Proposed RMP by considering the relative impact of the widths of the Riparian Reserve, management direction within the Riparian Reserve, and levels of timber harvest activity within the Riparian Reserve. These factors affect the light levels in riparian habitats; the higher the light levels, the higher the risk for the introduction of invasive plant species. As described in the Planning Criteria, the BLM assumed for the purpose of invasive plant species analysis that the light levels of areas within 100 feet of timber harvest would increase and that the light levels 100 feet or more from timber harvest would remain unaffected.

The BLM analyzed the effects of thinning within the Riparian Reserve over the next 10 years using spatial analysis to determine susceptibility of invasive plant species introduction into riparian habitats. In this analysis, the BLM used the modeled thinning acres in the Riparian Reserve from the Woodstock vegetation model to compare the susceptibility of introducing invasive plant species into riparian habitats through such thinning across the alternatives and the Proposed RMP over the next 10 years for each office. As noted above, the geographic arrangement of thinning is a modeling product used solely for the purpose of this analysis and is not a product of actual site-specific project planning or decision-making. For the purposes of this analysis, the risk of introducing invasive plants into riparian habitats from thinning activities matches the level of susceptibility.

The BLM also analyzed the effects of timber harvest activity adjacent to the Riparian Reserve over the next 10 years using spatial analysis to determine susceptibility of invasive plant species introduction into riparian habitats. The BLM considered the effects of timber harvest activities occurring outside of and adjacent to the Riparian Reserve with widths less than 100 feet on either side of streams. Multiplying Riparian Reserve acres susceptible to effects from the alternatives' timber harvest activities by weights accounting for the relative differences in the combination of factors below provides a range of watershed riparian susceptibility values and subsequent susceptibility categories of Low, Moderate, and High:

- Light generated by timber harvest types
- Soil disturbance from different timber harvest methods
- Shade reduction in stands adjacent to timber harvest activities

The BLM used riparian susceptibility and species distribution categories to determine the risk by alternative and the Proposed RMP of introducing invasive plant species into riparian habitats over the next 10 years.

As described in the Fisheries section of this chapter, there is an element of uncertainty related to riparian thinning under the No Action alternative compared to the action alternatives and the Proposed RMP. Riparian thinning under the No Action alternative is allowed anywhere in the Riparian Reserve with no specific retention requirements. However, activities must meet the Aquatic Conservation Strategy objectives, which are often difficult to interpret at the site scale. Nevertheless, the 1995 RMPs do not define an inner zone with management direction prohibiting thinning, which makes the specific location and implementation of riparian thinning less certain than under the action alternatives or the Proposed RMP.

Assessing Risk of Introduction and Spread of Invasive Plant Species Associated with New Road Construction

Road construction and associated road management activities involving disturbance to soil and increased light levels contribute to the introduction of new infestations and the spread of existing invasive plant infestations. Road construction equipment can inadvertently transport invasive plant species seed or vegetation, creating new infestations. Soil disturbance and increased light created by road construction activities provide opportunities for invasive plants already present in a project area to thrive. Light and disturbed soils provide favorable conditions for invasive plant seed germination and plant establishment.

The BLM determined the susceptibility of watersheds to invasive species introduction associated with new road construction (temporary or permanent) by prorating each watershed with the road construction estimates for each alternative and the Proposed RMP produced in the Trails and Travel Management section in this chapter. Susceptibility values fall into relative susceptibility categories, allowing the BLM to compare the susceptibility of the watersheds to invasive plant species introduction and spread. As noted above, the geographic arrangement of timber harvest is a modeling product used solely for the purpose of this analysis, as is the modeled location of associated new road construction, and is not a product of actual site-specific project planning or decision-making.

The BLM used the susceptibility categories and species distribution categories for the watersheds to determine each alternative and the Proposed RMP's relative risk of invasive plant introduction associated with road construction.

Assessing Risk of Introduction and Spread of Invasive Plant Species Associated with Public Motorized Vehicle Use

Motorized vehicles can inadvertently transport invasive plant species seed or vegetation, creating new infestations. Infestations associated with public motorized vehicle travel tend to spread along road and trail corridors. Public motorized vehicle travel along roads and trails disturb soil, especially along new trails. The combination of disturbed soil conditions from public motorized vehicle travel and vehicles inadvertently transporting invasive plant parts create susceptibility.

The BLM assessed the susceptibility of BLM-administered lands in the planning area to invasive species introduction associated with public motorized travel activities by comparing each alternative and the Proposed RMP's acres of *open*, *closed*, and *limited* for public motorized access designations. The BLM assumed that areas designated as *open* would be more susceptible to having new introductions of invasive plant species and infestation spread than areas designated as *limited* or *closed*. The BLM assumed that areas designated as *closed* would not be susceptible to new introductions and spread of invasive plant species associated with public motorized travel activities. As noted above, the BLM assumed that members of the public participating in motorized travel recreation would operate vehicles consistent with BLM decisions about public motorized travel opportunities.

The BLM assigned public motorized access designation weights to each part of the watershed having a different public motorized access designation under each alternative or the Proposed RMP. Public motorized access designation susceptibility weights are the following:

- *Closed* = 0
- *Limited* = 3
- *Open* = 5

For each alternative and the Proposed RMP, the BLM multiplied the susceptibility weights by total acres per watershed for each of the three designations to generate a set of susceptibility values for the watersheds and then divided them into three categories: Low, Medium, and High.

The BLM used the susceptibility weights and species distribution categories for the watersheds to determine each alternative and the Proposed RMP's relative risk of invasive plant introduction associated with public motorized access designations.

Assessing Risk of Introduction and Spread of Invasive Plant Species Associated with Livestock Grazing

The BLM assessed the risk of invasive species introduction associated with livestock grazing by comparing the relative amount of land available for livestock grazing under each alternative and the Proposed RMP. Livestock grazing creates ground disturbance, which creates susceptibility for the introduction and spread of invasive plants. The BLM assumed invasive plants would occur in the areas available for livestock grazing. Livestock movement and associated activities, such as the transport of contaminated hay, can introduce invasive plants into new locations. Therefore, areas that the BLM determined would be susceptible for introduction and spread of invasive plants associated with livestock grazing would be at risk. Only the Coos Bay District, Klamath Falls Field Office, and Medford District administer livestock grazing in the decision area. Comparing the acreage available for livestock grazing in the Coos Bay District, Klamath Falls Field Office, and Medford District provides a relative assessment for the introduction and spread of invasive plants across the alternatives and the Proposed RMP.

Affected Environment

The Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management Districts describes the Invasive Plant management program in detail, which the BLM incorporates here by reference (USDI BLM 2008, pp. 274–282). This reference includes definitions, magnitude of invasive species diversity in the planning area, and information about how land management activities contribute to invasive plant introduction and spread within the planning area.

While the affected environment section from the 2008 planning effort is still pertinent, data sharing among land managers has led to a more robust understanding of the distribution of invasive plant species than was available in 2008. The distribution of invasive plant species is available at iMapInvasives (www.imapinvasives.org). While this data is more robust then that available in 2008, the data is still limited because there is no requirement for county, private, or corporate landowners to report invasive plant information.

Figure 3-97, Figure 3-98, and **Table 3-70** show the relative density of the reported infestations, which demonstrate that the representative invasive plant species are common throughout the planning area. Although reported infestations of the representative invasive plant species are less than the total amount of all invasive plant species infestations, these reported infestations provide a sense of how invasive species are distributed within the planning area. Almost all of the watersheds currently fit the Limited or Abundant species distribution categories. Only one watershed fits the Low species distribution category, and only one watershed has no reported sites. Neither of these watersheds contains BLM-administered lands.

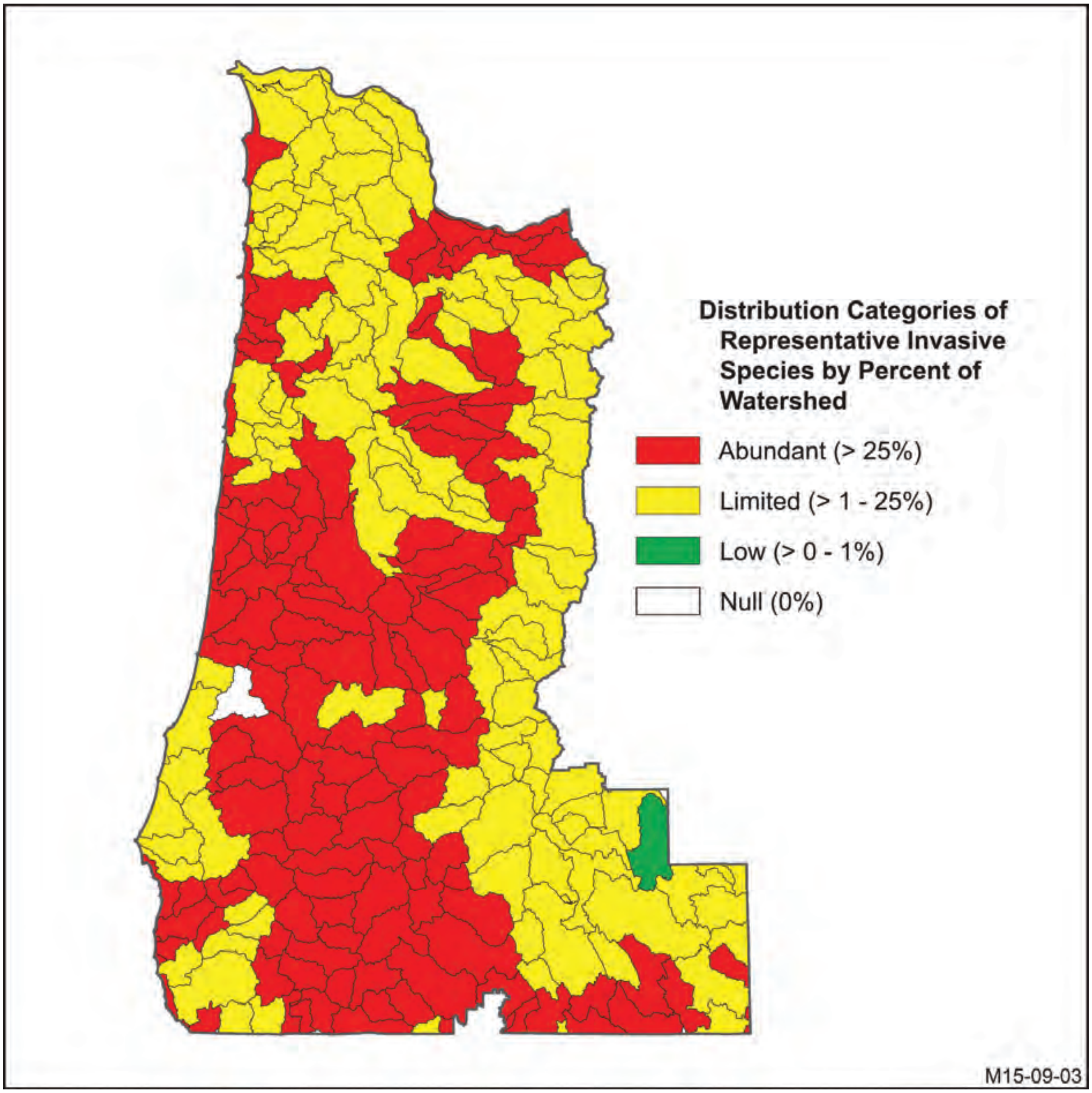

Figure 3-98. Distribution categories of invasive plant species for the watersheds within the planning area

Table 3-70. Number of watersheds per district in each species distribution category

District/ Field Office	Species Distribution Categories		
	Low	**Limited**	**Abundant**
Coos Bay	-	14	13
Eugene	-	11	22
Klamath Falls	1	19	12
Medford	-	6	35
Roseburg	-	11	16
Salem	-	63	36
Total Watersheds	**1**	**124**	**134**

Environmental Consequences

This analysis examines timber harvest, road management activities, and public motorized access designations for the potential to introduce and spread invasive plant species that would result from the alternatives.

Risk of Introduction and Spread of Invasive Plant Species Associated with Timber Harvest

Susceptibility to the introduction and spread of invasive plant species due to timber harvest would be greatest under Alternative B, which would have 157 watersheds that have some level of susceptibility associated with timber harvest activities over the next 10 years. Alternative A would have the least watersheds with some level of susceptibility from timber harvest activities, with 136 susceptible watersheds. The No Action alternative, Alternatives C and D, and the Proposed RMP would be intermediate in susceptibility, with 143, 144, 146, and 155 susceptible watersheds, respectively.

The watersheds in the high susceptibility category occur evenly throughout the planning area under all alternatives and the Proposed RMP, with Alternative C having the most watersheds in this category and Alternative D having the fewest, at 67 and 35 watersheds, respectively. The No Action alternative, Alternatives A and B, and the Proposed RMP would have an intermediate number of High susceptibility category watersheds at 44, 40, 39, and 45 respectively. Watersheds with the potential for the most area with timber harvest activities that would generate soil disturbance and reduced shade over the next 10 years fall into the highest susceptibility categories.

Categories for the distribution of invasive plant species and the categories for the susceptibility of introduction from timber harvest activities determine the relative risk categories for the introduction of invasive plant species. For example, watersheds with both a high density of representative invasive species and a high level of susceptibility would be in the Highest risk category.

Table 3-71 contains the relative risk for the introduction and spread of invasive plant species that are associated with timber harvest activities over the next 10 years.

Table 3-71. Risk of introduction and spread of invasive plant species associated with timber harvest over the next 10 years

Risk Category	No Action (Number of Watersheds)	Alt. A (Number of Watersheds)	Alt. B (Number of Watersheds)	Alt. C (Number of Watersheds)	Alt. D (Number of Watersheds)	PRMP (Number of Watersheds)
Highest	42	30	30	52	26	32
High	33	43	56	46	57	53
Moderately High	11	12	16	11	11	10
Moderate	24	32	28	16	26	31
Moderately Low	33	19	27	19	26	29
Low	-	-	-	-	-	-
Total at Risk	**143**	**136**	**157**	**144**	**146**	**155**
Total Not at Risk	**124**	**131**	**110**	**123**	**121**	**112**
Total Watersheds	**267**	**267**	**267**	**267**	**267**	**267**

Over the next 10 years, Alternative B would have the most watersheds at some level of risk (157), and Alternative A would have the least watersheds at some level of risk (136). Under all alternatives and the Proposed RMP, slightly more than half of the watersheds in the planning area would experience some level of risk of introduction of invasive plant species associated with timber harvest activities over the next 10 years. The highest degree of risk would occur under Alternative C, and the lowest would occur under Alternative A, with 98 and 73 watersheds in the High and Highest risk categories, respectively. Moderate levels of risk intensity associated with timber harvest in the watersheds over the next 10 years would occur under the No Action alternative, Alternatives B and D, and the Proposed RMP as shown in **Table 3-71**. Under all alternatives and the Proposed RMP, less than one-quarter of the watersheds would experience Moderate to Moderately Low risk of invasive plant species introduction associated with timber harvest activities over the next 10 years.

Risk of Introduction and Spread of Invasive Plant Species into Riparian Habitats Associated with Timber Harvest Adjacent to the Riparian Reserve

The Riparian Reserve would be wide enough (i.e., at least 100 feet) to avoid effects on light levels in riparian habitats from adjacent timber harvest activities (including regeneration harvest where the Riparian Reserve is adjacent to Harvest Land Base, and thinning where the Riparian Reserve is adjacent to Late-Successional Reserve) under the following alternatives and the Proposed RMP and stream types:

- No Action alternative, Alternatives A and D, and the Proposed RMP Class I and Class II subwatersheds – all streams
- Alternative B – fish-bearing and perennial streams and intermittent, debris-flow-prone, non-fish-bearing streams
- Alternative C and the Proposed RMP Class III subwatersheds – fish-bearing and perennial streams

However, riparian habitats would be susceptible to increases in light levels associated with adjacent timber harvests, because the Riparian Reserve would be less than 100 feet in width on either side of streams under the following alternatives and the Proposed RMP and stream types:

- Alternative B – intermittent, non-debris-flow-prone, non-fish-bearing streams
- Alternative C and the Proposed RMP Class III subwatersheds – intermittent, non-fish-bearing streams

Figure 3-99 shows the susceptibility to the introduction and spread of invasive plant species into riparian habitats associated with timber harvest adjacent to the Riparian Reserve over the next 10 years.

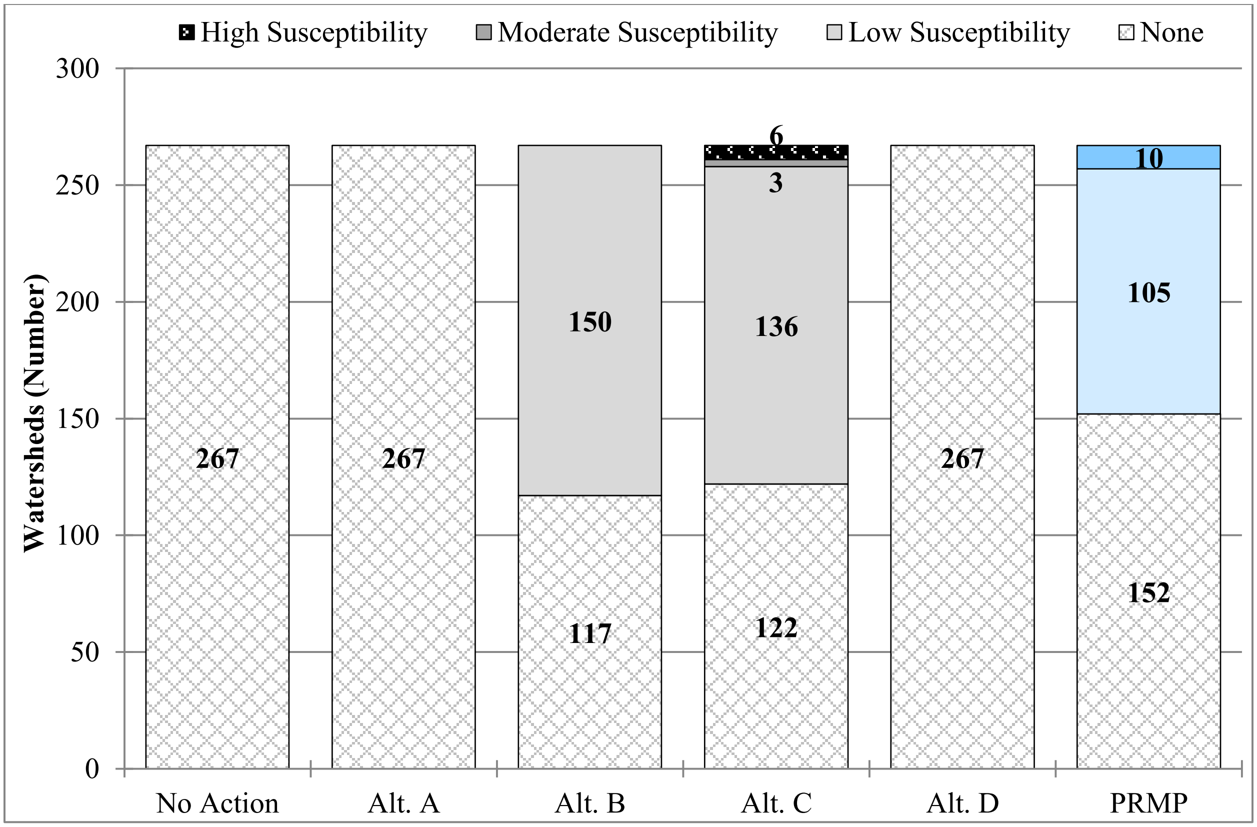

Figure 3-99. Susceptibility to the introduction and spread of invasive plant species into riparian habitats associated with timber harvest adjacent to the Riparian Reserve over the next 10 years

Under the No Action alternative and Alternatives A and D, there would be no susceptibility for invasive plant introductions into riparian habitats associated with timber harvest activities adjacent to the Riparian Reserve. Under Alternative B, 150 watersheds would have a Low susceptibility, and no watersheds would have Moderate to High susceptibility. Under Alternative C, 136 of the 267 watersheds in the planning area would be susceptible to invasive plant introduction into riparian habitats associated with timber harvest activities adjacent to the Riparian Reserve over the next 10 years. Eight watersheds would have Moderate to High susceptibility. Under the Proposed RMP, 22 watersheds would be susceptible to invasive plant introduction into riparian habitats associated with timber harvest activities adjacent to the Riparian Reserve over the next 10 years, and 10 of those watersheds would have Moderate susceptibility.

Under the No Action alternative and Alternatives A and D, no watersheds would be at risk of the introduction of invasive plant species into riparian habitats associated with timber harvest activities adjacent to the Riparian Reserve over the next 10 years. The highest overall risk would occur under Alternatives B and C. More of the watersheds (56 and 51 percent, respectively) would be at risk under Alternatives B and C, compared to the eight percent of the watersheds at risk under the Proposed RMP. **Table 3-72** displays the risk of introduction and spread of invasive plant species into riparian habitats associated with timber harvest adjacent to the Riparian Reserve over the next 10 years.

Table 3-72. Risk of introduction and spread of invasive plant species into riparian habitats associated with timber harvest adjacent to the Riparian Reserve over the next 10 years

Risk Category	No Action (Number of Watersheds)	Alt. A (Number of Watersheds)	Alt. B (Number of Watersheds)	Alt. C (Number of Watersheds)	Alt. D (Number of Watersheds)	PRMP (Number of Watersheds)
Highest	-	-	-	3	-	-
High	-	-	-	5	-	8
Moderately High	-	-	-	-	-	2
Moderate	-	-	102	88	-	8
Moderately Low	-	-	48	40	-	4
Total at Risk	**-**	**-**	**150**	**136**	**-**	**22**
Total Not at Risk	**267**	**267**	**117**	**131**	**267**	**245**
Total Watersheds	**267**	**267**	**267**	**267**	**267**	**267**

Risk of Introduction and Spread of Invasive Plant Species in Riparian Habitats Associated with Thinning within the Riparian Reserve

Under all alternatives and the Proposed RMP, thinning activities would occur within the Riparian Reserve at varying levels in the next 10 years. Thinning would be limited to outside of the inner zone of the Riparian Reserve under all action alternatives and the Proposed RMP and could occur anywhere in the Riparian Reserve under the No Action alternative.

Under the No Action alternative, there is no defined area excluding thinning activities within the Riparian Reserve, which leaves all riparian habitats susceptible to invasive plant introductions associated with thinning activities. Under the No Action alternative, 31,407 acres of thinning in the Riparian Reserve would occur over the next 10 years, and a proportion of those acres could be within 100 feet of streams (see the Fisheries section of this chapter). Therefore, the No Action alternative would have the highest risk of introducing and spreading invasive plants into riparian habitats from thinning within the Riparian Reserve of all alternatives and the Proposed RMP.

Under Alternative A, the inner zone of the Riparian Reserve would be wider than 100 feet from fish-bearing streams and perennial streams and are therefore wide enough to prevent thinning activities in the outer zone from reducing shade levels in riparian habitats. On intermittent, non-fish-bearing streams, thinning could occur within 100 feet of streams. In moist forests, thinning would be limited to snag and down woody debris creation (i.e., no commercial thinning). These activities would not change shade levels enough to increase the susceptibility of the treatment areas to the introduction and spread of invasive plant infestations. In dry forests, thinning to reduce fire hazards would reduce shade levels and disturb the soil within 50 feet of streams, making the riparian habitats more susceptible to the introduction and spread of invasive plants. Under Alternative A, 7,219 acres of thinning in Riparian Reserve would occur over the next 10 years, but the fuel treatments in the dry forest of the Riparian Reserve would be the only thinning within the Riparian Reserve under Alternative A that would result in susceptibility for invasive plant introductions and spread into riparian habitats. As a result, Alternative A would have the second lowest level of susceptibility for introducing invasive plants into riparian habitats.

Under Alternative B, the inner zone of the Riparian Reserve would be less than 100 feet on either side of fish-bearing streams and perennial streams. The inner zone would also be less than 100 feet on either side of intermittent, debris-flow-prone, non-fish-bearing streams. Riparian Reserve thinning outside of the inner zone would create susceptibility for the introduction of invasive plant species into riparian habitats over the next 10 years. No thinning would occur within Riparian Reserve along intermittent, non-debris-flow-prone, non-fish-bearing streams. Under Alternative B, 15,958 acres of thinning in the Riparian Reserve would occur over the next 10 years. Alternative B would have the second highest level of risk for introducing invasive plants into riparian habitats associated with thinning within the Riparian Reserve.

Under Alternative C, the width of the inner zone of the Riparian Reserve would be less than 100 feet on either side of fish-bearing streams and perennial streams, similar to Alternative B. No thinning would occur within Riparian Reserve along intermittent, non-fish-bearing streams under Alternative C. The Riparian Reserve thinning activities along fish-bearing streams and perennial streams would create susceptibility for the introduction of invasive plant species into riparian habitats over the next 10 years. Under Alternative C, 7,146 acres of thinning in the Riparian Reserve would occur over the next 10 years. Alternative C would have a Moderate level of risk for introducing invasive plants into riparian habitats associated with thinning within the Riparian Reserve.

Under Alternative D, there would be no susceptibility for invasive plant introductions and spread into riparian habitats associated with thinning within the Riparian Reserve. Under Alternative D, the inner zone of the Riparian Reserve would be wider than 100 feet from all streams and are therefore wide enough to prevent thinning activities in the outer zone from reducing shade levels in riparian habitats. Therefore, there would be no risk of introducing and spreading invasive plants into riparian habitats from thinning within the Riparian Reserve under Alternative D.

Under the Proposed RMP, the effects of thinning along fish-bearing streams and perennial streams in all subwatersheds would the same as Alternatives A and D; there would be no risk of introducing and spreading invasive plants into riparian habitats from thinning within the Riparian Reserve because the inner zone would be wider than 100 feet from streams. In Class I subwatersheds, thinning along intermittent, non-fish-bearing streams would be the same as Alternative A; there would be no risk in moist forests, but some limited risk associated with fuels treatments in dry forests. In Class II subwatersheds, the width of the inner zone of the Riparian Reserve would be less than 100 feet on either side intermittent, non-fish-bearing streams, which would create susceptibility for the introduction of invasive plant species into riparian habitats over the next 10 years. In Class III subwatersheds, no thinning would occur within Riparian Reserve along intermittent, non-fish-bearing streams. In total, 10,561 acres of Riparian Reserve thinning would occur under the Proposed RMP over the next 10 years. The Proposed RMP would have a Moderately Low level of risk of introducing and spreading invasive plants into riparian habitats from thinning within the Riparian Reserve.

Risk of Introduction and Spread of Invasive Plant Species Associated with New Road Construction

The BLM determined the susceptibility of watersheds to invasive species introduction associated with new road construction (temporary or permanent) by prorating each watershed with the road construction estimates for each alternative and the Proposed RMP produced in the Trails and Travel Management section in this chapter. Susceptibility values fall into relative susceptibility categories, allowing the BLM to compare the susceptibility of the watersheds to invasive plant species introduction and spread. As noted above, the geographic arrangement of timber harvest is a modeling product used solely for the purpose of this analysis, as is the modeled location of associated new road construction, and is not a product of actual site-specific project planning or decision-making.

The BLM used the susceptibility categories and species distribution categories for the watersheds to determine each alternative and the Proposed RMP's relative risk of invasive plant introduction associated with road construction. See **Table 3-73** for the risk comparison for the introduction and spread of invasive plant species resulting from new road construction activities among the alternatives and the Proposed RMP.

Table 3-73. Risk of introduction and spread of invasive plant species associated with new road construction over the next 10 years

Risk Category	No Action (Number of Watersheds)	Alt. A (Number of Watersheds)	Alt. B (Number of Watersheds)	Alt. C (Number of Watersheds)	Alt. D (Number of Watersheds)	PRMP (Number of Watersheds)
Highest	36	14	34	55	12	26
High	41	45	42	47	44	46
Moderately High	16	13	16	8	12	15
Moderate	22	44	30	17	45	33
Moderately Low	28	29	35	18	33	35
Low	-	-	-	-	-	-
Total at Risk	**143**	**145**	**157**	**145**	**146**	**155**
Total Not at Risk	**132**	**130**	**118**	**130**	**129**	**120**
Total Watersheds	**275**	**275**	**275**	**275**	**275**	**275**

Under Alternative B and the Proposed RMP, 157 and 155 watersheds, respectively, would be at risk of introduction of invasive plant species associated with new road construction in the next 10 years. The other alternatives would have between 143 and 146 watersheds at risk of introduction of invasive plant species associated with new road construction in the next 10 years. Alternative C would have 102 watersheds in the High to Highest relative risk rankings, more than any other alternative or the Proposed RMP. The No Action alternative, Alternative B, and the Proposed RMP would have an intermediate number of watersheds in the High to Highest risk categories, 77, 76, and 72 watersheds, respectively. Alternatives A and D would have the fewest watersheds in the High to Highest risk categories, 59 and 56 watersheds, respectively.

Overall, the greatest relative risk of invasive plant species introduction associated with new road construction would occur under Alternative C, because it would have the most watersheds in the High to Highest risk categories. The lowest risk would occur under the Alternatives A and D. However, all alternatives and the Proposed RMP have management objectives to prevent the introduction of invasive species and the spread of existing invasive species infestations and the BLM would implement measures to prevent, detect, and rapidly control new invasive species infestations based on management direction. Because of this management direction, all alternatives and the Proposed RMP would be expected to continue to apply mitigation against introduction and spread of invasive plant species equally across all risk-level HUC 10 watersheds within the planning area in response to new road construction.

Risk of Introduction and Spread of Invasive Plant Species Associated with Public Motorized Vehicle Use

The action alternatives and the Proposed RMP would have similar susceptibility to invasive plant introduction and spread associated with public motorized access designations because none would designate any areas as open to public motorized vehicle use. The BLM would only designate *open* for public motorized access under the No Action alternative. Furthermore, all alternatives and the Proposed RMP would have similar susceptibility to invasive plant introduction and spread associated with public motorized access designations over the portions of the decision area where the topography and vegetation inhibit cross-country vehicle travel.

The designation of *open* areas in the No Action alternative, and the number and distribution of areas with public motorized vehicle use restrictions (e.g., ACECs and District-Designated Reserve – Lands Managed for their Wilderness Characteristics) would result in the slight differences among the alternatives and the Proposed RMP in the risk results. **Table 3-74** shows a relative risk comparison for introduction and spread of invasive plant species associated with public motorized access designations between the alternatives and the Proposed RMP.

Table 3-74. Risk of introduction and spread of invasive plant species associated with public motorized access designations

Risk Category	No Action (Number of Watersheds)	Alt. A (Number of Watersheds)	Alt. B (Number of Watersheds)	Alt. C (Number of Watersheds)	Alt. D (Number of Watersheds)	PRMP (Number of Watersheds)
Highest	38	-	-	-	-	-
High	100	86	80	68	64	111
Moderately High	40	63	62	57	55	68
Moderate	5	30	35	47	52	5
Moderately Low	3	6	7	12	14	1
Low	-	-	-	-	-	-
Total at Risk	**186**	**185**	**184**	**184**	**184**	**185**
Total Not at Risk	**81**	**82**	**83**	**83**	**83**	**82**
Total Watersheds	**267**	**267**	**267**	**267**	**267**	**267**

Almost 70 percent of the watersheds would be at risk for invasive plant species introductions associated with public motorized travel under all of the alternatives and the Proposed RMP. The No Action alternative would have higher risk levels than the action alternatives and the Proposed RMP, because it is the only alternative with areas designated as *open* for public motorized access. The No Action alternative is the only alternative that would have any watersheds in the Highest risk category for invasive plant species introduction and spread associated with public motorized travel. The No Action alternative would have more watersheds in the High to Highest risk categories than any action alternative or the Proposed RMP. Although the Proposed RMP would have no watersheds in the Highest risk category, it would have the most watersheds in the High risk category, 111 watersheds. Alternatives A and B would have an intermediate number of watersheds in the High risk category, 86 and 80 watersheds, respectively. Alternatives C and D would have the fewest watersheds in the High risk category, 68 and 64 watersheds, respectively.

Risk of Introduction and Spread of Invasive Plant Species Associated with Livestock Grazing

The BLM assessed the risk of invasive species introduction associated with livestock grazing by comparing the relative amount of land available for livestock grazing under each alternative and the Proposed RMP. Livestock grazing creates ground disturbance, which creates susceptibility for the introduction and spread of invasive plants. The BLM assumed invasive plants would occur in the areas available for livestock grazing. Livestock movement and associated activities, such as the transport of contaminated hay, can introduce invasive plants into new locations. Therefore, areas that the BLM determined would be susceptible for introduction and spread of invasive plants associated with livestock grazing would be at risk. The Livestock Grazing section of this chapter lists the acres of BLM-administered lands in the Coos Bay District, Klamath Falls Field Office, and Medford District available for livestock grazing by alternative and the Proposed RMP.

In the Coos Bay District, the No Action alternative would have 544 acres available for livestock grazing, resulting in the greatest risk of invasive plant introduction and spread. Under all action alternatives and the Proposed RMP, no lands would be available for livestock grazing in the Coos Bay District, and there would therefore be no risk of invasive plant introduction and spread associated with livestock grazing.

In the Klamath Falls Field Office, the No Action alternative would result in the greatest risk of introduction and spread, with 203,582 acres available for livestock grazing. Alternatives A, B, and C and the Proposed RMP would have 203,377 acres available for livestock grazing, resulting in slightly less risk of introduction and spread than the No Action alternative. Alternative D would have no acres available for livestock grazing and would therefore result in no risk of invasive plant introduction and spread associated with livestock grazing.

In the Medford District, the No Action alternative would result in the greatest risk of introduction and spread, with 285,920 acres available for livestock grazing. Alternatives A, B, and C would have 162,854 acres available for livestock grazing, resulting in less risk of introduction and spread than the No Action alternative. The Proposed RMP would have 156,926 acres available for livestock grazing, resulting in less risk of introduction and spread than the No Action alternative and Alternative A, B, and C. Alternative D would have no acres available for livestock grazing and would therefore result in no risk of invasive plant introduction and spread associated with livestock grazing.

Summary

The risk of introduction and spread of invasive plant species would vary by the various management activities, as described above. It is not possible to combine the risks associated with various management activities quantitatively to provide a total cumulative risk from all management activities for each alternative or the Proposed RMP because of the different metrics used for measuring the risk associated with different management activities and the differing geographic scope of management activities (see 'Determining Species Distribution Categories' in the Summary of Analytical Methods above). Additionally, the risk of introduction and spread of different invasive plant species and different management activities are not quantitatively comparable. For example, timber harvest adjacent to the Riparian Reserve would have indirect effects on the introduction and spread of invasive plant species in riparian habitats by increasing light levels in riparian habitats, whereas road construction would have more direct effects on the introduction and spread of invasive plant species by transporting invasive plant seeds or vegetation.

It is possible to summarize qualitatively the relative cumulative risk of introduction and spread of invasive plant species for each alternative and the Proposed RMP. **Table 3-75** ranks the alternatives and Proposed RMP in terms of the relative risk of introduction and spread of invasive plant species by analysis factor and overall.

The No Action alternative would result in a moderate overall risk of introduction and spread of invasive plant species. Under the No Action alternative, the risk associated with timber harvest and new road construction would be moderately low and moderate, respectively. The No Action alternative would have no risk of introduction and spread of invasive plant species in riparian habitats from timber harvest outside of the Riparian Reserve, but the highest risk associated with thinning within the Riparian Reserve. The No Action alternative would have the highest risk associated with public motorized vehicle use and livestock grazing, but the effect of these management activities on introduction and spread of invasive plant species would be geographically limited within the decision area.

Alternative A would result in a low overall risk of introduction and spread of invasive plant species. Under Alternative A, timber harvest activities and new road construction would result in a Low risk of introduction and spread of invasive plant species relative to the other alternatives and the Proposed RMP. Alternative A would result in a Moderate risk associated with public motorized vehicle use and livestock grazing, but the effect of these management activities on introduction and spread of invasive plant species would be geographically limited within the decision area.

Alternative B would result in a Moderately High overall risk of introduction and spread of invasive plant species, the second highest of all alternatives and the Proposed RMP. Under Alternative B, timber harvest activities and new road construction would result in a Moderate risk of introduction and spread of invasive plant species relative to the other alternatives and the Proposed RMP. Alternative B would result in a High risk of introduction and spread of invasive plant species in riparian habitats, both from timber harvest outside of the Riparian Reserve and thinning within the Riparian Reserve. Alternative B would result in a Moderate risk associated with public motorized vehicle use and livestock grazing, but the effect of these management activities on introduction and spread of invasive plant species would be geographically limited within the decision area.

Alternative C would result in the highest overall risk of introduction and spread of invasive plant species of all alternatives and the Proposed RMP. Under Alternative C, timber harvest activities and new road construction would result in the Highest risk of introduction and spread of invasive plant species. Alternative C would result in a Low risk associated with public motorized vehicle use and a Moderate risk associated with livestock grazing, but the effect of these management activities on introduction and spread of invasive plant species would be geographically limited within the decision area.

Alternative D would result in the lowest overall risk of introduction and spread of invasive plant species of all alternatives and the Proposed RMP. Under Alternative D, timber harvest activities would result in a Moderate risk and new road construction would result in the Lowest risk of introduction and spread of invasive plant species. Alternative D would have no risk of introduction and spread of invasive plant species in riparian habitats from either timber harvest outside of the Riparian Reserve or thinning within the Riparian Reserve. Alternative D would result in the Lowest risk associated with public motorized vehicle use. Alternative D would have no risk of introduction and spread of invasive plant species associated with livestock grazing.

The Proposed RMP would result in a moderate overall risk of introduction and spread of invasive plant species. Under the Proposed RMP, the risk associated with timber harvest and new road construction would be moderate relative to the alternatives. The Proposed RMP would result in a Low risk of introduction and spread of invasive plant species in riparian habitats from timber harvest outside of the Riparian Reserve, and a Moderately Low risk associated with thinning within the Riparian Reserve, but this risk would be limited to Class III subwatersheds. The Proposed RMP would result in a Moderately High risk associated with public motorized vehicle use and a Moderate risk associated with livestock grazing, but the effect of these management activities on introduction and spread of invasive plant species would be geographically limited within the decision area.

These qualitative rankings of risk are simply evaluations of susceptibility based on current conditions of invasive plant species populations, coupled with management actions proposed under the alternatives and the Proposed RMP. That is, an alternative's overall rating describes the level of risk of introduction and spread of invasive plant species rather than an analysis of actual introduction and spread of invasive plant species in any specific watershed. Whether an alternative would result in actual introduction and spread of invasive plant species in any specific watershed would depend on a variety of project-specific, watershed-specific, and species-specific factors that cannot be analyzed at this scale of analysis. All alternatives and the Proposed RMP have management objectives to prevent the introduction of invasive species and the spread of existing invasive species infestations and the BLM would implement measures to prevent, detect, and rapidly control new invasive species infestations based on management direction. Because of this management direction, all alternatives and the Proposed RMP would be expected to continue to apply mitigation against introduction and spread of invasive plant species equally across all risk-level HUC 10 watersheds within the planning area in response to management activities.

Table 3-75. Relative risk of introduction and spread of invasive plant species by analysis factor and overall

Management Activity	No Action (Risk)	Alt. A (Risk)	Alt. B (Risk)	Alt. C (Risk)	Alt. D (Risk)	PRMP (Risk)
Timber harvest activities	Moderately Low	Lowest	Moderate	Highest	Moderate	Moderate
Timber harvest activities adjacent to Riparian Reserve (invasive plant species in riparian habitats)	None	None	High	Highest	None	Low
Thinning activities within Riparian Reserve (invasive plant species in riparian habitats)	Highest	Low	High	Moderate	None	Moderately Low
New road construction	Moderate	Low	Moderate	Highest	Lowest	Moderate
Public motorized vehicle use	Highest	Moderate	Moderate	Low	Lowest	Moderately High
Livestock grazing	Highest	Moderate	Moderate	Moderate	None	Moderate
Overall Risk of Introduction and Spread of Invasive Plant Species	**Moderately High**	**Low**	**Moderately High**	**Highest**	**Lowest**	**Moderate**

Issue 2

How would the alternatives affect the risk of invasive aquatic species introduction and spread?

Summary of Analytical Methods

The BLM compared the relative risk of introducing and spreading invasive aquatic species resulting from the land use allocations and planned management activity levels under the alternatives and the Proposed RMP, taking into consideration the collective distribution of a representative set of invasive aquatic species. Variation in the effects among the alternatives and the Proposed RMP would result from differences in Recreation Management Area designations, the area available to livestock grazing, and the mileage of new road construction over the next 10 years. The Planning Criteria provides detailed information on the invasive species analysis and assumptions, which is incorporated here by reference (USDI BLM 2014, pp. 90–98).

In this analysis, the BLM measured effects associated with new road construction and RMA designations using subbasins (HUC 8) as the basic analytical unit, in much the same way as a site-specific analysis may report infestation effects in terms of acres, rather than in smaller increments representing the extent of the infestations. Even though BLM-administered lands constitutes a small percentage of many subbasins, BLM management actions could still affect susceptibility and risk for the introduction and spread of invasive plant species. Therefore, the BLM included all subbasins within the decision area in this analysis. The BLM measured the effects of livestock grazing on the introduction and spread of invasive aquatic species at the scale of the district or field office.

Representative Species

The BLM selected the following invasive aquatic species to characterize the general condition of invasive aquatic species in the decision area:

- American bullfrog (*Rana catesbeiana*)
- Asiatic clam (*Corbicula fluminea*)
- New Zealand mudsnail (*Potamopyrgus antipodarum*)
- Nutria (*Myocastor coypus*)
- Yellow flag iris (*Iris pseudacorus*)

Each of these species has a unique distribution and strategy for spreading and resisting different control methods. Although each species is unique, this sample of invasive aquatic species represents a range of life histories and methods of introduction and spread sufficient to describe the condition of invasive aquatic species in the decision area. The BLM considered these dispersal strategies when developing its assumptions around how management activities would affect invasive aquatic species introduction and spread. **Figure 3-100** illustrates the reported presence of the representative invasive aquatic species in the planning area.

A complete accounting of the distribution of invasive aquatic species is unavailable, because there is no requirement for county, private, or corporate landowners to report occurrences of invasive aquatic species. Despite the limited reporting, a sufficient picture of the distribution of invasive aquatic species is available on a species-by-species basis on the NAS – Nonindigenous Aquatic species database managed by the U.S. Geological Survey (http://nas.er.usgs.gov/) and iMapInvasives (www.imapinvasives.org). Baseline occurrence data in iMapInvasives and the NAS – Nonindigenous Aquatic species database allow for an analysis of invasive aquatic species among alternatives and the Proposed RMP using the subbasins as the basic analysis unit.

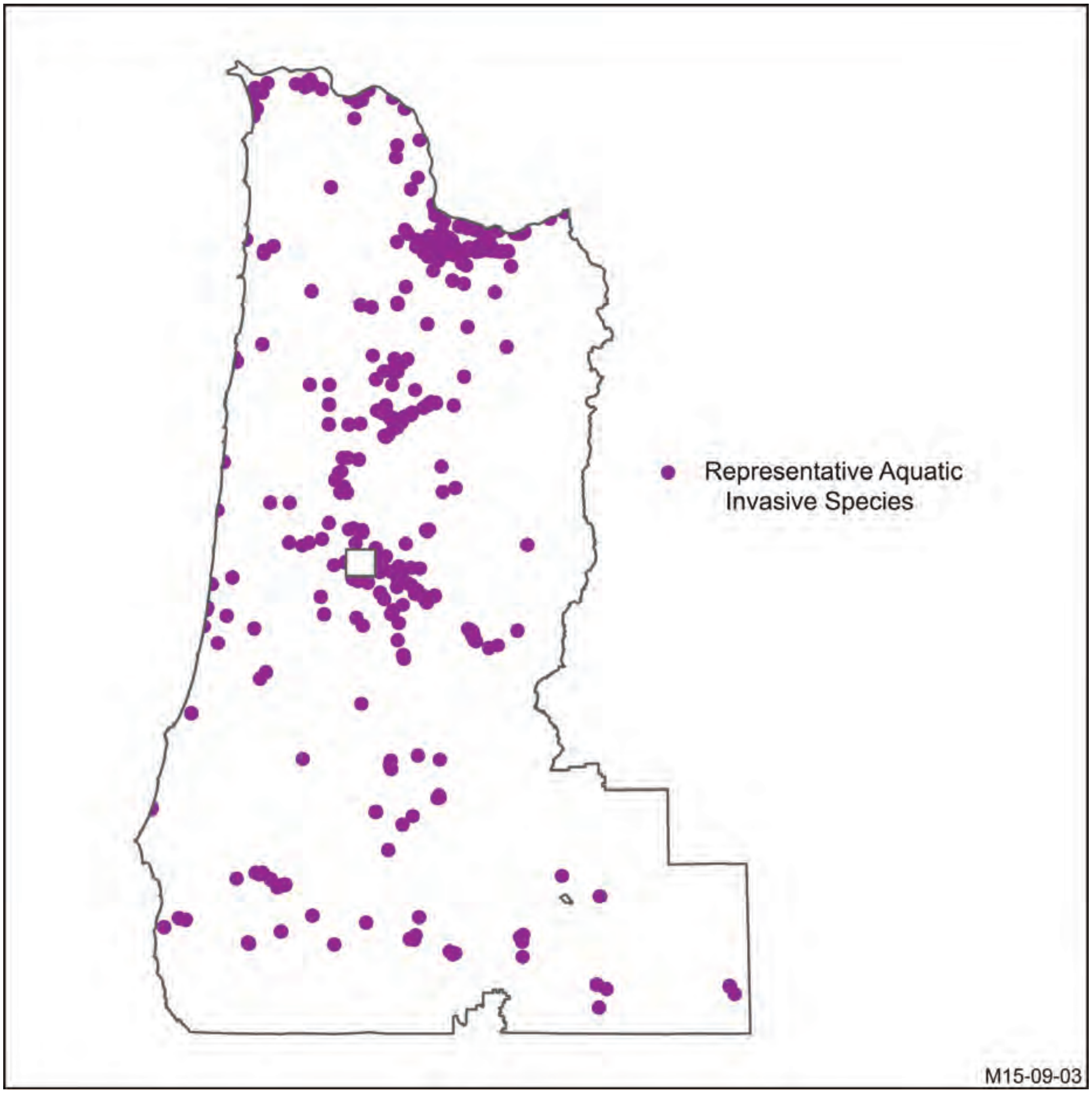

Figure 3-100. Reported infestations of representative invasive aquatic species within the planning area

Determining Species Distribution Categories

The BLM pooled representative invasive aquatic species occurrence data from BLM corporate datasets and iMapInvasives (ORBIC 2013). The BLM evaluated the collective pool of reported sites to determine representative invasive plant presence for each square mile in a grid applied to the planning area. The BLM based the invasive aquatic species distribution categories of Abundant, Limited, and Low on the known representative species' distribution in the subbasins:

- **Abundant**—the representative invasive species reported from more than 25 percent of the square miles within the subbasin
- **Limited**—the representative invasive species reported from more than 1 percent and less than 25 percent of the square miles within the subbasin

- **Low**—the representative invasive species reported in no more than 1 percent of the square miles within the subbasin

Subbasins fitting the Abundant species distribution category are more likely to have invasive species introduction and spread associated with management and human activities than those fitting the Limited and Low species distribution categories because there are already more infestations within them.

Risk of Introduction and Spread of Invasive Aquatic Species

The BLM considered the following factors in the analysis of the relative levels of risk of the introduction and spread of invasive aquatic species in the decision area:

- Distribution and abundance of invasive aquatic species
- Levels of new road construction over the next 10 years
- Designations for Recreation Management Areas
- Proximity of Recreation Management Area designations to streams and water bodies
- Area available to livestock grazing

The relative risk of introducing and spreading invasive aquatic species would vary by alternative and the Proposed RMP. This analysis compares the effects road construction, recreation use, and livestock grazing would have on the introduction and spread of invasive aquatic species, in terms of susceptibility and risk (see Issue 1 above for the discussion of susceptibility and risk).

As in Issue 1 above, the analysis assumed that actions on other ownerships and BLM management actions other than those listed above would continue to contribute to invasive aquatic species introduction and spread at current levels.

All alternatives and the Proposed RMP include management direction to "prevent, detect, and rapidly control new invasive aquatic species infestations" (**Appendix B**). This management direction is general, as is appropriate to the scope and scale of this action. Under the alternatives and the Proposed RMP, the BLM would mitigate some of the effects by incorporating prevention measures in the planning and design of implementation-level actions, to prevent the introduction of new infestations. These specific measures would include, but are not limited to, the following:

- Clean road construction, restoration, and livestock grazing management equipment that would operate off roads. In infested areas, where the transport of invasive species seeds, propagules, or individuals on equipment is likely, clean the equipment before leaving the project site
- Use sterile road construction materials and weed-free straw and mulch
- Use native plant species to promote competitive exclusion of invasive plant species
- Retain native plant communities in and around riparian and aquatic habitats and minimize soil disturbance, consistent with project objectives

Although implementation of these measures under all alternatives and the Proposed RMP would mitigate the effects of management activities on the introduction and spread of invasive aquatic species, it is not possible to forecast the effectiveness of prevention or treatment measures in avoiding or reducing the introduction and spread of specific invasive aquatic species. Thus, it is not possible to incorporate a quantitative analysis of the effect of such prevention and treatment measures into this analysis.

Assessing Risk of Invasive Aquatic Species Introduction Associated with New Road Construction

Road construction activities contribute to the introduction of new infestations and the spread of existing invasive aquatic species infestations. Road construction equipment can inadvertently transport invasive aquatic species from one contaminated aquatic system to another. In addition, the disturbance and modification of riparian and aquatic habitats by road construction can create better habitat conditions for some invasive aquatic species.

This analysis used levels of new road construction over the next 10 years to compare the relative risk of invasive aquatic species introduction associated with road construction across the alternatives and the Proposed RMP.

The BLM determined the susceptibility of subbasins to invasive species introduction associated with new road construction by analyzing the alternatives and the Proposed RMPs estimates of road construction from the Woodstock vegetation model and the coefficients developed for the 10-year scenarios in the 2008 FEIS (**Appendix C**). See Issue 1 above for discussion of the analytical assumptions regarding new road construction.

The BLM prorated the road construction estimates for the subbasins in the planning area for each alternative and the Proposed RMP. The BLM used levels of new road construction under each alternative and the Proposed RMP over the next 10 years to generate susceptibility values for each subbasin. The BLM used these susceptibility values to compare the susceptibility of the subbasins to invasive aquatic species introduction and spread.

This analysis considers both the susceptibility of a subbasin to invasion due to new road construction and the presence of invasive aquatic species to determine the risk of invasion and spread of invasive aquatic species. Subbasins with a low distribution of invasive aquatic species and low susceptibility for the introduction of invasive aquatic species would have the lowest risk of invasion. The greatest risk of invasion would be in subbasins where both invasive aquatic species are more abundant and susceptibility would be higher. Subbasins without a risk category either have no reported sites for the representative sample set of invasive aquatic species or have no BLM-administered lands in the subbasin.

Assessing Risk of Introduction and Spread of Invasive Aquatic Species Associated with Recreation Management Area Designations

Visitors to recreation areas could introduce invasive aquatic species to new locations in a number of different ways. Recreational vehicles and equipment can inadvertently transport invasive aquatic species into new habitats, resulting in new introductions. In addition, visitors sometimes deliberately release aquatic pets they no longer want in areas with easy access to water.

The levels of human activity in the different Recreation Management Area (RMA) designations would create varying levels of opportunity for introducing and spreading invasive aquatic species. Visitor use and concentration would be highest in Special Recreation Management Areas (SRMAs), intermediate in Extensive Recreation Management Areas (ERMAs), and lowest in areas outside of designated RMAs. In this analysis, the BLM assumed that, with increased visitor use and activity, there would be a corresponding increase in the susceptibility of introduction and spread of invasive aquatic species. That is, this analysis assumed that SRMAs would be most susceptible, ERMAs would be moderately susceptible, and areas with no RMA designation would be least susceptible to introduction and spread of invasive aquatic species.

New guidance on applying RMA allocations on BLM-administered lands creates a marked difference in how RMA designations are defined under the No Action alternative, compared to all action alternatives and the Proposed RMP. Under the No Action alternative, all lands in the decision area would be designated to either SRMAs or ERMAs, but these designations have different meaning than under the action alternatives or the Proposed RMP (see the Recreation section of this chapter). Because the RMA designation definitions differ for the No Action alternative, the relative ranking analysis can only compare the action alternatives and the Proposed RMP.

The BLM assessed susceptibility to invasive aquatic species introduction and spread by using subbasins as the basic unit of analysis. SRMAs received the highest weight (i.e., the highest susceptibility) and areas with no RMA designation received the lowest weight (i.e., the lowest susceptibility). Susceptibility values for each subbasin result from multiplying the acres of each type of RMA by the relative weight for each alternative and the Proposed RMP. The BLM organized the susceptibility categories into relative susceptibility categories of High, Medium, and Low.

This analysis considers both the susceptibility of a subbasin to invasion due to RMA designations and the presence of invasive aquatic species to determine the risk of invasion and spread of invasive aquatic species. Subbasins with a low distribution of invasive aquatic species and low susceptibility for the introduction of invasive aquatic species would have the lowest risk of invasion. The greatest risk of invasion would be in subbasins where both invasive aquatic species are more abundant and susceptibility would be higher. Subbasins without a risk category either have no reported sites for the representative sample set of invasive aquatic species or have no BLM-administered lands in the subbasin.

Assessing Risk of Introduction and Spread of Invasive Aquatic Species Associated with Livestock Grazing

The BLM assessed the risk of invasive aquatic species introduction and spread associated with livestock grazing by comparing the amount of land available for livestock grazing in each alternative and the Proposed RMP by BLM district. Livestock grazing creates opportunities for livestock and equipment to move through streams and other aquatic environments, which creates susceptibility for the introduction and spread of invasive aquatic species. Therefore, areas that the BLM determined would be susceptible for introduction and spread of invasive aquatic species associated with livestock grazing would be at risk. Only the Coos Bay District, Klamath Falls Field Office, and Medford District administer livestock grazing in the decision area. Comparing the acreage available for livestock grazing in the Coos Bay District, Klamath Falls Field Office, and Medford District provides a relative assessment for the introduction and spread of invasive aquatic species across the alternatives and the Proposed RMP.

Background

Invasive aquatic species include non-native species in all taxa groups whose introduction causes economic or environmental harm, or harm to human health. Numerous invasive species identified in the Oregon Conservation Strategy (ODFW 2006) occur in the planning area. Some of these invasive species include New Zealand mudsnails, ringed crayfish, bullfrogs, and bluegill. Other priority invasive aquatic species with documented sightings in western Oregon that have the potential to be introduced and documented in the planning area include quagga mussels, Eastern snapping turtle, and Louisiana swamp crawfish. In this analysis, the BLM is specifically considering the following representative species, all of which occur within the planning area.

American Bullfrog

American bullfrogs (*Rana catesbeiana)* inhabit river and stream segments with slow moving waters, ponds, lakes, and boggy areas and prefer simplified, modified aquatic habitats (Fuller *et al.* 2011). Tadpoles require moisture year round to mature. American bullfrogs move to new sites by a variety of mechanisms including: aquaculture and garden water feature escapes, translocation into private wetlands from pet store purchases, and release of bullfrog pets into the wild (Crayon *et al*. 2009). Bullfrogs disperse from ponds into natural water bodies up to two miles away during periods of seasonally high water (Adams *et al*. 2003).

Habitat modifications that make better conditions for American bullfrog establishment include simplifying the plant community and altering seasonally wet habitats to those with permanent water. Simplification of the plant community allows for easier hunting and increased water temperatures (Crayon *et al*. 2009). Warmer water temperatures generally provide better habitat conditions for American bullfrog in the planning area.

American bullfrogs occur on BLM-administered lands in the Roseburg District (USDI BLM 2013) and in numerous widespread locations across western Oregon.

Asiatic Clam

The Asiatic clam (*Corbicula fluminea*) is a filter feeder inhabiting the surface and top layer of sediment in rivers and reservoirs. This species can reproduce rapidly under warm conditions and can persist in cool temperatures. Simply one Asiatic clam introduced into a new location can multiply into a new population because the species is capable of self-fertilization and cloning. Asiatic clam are successful invasive species because they have multiple reproductive strategies, reproduce rapidly, easily relocate in aquatic systems, and tolerate a wide range of environmental conditions. The species' life history requirements limit its ability to spread in high temperature, low pH, and low calcium environments (Kramer-Wilt 2008).

People introduce Asiatic clam to new locations by way of contaminated sand and gravel for construction projects, bait buckets, and imported aquaculture purchases (Weidemer and Chan 2008). They also move to new areas in water currents, on contaminated sporting and construction equipment, and through the transfer of infested water (Foster *et al*. 2014).

Asiatic clam occur within the administrative boundaries of the Coos Bay, Eugene, Roseburg, and Salem Districts.

New Zealand Mudsnail

The New Zealand mudsnail (*Potamopyrgus antipodarum*) is a clonal mollusk species that thrives in disturbed fresh and brackish waters. This habitat generalist spreads very easily, likes to burrow in sediment, and grows large populations under high nutrient flows. New Zealand mudsnails live equally well on organic matter or silt in lakes and in slow-moving streams, or burrowed in sediment in fast-moving streams.

New Zealand mudsnails are spread into new locations by passage through fish digestive tracts, contaminated fishing, sporting, and construction equipment, and contaminated water from game fish relocations (Oregon Sea Grant 2010). Once introduced into an aquatic system, New Zealand mudsnails spread within aquatic environments as hitchhikers on fish and aquatic plants. This species has the potential to interfere with the operations of facilities drawing infested waters. New Zealand mudsnail populations can become very dense and outcompete native snails for habitat and food (Benson *et al*. 2014).

New Zealand mudsnail are reported across the planning area, on BLM-administered lands in the Coos Bay District, and within the administrative boundaries of the Eugene, Medford, Roseburg, and Salem Districts.

Nutria

Humans intentionally introduced nutria (*Myocastor coypus*), a large rodent, to Oregon and Washington in the 1930s for two purposes: fur trade and undesirable aquatic plant control. Within a decade, nutria escaped captivity and became feral (Washington Department of Fish and Wildlife 2006). Nutria is now well established throughout the planning area. Nutria travel long distances over land to find new habitat as their populations expand (Washington State Lake Protection Association 2011). They inhabit burrows in riparian areas near still or slow-moving water bodies, including marshes, wetlands, ponds, and rivers. Dense populations of nutria modify riparian ecosystems by overgrazing riparian vegetation and building numerous burrows. The burrows also weaken fabricated structures, such as roadbeds and dikes. Intolerance to freezing temperatures is the primary factor limiting the spread of nutria in Oregon (ODFW 2014).

Nutria is reported in all parts of the planning area.

Yellow Flag Iris

Yellow flag iris (*Iris pseudacorus*) is a tall and showy invasive perennial wetland plant species introduced to North America for multiple purposes, including gardening, erosion control, and bioremediation (specifically, to remove metals from wastewater in sewage treatment plants). Yellow flag iris reproduces sexually by seed and vegetatively by rhizomes. The species tolerates a broad array of habitat conditions, including high soil acidity, high salinity, low soil oxygen, and periods of drought. However, yellow flag iris does not tolerate long periods of freezing temperatures (Ramey 2001).

Similar to other invasive aquatic plants, yellow flag iris can be introduced to new locations when it is inadvertently transported on construction equipment and vehicles. Once introduced, yellow flag iris spreads to form thickets in mud and shallow water. Seeds can float long distances and start new colonies downstream. Any disturbance to yellow flag iris infestations provides an opportunity for the species to spread via rhizome fragments. Yellow flag iris thickets crowd out most other vegetation, including native aquatic plants such as cattails (Ramey 2001).

Yellow flag iris has limited to widespread distribution in western Oregon and occupies BLM-administered lands in the Coos Bay, Eugene, and Medford Districts.

Affected Environment

The representative invasive aquatic species generally have the following distribution in the planning area:

- American bullfrog occurs in numerous widespread locations across western Oregon.
- Asiatic clam occurs within the administrative boundaries of the Coos Bay, Eugene, Roseburg, and Salem Districts.
- New Zealand mudsnail infestations are reported across the planning area.
- Nutria are well established throughout the planning area.
- Yellow flag iris has limited to widespread distribution in western Oregon and occupies BLM-administered lands in the Coos Bay, Eugene, and Medford Districts.

Figure 3-101 shows the distribution of representative invasive aquatic species throughout the planning area by subbasin.

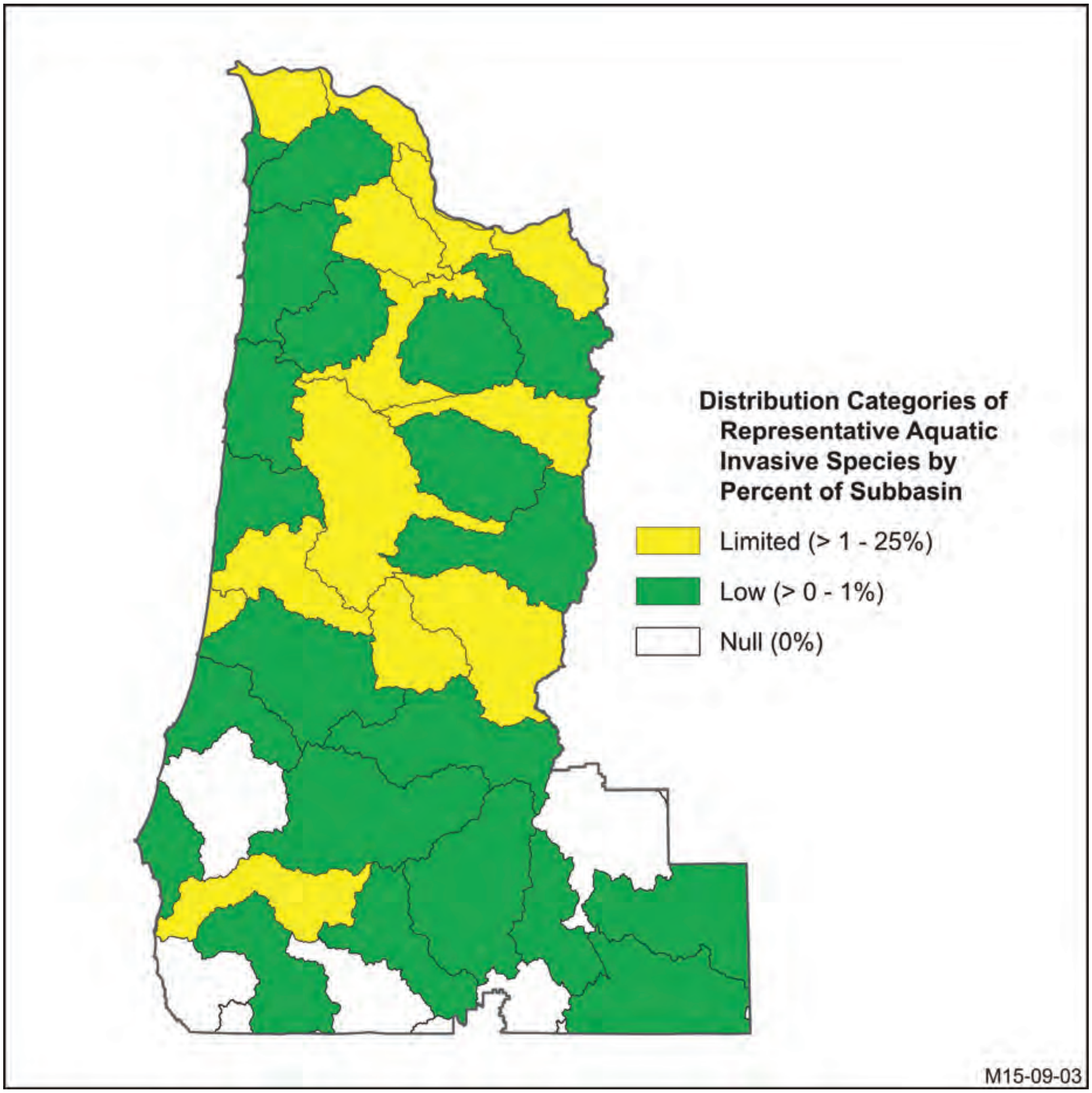

Figure 3-101. Distribution categories of invasive aquatic species by subbasins within the planning area

Of the 41 subbasins completely or mostly within the planning area, none have enough reported infestations of the representative invasive aquatic species to fall into the Abundant species distribution category. Thirteen subbasins are in the Limited distribution category, and 21 subbasins are in the Low distribution category for invasive aquatic species. In total, 83 percent of the subbasins have some reported representative invasive aquatic species infestations. Seven subbasins (17 percent) fall in the Null distribution category (i.e., they currently have no reported representative invasive aquatic species infestations).

Environmental Consequences

Risk of Introduction and Spread of Invasive Aquatic Species Associated with New Road Construction

The No Action alternative and Alternative C would have the greatest susceptibility because they have the most subbasins in the highest susceptibility ranking. Alternatives B and C, and the Proposed RMP would each have 36 subbasins with some level of susceptibility that is associated with new road construction over the next 10 years. Alternative D would have the least susceptibility to the introduction and spread of invasive aquatic species, with all of the susceptible subbasins with Moderate to Low relative categories. Alternative B would be the second highest in susceptibility; Alternative A would be intermediate, and the Proposed RMP second to the least susceptible.

See **Table 3-76** for the risk of the introduction and spread of invasive aquatic species resulting from new road construction activities among the alternatives and the Proposed RMP.

Under all alternatives and the Proposed RMP, no subbasins would have a High risk of introduction and spread of invasive aquatic species resulting from new road construction over the next 10 years. Alternative A would have the most number of subbasins with some level of risk of introduction and spread of invasive aquatic species resulting from new road construction, and Alternative D would have the fewest. However, the No Action alternative and Alternative C would have the highest relative risk of introduction and spread of invasive aquatic species resulting from new road construction, because they would have the most subbasins in the Moderately High risk category. Alternative B and the Proposed RMP would have an intermediate number of subbasins in the Moderately High risk category. Alternatives D and A would have the lowest relative risk of introduction and spread of invasive aquatic species resulting from new road construction, because they would have the least number of subbasins in the Moderately High risk category.

Table 3-76. Risk of introduction and spread of invasive aquatic species associated with new road construction by subbasins over the next 10 years.

Risk Category	No Action (Number of Subbasins)	Alt. A (Number of Subbasins)	Alt. B (Number of Subbasins)	Alt. C (Number of Subbasins)	Alt. D (Number of Subbasins)	PRMP (Number of Subbasins)
High	-	-	-	-	-	-
Moderately High	8	3	7	8	4	6
Moderate	1	-	4	5	-	3
Moderately Low	15	14	14	12	16	16
Low	6	15	6	6	9	6
Total at Risk	**30**	**37**	**31**	**31**	**29**	**31**

Risk of Introduction and Spread of Invasive Aquatic Species Associated with Recreation Management Area Designations

See **Table 3-77** for the risk of introduction and spread of invasive aquatic species associated with the RMA designations.

All of the alternatives and the Proposed RMP would have 32 total subbasins with some level of risk of introduction and spread of invasive aquatic species associated with RMA designations and 9 subbasins with no risk of introduction and spread of invasive aquatic species associated with RMA designations.

The Proposed RMP would have 7 subbasins in the Moderately High to High risk categories, and would therefore result in the most risk of introduction and spread of invasive aquatic species associated with RMA designations, Alternative C and D would have 6 subbasins in the Moderately High to High risk categories, and Alternative B and A would have 4 and 3 subbasins, respectively, in the Moderately High to High risk categories, and would therefore have the least risk of introduction and spread of invasive aquatic species associated with RMA designations.

Table 3-77. Risk of introduction and spread of invasive aquatic species associated with RMA designations

Risk Ranking	Alt. A (Number of Subbasins)	Alt. B (Number of Subbasins)	Alt. C (Number of Subbasins)	Alt. D (Number of Subbasins)	PRMP (Number of Subbasins)
High	-	-	1	2	2
Moderately High	3	4	5	4	5
Moderate	-	1	4	6	5
Moderately Low	14	23	20	20	17
Low	15	4	2	-	3
Total at Risk	**32**	**32**	**32**	**32**	**32**
Total Watersheds	**41**	**41**	**41**	**41**	**41**

Risk of Introduction and Spread of Invasive Aquatic Species Associated with Livestock Grazing

The Livestock Grazing section in this chapter lists acres of the BLM-administered lands available for livestock grazing by alternative and the Proposed RMP.

In the Coos Bay District, the No Action alternative would have 544 acres available for livestock grazing, resulting in the greatest risk of invasive aquatic species introduction and spread. Under all action alternatives and the Proposed RMP, no lands would be available for livestock grazing in the Coos Bay District, and there would therefore be no risk of invasive aquatic species introduction and spread associated with livestock grazing.

In the Klamath Falls Field Office, the No Action alternative would result in the greatest risk of introduction and spread, with 203,582 acres available for livestock grazing. Alternatives A, B, and C and the Proposed RMP would have 203,377 acres available for livestock grazing, resulting in slightly less risk of introduction and spread of invasive aquatic species than the No Action alternative. Alternative D would have no acres available for livestock grazing and would therefore result in no risk of invasive aquatic species introduction and spread associated with livestock grazing.

In the Medford District, the No Action alternative would result in the greatest risk of introduction and spread of invasive aquatic species, with 285,920 acres available for livestock grazing. Alternatives A, B, and C would have 162,854 acres available for livestock grazing, resulting in less risk of introduction and spread than the No Action alternative. The Proposed RMP would have 156,926 acres available for livestock grazing, resulting in less risk of introduction and spread than the No Action alternative and Alternative A, B, and C. Alternative D would have no acres available for livestock grazing and would therefore result in no risk of invasive aquatic species introduction and spread associated with livestock grazing.

Summary

The risk of introduction and spread of invasive aquatic species would vary by the various management activities, as described above. As with the discussion of invasive plant species in Issue 1 above, it is not possible to combine the risks associated with various management activities quantitatively to provide a total cumulative risk from all management activities for each alternative or the Proposed RMP because of the different metrics used for measuring the risk associated with different management activities and the differing geographic scope of management activities. Additionally, the risk of introduction and spread of different invasive aquatic species and different management activities are not quantitatively comparable. **Table 3-78** shows the relative risk of the alternatives and the Proposed RMP, by analysis factor and overall, of introduction and spread of invasive aquatic species.

Table 3-78. Relative risk of introduction and spread of invasive aquatic species by analysis factor and overall

Management Activity	No Action (Risk)	Alt. A (Risk)	Alt. B (Risk)	Alt. C (Risk)	Alt. D (Risk)	PRMP (Risk)
New road construction	High	Lowest	Moderately High	Highest	Low	Moderate
RMA designations	--	Lowest	Low	High	High	Highest
Livestock grazing	Highest	Moderate	Moderate	Moderate	None	Moderate
Overall relative risk for the introduction and spread of invasive aquatic species	**High**	**Lowest**	**Moderate**	**Highest**	**Low**	**Moderately High**

The No Action alternative would result in a high overall risk of introduction and spread of invasive aquatic species. Under the No Action alternative, the risk associated with new road construction would be high. As noted above, the RMA designations under the No Action alternative cannot be directly compared to the RMA designations under the action alternatives and the Proposed RMP. However, the overall recreation management approach under Alternative B best reflects the recreation management approach of the No Action alternative, updated with RMA designations consistent with current BLM policy. Thus, the effect of recreation management on risk of introduction and spread of invasive aquatic species under the No Action alternative can best be approximated as Low relative to the other alternatives and the Proposed RMP, similar to Alternative B. The No Action alternative would have the Highest risk associated with livestock grazing, but the effect of livestock grazing on introduction and spread of invasive aquatic species would be geographically limited within the decision area.

Alternative A would result in the lowest overall risk of introduction and spread of invasive aquatic species. Under Alternative A, new road construction and RMA designations would result in the Lowest risk of introduction and spread of invasive aquatic species relative to the other alternatives and the Proposed RMP. Alternative A would result in a Moderate risk associated with livestock grazing, but the effect of livestock grazing on introduction and spread of invasive aquatic species would be geographically limited within the decision area.

Alternative B would result in a moderate overall risk of introduction and spread of invasive aquatic species. Under Alternative B, new road construction would result in a Moderately High risk of introduction and spread of invasive aquatic species relative to the other alternatives and the Proposed RMP. RMA designations would result in a Low risk relative to the other alternatives and the Proposed RMP. Alternative B would result in a Moderate risk associated with livestock grazing, but the effect of livestock grazing on introduction and spread of invasive aquatic species would be geographically limited within the decision area.

Alternative C would result in the highest overall risk of introduction and spread of invasive aquatic species. Under Alternative C, new road construction would result in the Highest risk of introduction and spread of invasive aquatic species relative to the other alternatives and the Proposed RMP. RMA designations would result in a High risk relative to the other alternatives and the Proposed RMP. Alternative C would result in a Moderate risk associated with livestock grazing, but the effect of livestock grazing on introduction and spread of invasive aquatic species would be geographically limited within the decision area.

Alternative D would result in a low overall risk of introduction and spread of invasive aquatic species. Under Alternative D, new road construction would result in a Low risk of introduction and spread of invasive aquatic species relative to the other alternatives and the Proposed RMP. RMA designations would result in a High risk relative to the other alternatives and the Proposed RMP Alternative D would have no risk of introduction and spread of invasive aquatic species associated with livestock grazing.

The Proposed RMP would result in a moderately high overall risk of introduction and spread of invasive aquatic species. Under the Proposed RMP, new road construction would result in a Moderate risk of introduction and spread of invasive aquatic species relative to the alternatives. RMA designations would result in the Highest risk relative to the alternatives. The Proposed RMP would result in a Moderate risk associated with livestock grazing, but the effect of livestock grazing on introduction and spread of invasive aquatic species would be geographically limited within the decision area.

Issue 3

How would the alternatives affect the risk of sudden oak death introduction and spread?

Summary of Analytical Methods

The BLM designed the analysis to project the rate of sudden oak death (*Phytophthora ramorum*) infestation expansion for the periods of 2013–2023 and 2023–2033. The analysis shows the relative differences in the expected rate of sudden oak death infestation expansion resulting from different sudden oak death treatments strategies under the alternatives and the Proposed RMP. The Planning Criteria provides detailed information on the sudden oak death analysis and assumptions, which is incorporated here by reference (USDI BLM 2014, pp. 101–104).

The BLM measured the effects of where sudden oak death treatments would occur in the decision area in terms of the location and amount of area projected to become infested in the sudden oak death expansion zones over the next 10–20 years. Zone 1 covers infestation area for the period between 2001 and 2013; Zone 2 shows the expected extent of the infested area by 2023, and Zone 3 by 2033.

The BLM considered the following factors in the analysis relative to the projected sudden oak death infestation levels and spread over the next 10–20 years:

- Sudden oak death treatment strategy by alternative and the Proposed RMP:
    - Treat all infestations under the No Action alternative, Alternatives C and D, and the Proposed RMP
    - No treatments under Alternative A
    - Treat all infestations outside of the Riparian Reserve under Alternative B
- Sudden oak death projected infestation zones for the next 10–20 years

The rate of the sudden oak death expansion realized from the date of first detection in 2001 through 2013 defines the boundaries of the infestation zones for the next 10–20 years. Under the status quo, technical experts anticipate the infestation area would expand by approximately 1 mile to the south, 5 miles to the east and 17 miles to the north every 10 years for the next 20 years, as it has done in the previous 10 years (Frankel and Palmieri 2014).

A team of technical experts including Ellen Goheen (U.S. Forest Service), Alan Kanaskie (Oregon Department of Forestry), and Everett M. Hansen (Department of Botany and Plant Pathology, Oregon State University) worked with the BLM to project the rate of disease expansion and infestation zones for the next 10–20 years under the alternatives and the Proposed RMP. The experts used their professional opinions, the proportion of infestation acres on BLM-administered lands in the Riparian Reserve (as described under Alternative B) compared to total infestation area on BLM-administered lands, and the principles within a sudden oak death distribution model to arrive at the projected rates of expansion and infestation levels on BLM-administered lands.

The technical experts added assumptions to facilitate the analysis after the Planning Criteria was developed. These assumptions include:

- The acres treated on BLM-administered lands in the period 2001–2013 represent the infested area for the same period.
- The area treated would expand at the same rate on BLM-administered lands in the second and third decades as it did between 2001 and 2013.
- Disease management practices on nearby non-Federal land will influence amount of disease on BLM-administered lands; sudden oak death will spread and intensify when left untreated resulting in disease intensification and spread from infected trees for several years and accelerated mortality in untreated areas.
- All infestations on other ownerships would be treated.

The analysis does not account for the following:

- Regrowth of vegetation on sites that were treated and replanted or naturally re-vegetated
- Variation in abundance of tanoak across the landscape
- Treatments that remove tanoak but leave overstory conifer and non-host hardwoods intact

Background

Non-native forest pathogens, whose introduction causes economic or environmental harm, or harm to human health, are invasive species. Sudden oak death, caused by the invasive pathogen *Phytophthora ramorum*, threatens Oregon's forest and nursery industries.

Phytophthora ramorum, a water mold (oomycete), caused high levels of tanoak and live oak mortality in California for several years before its presence in Curry County, Oregon became evident in 2001. *Phytophthora ramorum* also infects nursery stock of a wide range of host species in Europe, California, Oregon, and Washington. The European and North American mating types are not the same, which indicates that the source population for the North American infestations is not from Europe. In 2001, Oregon had several infection centers in close proximity to one another on private residential, industrial forestland, and BLM-administered lands. The original quarantine area covered 9 square miles (Goheen *et al*. 2006). By 2013, the quarantine area expanded to 264 square miles, despite aggressive coordinated education, prevention, and early detection and treatment efforts.

Phytophthora ramorum travels long distances via nursery stock and in the infected wood of some host species. For that reason, the pathogen is subject to both State (ORS 603-052-1230) and Federal (7 CFR

301.92) quarantine regulations that restrict the movement of host material from infested areas into disease-free areas. *Phytophthora ramorum* infects more than 46 host species and more than 90 associated species (USDA APHIS 2013). Regulated material includes host nursery stock and wood, logs, and lumber of identified host species. Many host species are native trees and shrubs found in forests in the decision area, including tanoak and canyon live oak. *Phytophthora ramorum* causes mortality in susceptible oak, tanoak, rhododendron, viburnum, evergreen huckleberry, and other plant species.

Phytophthora ramorum affects the stem, twigs and leaves of its host. The species spreads by both resting (chlamydospores) and swimming (zoospores) spores. Sporangia released from the canopies of infected trees travel to new host trees or the ground through the air assisted by wind and rain. Zoospores can move through water along the stems, twigs, and leaves of host plants, and some spores ultimately penetrate and infect new hosts. The spores travel in water, splash onto new susceptible host plants, and start new infections. Irrigation water from infested drainages or water sources also carries spores to new sites. Chlamydospores, which can survive periods of warmth and drought, move to new locations on infested soil, leaf, and twig litter (Goheen *et al*. 2006).

Outside of nurseries, pathologists have not detected *Phytophthora ramorum* infections on conifer species in Oregon. Pathologists believe the aggressive treatments in Oregon's forests have kept the spore levels down to a level where understory conifer species growing in infestation areas have escaped inoculation. However, in California, infestation levels are relatively high, and several species of conifers in the understory of infected oaks have become infected. The list of susceptible conifers in California includes Douglas-fir, several fir species, coast redwood, and Pacific yew. When left untreated, the disease intensifies as the infected hosts produce more spores for several years. In Oregon, where the disease has been aggressively treated since 2001, the spore loads have not reached high levels.

Early in 2013, the State of Oregon revised the quarantine rule to establish a Generally Infested Area where landowners are no longer required to try to eradicate infestations. The BLM and other Federal agencies have continued aggressive treatments within the Generally Infested Area (Frankel and Palmieri 2014). Pathologists do not know if higher spore levels in untreated areas in Oregon will lead to infections on understory conifers, such as in California, but pathologists do know the spore loads will increase. With higher spore loads come more opportunities for the spores to infect more hosts and to move off site to new locations.

The Coos Bay District has been coordinating treatment activities with adjoining landowners, the Oregon Department of Forestry, and the U.S. Forest Service to control sudden oak death infection sites in the state-designated quarantine area since 2001. After pathologists found new infestations north of the established quarantine area in 2013, the Animal and Plant Health Inspection Service (APHIS) and the State of Oregon expanded the quarantine area in Curry County to 264 square miles (USDA APHIS 2013). Pathologists have found no new infestations from the movement of nursery stock outside of Oregon's quarantine area, which suggests the quarantine program established in 2002 has been effective (USDA APHIS 2014).

The Coos Bay District has been using an integrated pest management approach to control all detected sudden oak death infestations. Treatments have included cutting, piling, and applying herbicides to host species within 300 feet of infected trees. Treatments have typically included broadcast or pile burning of cut material. Pathologists from the Oregon Department of Forestry and the U.S. Forest Service have performed follow-up surveys until the area has been determined to be disease-free for two successive years. If the disease is still present, the area has been retreated. The Coos Bay District has been planting treatment areas with Douglas-fir within two years of treatment.

Affected Environment

In 2001, Oregon had several infection centers in close proximity to one another on private residential, industrial forestland and on BLM-administered lands within the planning area. All of the western Oregon districts are at risk for sudden oak death infestations (Václavík *et al.* 2010), but Coos Bay District is the only one currently with known sites.

Sudden oak death infestation Zone 1 represents the broader infested area over the period of 2001 through 2013 (**Figure 3-102**). The Coos Bay District manages over 10,000 acres (almost 15 percent) of the total area within Zone 1. *Phytophthora ramorum* infests almost 1,000 acres (10 percent) of the Coos Bay District administered lands in Zone 1. Because the pathogen thrives in wet environments, trees closer to streams have a higher infection rate than those in upland habitats. More than 25 percent of the infested area is either within one site-potential tree height of perennial and fish-bearing streams or within 50 feet on non-fish-bearing intermittent streams, or both.

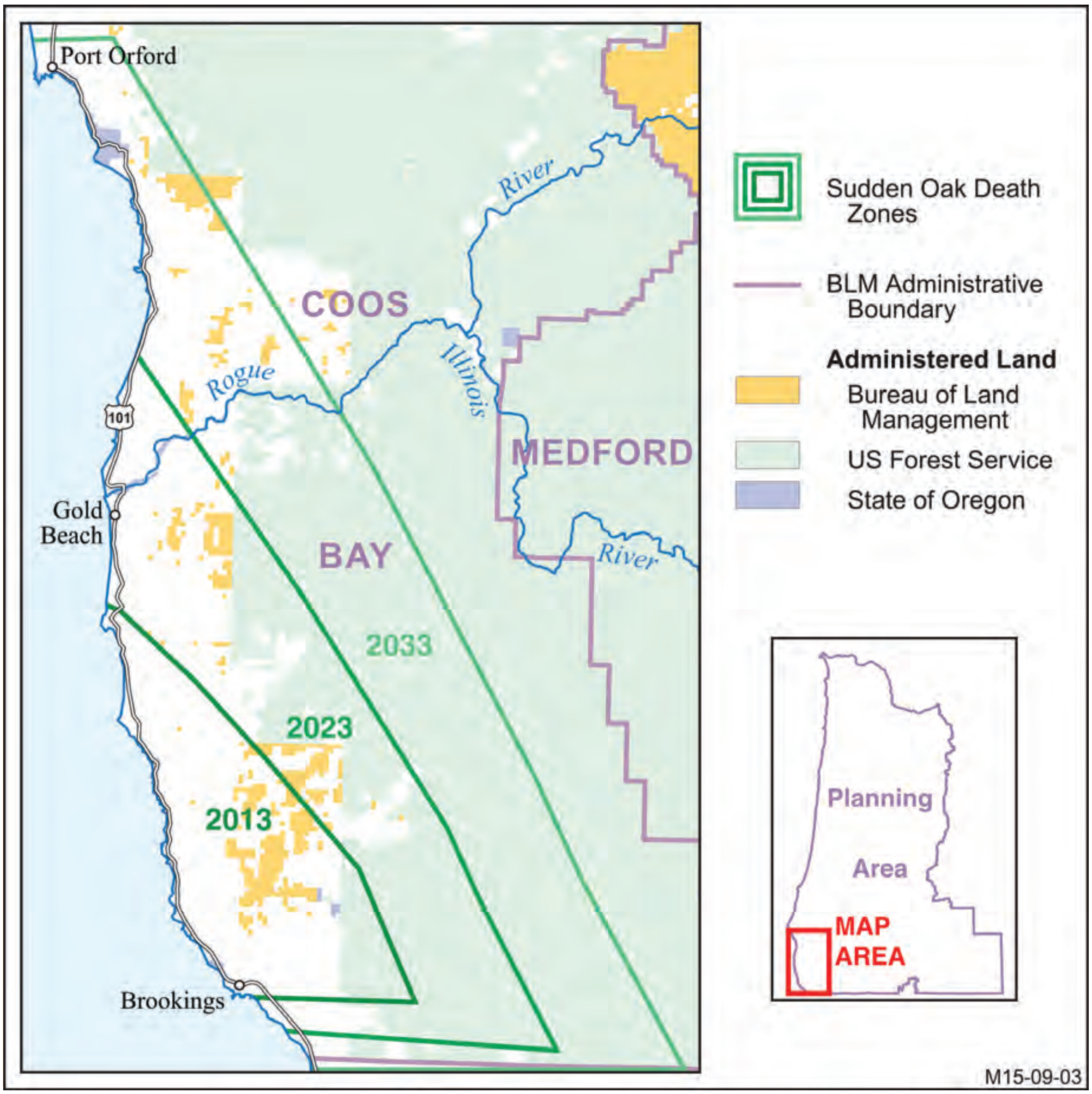

Figure 3-102. Sudden oak death infestation zones as of 2013 and expected expansion zones by 2023 and 2033

Between 2001 and 2013, the BLM implemented integrated pest management treatments to control sudden oak death on 959 acres. Most areas were treated using more than one method. In 2013, the Coos Bay District treated 46 acres by cutting and piling, over 160 acres by pile burning, and 24 acres by herbicide treatments. No retreatments occurred in 2013. The BLM's cumulative treatments between 2001 and 2013 include more than 830 acres of cutting and piling, almost 700 acres of pile burning, 17 acres of broadcast burns, and almost 80 acres of retreatments.

Environmental Consequences

The intensity and area of sudden oak death infestations would vary under the different treatment strategies over time. See **Table 3-10** for sudden oak death infestations levels by infestation zone over the next 10 and 20 years for each of the alternatives and the Proposed RMP.

Table 3-79. Sudden oak death infestations levels by infestation zone over the next 10 and 20 years

Infestation Zone (Time Frame)	Alt. A (Acres)	Alt. B (Acres)	No Action, Alt. C and D (Acres)	PRMP (Acres)
Zone 1 (2014–2023)	10,013	4,440	1,918	1,918
Zone 2 (2014–2023)	4,893	2,111	780	780
Zone 3 (2014–2023)	305	39	-	-
Total all zones (2014–2023)	**15,211**	**6,590**	**2,698**	**2,698**
Zone 1 (2024–2033)	10,013	5,874	2,877	2,877
Zone 2 (2024–2033)	8,143	3,978	1,560	1,560
Zone 3 (2024–2033)	3,050	1,429	584	584
Total all zones (2024–2033)	**21,206**	**11,281**	**5,021**	**5,021**

Under Alternative A, the BLM would not treat sudden oak death infestations, which would result in the most intense and largest levels of infestations on BLM-administered lands. Left untreated, infected trees would produce and release spores over several years, allowing rapid and uncontrolled infestation on BLM-administered lands. The highest levels of tanoak mortality would occur under Alternative A. In this alternative, by the end of the first decade, sudden oak death infestations would occupy all BLM-administered lands in Zone 1 (10,013 acres). Infestations would occupy all of the BLM-administered lands within the quarantine area and a quarter of the remaining BLM-administered lands within Zone 2. Sudden oak death infestations would occupy 1 percent (305 acres) of the BLM-administered lands in Zone 3 within the first 10 years. Sudden oak death would infest 87 percent (21,206 acres) of BLM-administered lands in the cumulative three-zone area by the end of the second decade under Alternative A.

Under Alternative B, the BLM would not implement treatments within the Riparian Reserve, but would treat all detected infestations outside of the Riparian Reserve. Sudden oak death would spread and intensify from the untreated areas in the Riparian Reserve, but Alternative B would result in a smaller increase in infected acres than Alternative A. Spores produced within the Riparian Reserve from untreated trees would spread to both additional hosts within and outside of the Riparian Reserve for several years. Ultimately, more tanoak would die from this intermediate treatment strategy under Alternative B than would die under the aggressive strategy prescribed under the No Action, Alternatives C and D, and the Proposed RMP. By the end of the first decade, the infestation would have increased in Zone 1 and entered

Zones 2 and 3. Cumulatively, the infestation would cover almost 6,590 acres. By the end of the second decade, the infestation would have increased in all zones, with a cumulative total infestation covering 11,281 acres or 47 percent of BLM-administered lands in the cumulative three-zone area.

Under Alternatives A and B, sudden oak death infestations would occupy 100 percent of the Riparian Reserve area in Zone 2 and almost 90 percent in the cumulative three-zone area by 2033.

The lowest amount of sudden oak death infestation intensification and increase in infested acres would occur under the No Action alternative, Alternatives C and D, and the Proposed RMP, because the BLM would treat all detected infestations. The infestation would still increase under this treatment strategy, as it has over the past 10 years. Spore loads would have less opportunity than under Alternatives A and B to increase and spread to new hosts due to rapid response treatments. By the end of the first decade, the infestation would increase in both Zones 1 and 2 and would total 2,698 acres. By the end of the second decade, the infestation would enter Zone 3 and the cumulative total for all zones would be 5,021 acres or 21 percent of BLM-administered lands in cumulative three-zone area. Under the No Action alternative, Alternatives C and D, and the Proposed RMP, 25 percent of the Riparian Reserve area in Zone 2 and 27 percent of the Riparian Reserve area in the cumulative three-zone area would have sudden oak death infestations. Under the No Action alternative, Alternatives C and D, and the Proposed RMP, the Riparian Reserve in Zone 3 would still be free of infestations by 2023.

The acreage of sudden oak death treatments under Alternative B would be substantially greater than under the No Action alternative, Alternatives C and D, and the Proposed RMP. Even though Alternative B would not apply treatments within the Riparian Reserve, the greater acreage of infestation under Alternative B would result in more acres of treatment than under the No Action alternative, Alternatives C and D, and the Proposed RMP. Decadal initial sudden oak death treatments under Alternative B would be almost two times higher than the expected treatment levels under the No Action alternative, Alternatives C and D, and the Proposed RMP over the next 10 years, and one and a half times greater in the second 10 years (**Table 3-80**).

Table 3-80. Initial sudden oak death treatment levels over the next 10 and 20 years

Sudden Oak Death Decadal Treatment Periods	Alt. A (Acres)	Alt. B (Acres)	No Action, Alt. C and D (Acres)	PRMP (Acres)
Initial treatments for 2014–2023	-	3,292	1,777	1,777
Initial treatments for 2024–2033	-	3,854	2,536	2,536
Cumulative Treatments	**-**	**7,146**	**4,313**	**4,313**

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Lands and Realty

Key Points

- Under the Proposed RMP and all alternatives, BLM-administered lands would be generally available for rights-of-way. Alternative D would most constrain the BLM's ability to grant rights-of-way compared to the current conditions.

Issue 1

How would the alternatives affect land tenure in western Oregon?

Summary of Notable Changes from the Draft RMP/EIS

This analysis of right-of-way avoidance areas and exclusion areas does not present acreage by specific criteria (e.g., ACECs and Recreation Management Areas). These specific criteria have substantial geographic overlap, creating confusion and errors related to the acreage associated with each specific criterion. Instead, the BLM identifies the specific criteria and presents the total acreage for avoidance areas and exclusion areas for all alternatives and the Proposed RMP.

Summary of Analytical Methods

The BLM identified the number of acres in each alternative and the Proposed RMP that would be included in each land tenure zone and considered the potential impact on the BLM's land holdings in western Oregon taking into account recent trends in land acquisition, exchange, and disposal.

Background

Through RMP-level decisions, the BLM places all of BLM-administered lands into one of the following three Land Tenure Zones:

- Lands in Zone 1 are retained under BLM administration
- Lands in Zone 2 are available for exchange to enhance public resource values, improve management capabilities, or reduce the potential for land use conflict
- Lands in Zone 3 are available for disposal using appropriate disposal mechanisms

Across the action alternatives and the Proposed RMP, the BLM used the following criteria to determine land tenure zones:

- Zone 1 lands would include:
    - Designated and Suitable Wild and Scenic River corridors
    - Wilderness Areas
    - Wilderness Study Areas
    - National Trail management corridors
    - Areas of Critical Environmental Concern (including Research Natural Areas and Outstanding Natural Areas)
    - Congressionally designated Outstanding Natural Areas
    - Lands acquired with Land and Water Conservation Funds

In addition to the criteria above, the Proposed RMP also would include District-Designated Reserve – Lands Managed for their Wilderness Characteristics in Zone 1.

- Zone 2 lands would include all BLM-administered lands not listed in the descriptions of both Zone 1 and Zone 3 lands.

- Zone 3 lands would include:
    - Lands that are either not practical to manage or are uneconomical to manage because of their intermingled location and non-suitability for management by another Federal agency
    - Survey hiatuses – an area between two surveys where the record describes them to have one or more common boundary lines with no omission
    - Unintentional encroachments – an unintended unlawful and adverse intrusion within the boundary of BLM property where the BLM has discretion to determine if the lands are suitable for disposal

Appendix K provides information on criteria for specific land tenure adjustments, including specific acquisition, exchange, and disposal criteria.

Affected Environment

Since the 1995 RMP, the BLM has acquired 8,962 acres of lands by purchase, which encompass 0.36 percent of lands within the decision area. Ongoing land acquisition projects include the Sandy River/ National Historical Oregon Trail in the Salem District.

The majority of the decision area is currently within Zone 2 (suitable for exchange). **Table 3-81** presents the land tenure acreages for the alternatives and the Proposed RMP. Since the 1995 RMPs, the BLM has made only limited use of land exchanges (22,390 acres acquired; 7,367 acres disposed). Federal legislation rather than discretionary agency action directed most land exchanges and transfer activities within the decision area.

The 1995 RMP designated 18,266 acres (approximately 0.7 percent of the decision area) as Zone 3 (i.e., suitable for disposal). The BLM has sold 3,798 acres of Zone 3 lands since 1995. The BLM sold these lands primarily to resolve unintentional encroachment cases where an individual had unintentionally built a development on BLM-administered lands. The BLM does not sell lands identified for disposal if project-level reviews show conflicts with the land tenure adjustment criteria found in **Appendix K**.

Environmental Consequences

The only variation among the action alternatives and the Proposed RMP comes from the arrangement and acreage of Areas of Critical Environmental Concern. The adjustment in acres for Areas of Critical Environmental Concern affects both Zone 1 and Zone 2 lands, (i.e., as more acres are proposed for Areas of Critical Environmental Concern, the difference of acres is reflected in Zone 2). Zone 3 acreage does not adjust per alternative or the Proposed RMP (**Table 3-81**). **Appendix K** lists the specific lands that would be in Land Tenure Zone 3.

Table 3-81. Land tenure zone within the decision area by alternative and the Proposed RMP

Land Tenure Zone	No Action (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	Alt. D (Acres)	PRMP (Acres)
Zone 1 – Lands Suitable for Retention	188,249	199,582	193,019	191,696	199,376	219,953
Zone 2 – Lands Suitable for Exchange	2,286,869	2,275,536	2,282,099	2,283,422	2,275,742	2,255,243
Zone 3 – Lands Suitable for Disposal	18,537	18,537	18,537	18,537	18,537	18,459

For the Proposed RMP, lands in Zone 1 are greater than in the action alternatives largely due to the inclusion of District-Designated Reserve – Lands Managed for their Wilderness Characteristics. The acreage of lands in Zone 3 is slightly less in the Proposed RMP than the action alternatives due to updated information on which lands would meet the criteria described above. The acreage difference between the action alternatives and the Proposed RMP would be approximately 1.2 percent of the planning area. This variation in acreage would have a negligible effect on the BLM's ability to exchange lands.

Issue 2

How would the alternatives affect the availability of BLM-administered lands for rights-of-way in western Oregon?

Summary of Analytical Methods

The BLM identified the number of acres in each alternative and the Proposed RMP that would be designated as right-of-way avoidance and exclusion areas. The BLM then considered how these designations would affect the availability of rights-of-way on BLM-administered lands in the decision area.

Background

Through RMP-level decisions, the BLM may identify certain BLM-administered lands as right-of-way avoidance or exclusion areas.

- Right-of-way avoidance areas – Areas with sensitive resource values where the BLM will grant future rights-of-way if the BLM determines that the right-of-way proposals are compatible with the protection of the values for which the land use was designated, or when no feasible alternative route or designated right-of-way corridor is available as applicable with BLM laws and policy.
- Right-of-way exclusion areas – The BLM would not grant future rights-of-way except when mandated by law.

Upon completion of this RMP revision, the BLM would display right-of-way avoidance areas and right-of-way exclusion areas on map(s) accompanying the approved RMP.

In the action alternatives and the proposed RMP, the BLM used the following criteria to identify BLM-administered lands that it would identify as right-of-way avoidance areas:

- Areas of Critical Environmental Concern (including Research Natural Areas and Outstanding Natural Areas)
- Recreation Management Areas (Special and Extensive)
- Wilderness Study Areas

- Designated and Suitable Wild and Scenic Rivers classified as Scenic or Recreational rivers
- Visual Resource Management Class II that is not included in right-of-way exclusion areas

The BLM used the following criteria to identify BLM-administered lands that it would identify as right-of-way exclusion areas:

- Wilderness Areas
- District-Designated Reserve – Lands Managed for their Wilderness Characteristics
- Designated and Suitable Wild and Scenic Rivers classified as Wild rivers
- Visual Resource Management Class I Areas

The Proposed RMP used the same criteria with one exception: the Proposed RMP included Wilderness Study Areas in right-of-way exclusion areas instead of right-of-way avoidance areas.

The checkerboard land ownership pattern of O&C lands generates most of the need to cross public lands in order to provide access and utilities to intermingled private lands. The BLM generally does not know the location and nature of such proposals until the BLM receives an application.

Currently, most rights-of-way the BLM grants over BLM-administered lands in western Oregon are for access roads. In most cases, other linear rights-of-way (for such uses as domestic or irrigation waterlines, or utility lines for servicing residences) are authorized within or adjacent to existing road-clearing limits. In addition, the BLM has authorized other activities on public land using permits, easements, or leases, 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
- Other miscellaneous short-term activities

Affected Environment

BLM-administered lands are currently generally available for needed rights-of-way where consistent with local public resource values. Under the 1995 RMPs, the BLM authorized numerous types of rights-of-way, including rights-of-way for county roads, private access roads, power transmission lines, communication sites, and bicycle trails. New right-of-way proposals across public lands are likely to continue in the future.

Of the current 6,254 authorized rights-of-way, 78 percent are for roads. In addition, there are 83 communication sites on BLM-administered lands within the planning area and **Appendix K** includes the inventory of existing communication sites.

Major existing right-of-way corridors within the planning area are shown in **Figure 3-103**. Existing facilities located within right-of-way corridors include Bonneville Power Administration and private electric transmission lines, pipelines, fiber-optic lines, and transportation infrastructure.

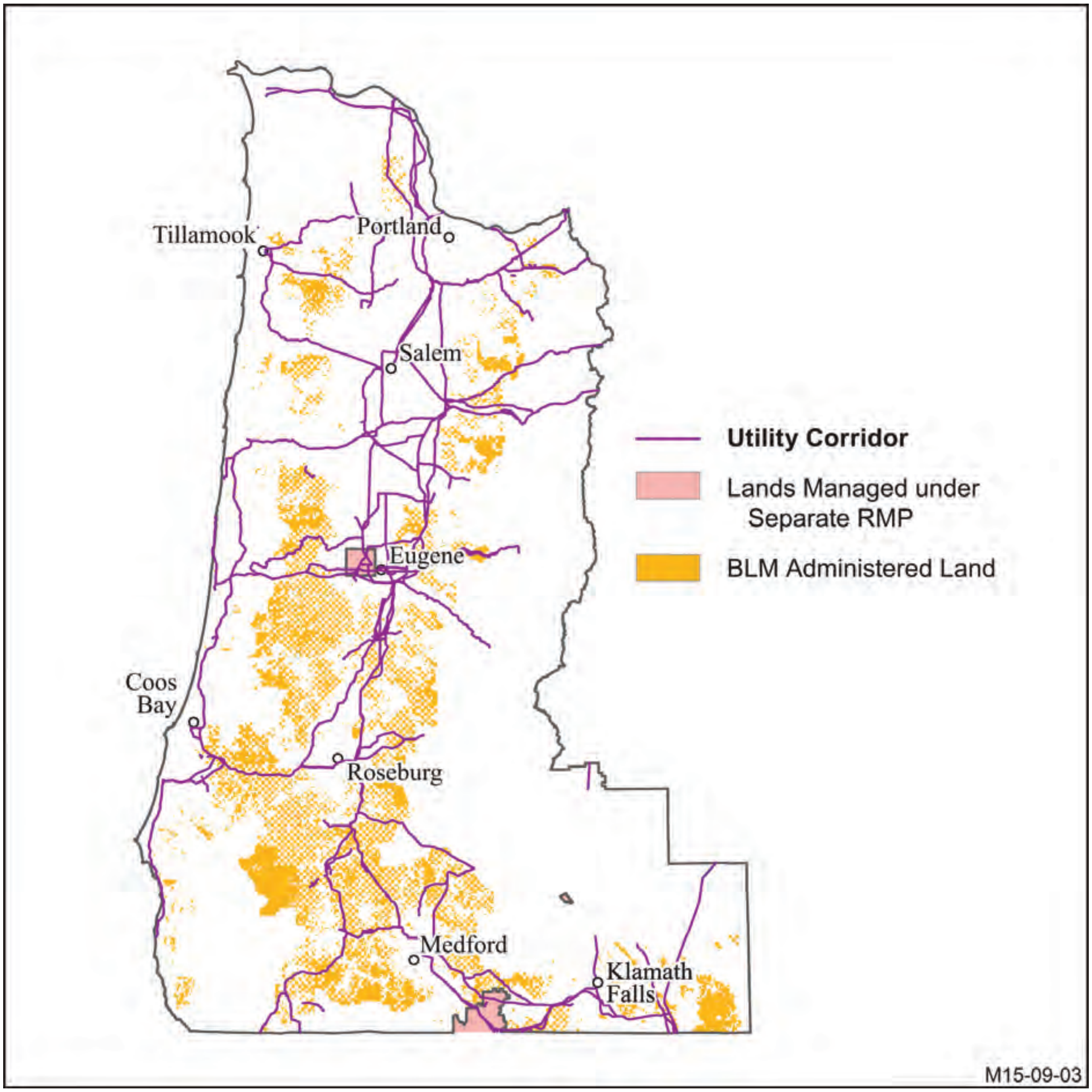

Figure 3-103. Utility corridors

Pacific Connector Pipeline Project

The Federal Energy Regulatory Commission released the Jordan Cove Energy and Pacific Connector Pipeline Project Draft EIS in November 2014 (FERC 2014) and the Final EIS in September 2015 (FERC 2015). The Pacific Connector Gas Pipeline project would include an approximately 232-mile-long, 36-inch-diameter underground natural gas pipeline extending from a proposed Jordan Cove Energy liquefied natural gas export terminal in Coos Bay, Oregon, to an interconnection with the existing interstate natural gas systems of Ruby Pipeline LLC and Gas Transmission Northwest LLC near Malin, Oregon. The proposed route extends across 40 miles (approximately 800 acres) of BLM-administered lands in the Coos Bay, Medford, Lakeview, and Roseburg Districts. Implementation of the Pacific Connector Pipeline would require a right-of-way grant from the BLM to cross BLM-administered lands. The FERC-prepared Final EIS considered amendments to the 1995 RMPs for Coos Bay, Medford, Roseburg, and the Klamath Falls Field Office where the proposed action would not conform to those RMPs. Approximately 13 acres of the proposed route of the pipeline passes through a right-of-way avoidance area within the Klamath Falls Field Office of the Lakeview District within the planning area and does not cross any right-of-way exclusion areas.

At this time, the Jordan Cove Energy and Pacific Connector Pipeline Project is no longer a reasonably foreseeable future action, because the FERC denied the certificate for construction of the Jordan Cove Energy and Pacific Connector Pipeline Project on March 11, 2016 (*Jordan Cove Energy Project, L.P. and Pacific Connector Gas Pipeline, L.P.*, 154 FERC ¶ 61,190 (2016)).

Environmental Consequences

The analysis shows that right-of-way avoidance area acres range from Alternative A with the least avoidance areas (179,436 acres) to Alternative D with the most avoidance acres (871,713 acres) (**Table 3-82).** While having fewer acres in avoidance areas than Alternative D, Alternative C would have more than double the acres in the No Action alternative. Alternative A has fewer acres than the No Action alternative. The large acreage difference is primarily due to differences in the acreage of Recreation Management Areas (which are designated in the action alternatives and Proposed RMP as right-of-way avoidance areas; see the Background section above), where the range of acreage is from 8,217 acres to 666,862 acres. With the large acreage of avoidance areas, the BLM's ability to grant rights-of-way under Alternative D, and to a slightly lesser degree under Alternative C, would be constrained relative to the current conditions. The Proposed RMP acres are more than the No Action and Alternatives A and B, and less than Alternatives C and D.

Table 3-82. Right-of-way avoidance and exclusion areas in the Decision Area

	No Action (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	Alt. D (Acres)	PRMP (Acres)
Avoidance Acres*	243,928	179,436	326,510	575,444	871,713	456,801
Exclusion Areas	43,590	130,597	93,274	93,274	42,568	107,790

* Right-of-way avoidance total acreage is not a direct sum of the individual criteria acres due to criteria that overlap geographically. Areas that overlap with right-of-way exclusion areas are subtracted from the sum of the total avoidance acres because right-of-way exclusion is more restrictive than right-of-way avoidance.

The No Action alternative would have the fewest acres in right-of-way exclusion areas (42,382 acres) (**Table 3-82**) and Alternative A would have the most (129,389 acres). This acreage difference of 87,007 acres accounts for approximately 3.49 percent of the total decision area. The minimal variation in acreage for right-of-way exclusion areas would have little effect on the BLM's ability to grant rights-of-way on BLM-administered lands. The Proposed RMP acres are less than Alternative A and more than the other alternatives.

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Lands with Wilderness Characteristics

Key Points

- Alternative A and the Proposed RMP would provide the largest protection of lands with wilderness characteristics within the decision area.
- Alternatives B and C would provide protection of an intermediate amount of lands with wilderness characteristics within the decision area.
- The No Action alternative and Alternative D would provide no protection of lands with wilderness characteristics within the decision area.

Summary of Notable Changes from the Draft RMP/EIS

The BLM refined the calculation of acres of identified lands with wilderness characteristics. The BLM also corrected spatial assignment errors at the unit level in the Draft RMP/EIS analysis of the action alternatives, altering the acreage of lands that would be managed for wilderness characteristics for Alternatives A, B, and C.

Issue 1

Issue 1: How would the alternatives affect BLM-administered lands with identified wilderness characteristics?

Summary of Analytical Methods

This section analyzes the environmental effects to lands with wilderness characteristics outside of designated Wilderness Areas and existing Wilderness Study Areas[76] within the decision area.

The BLM analyzed the extent to which each alternative or the Proposed RMP would protect or degrade identified lands with wilderness characteristics (i.e., size, naturalness, and either outstanding opportunities for solitude or primitive and unconfined recreation). The BLM did so by comparing the acres of identified lands with wilderness characteristics that the BLM would manage for their wilderness characteristics under each alternative and the Proposed RMP, as well as considering the acres not managed for identified wilderness characteristics to which the BLM would apply management actions likely to degrade the identified wilderness characteristics.

Managing for wilderness characteristics is inherently incompatible with sustained-yield timber harvest. As explained in Chapter 1, the BLM would not include managing O&C lands for wilderness characteristics in areas dedicated to sustained-yield timber production. While timber harvest practices would vary among alternatives and the Proposed RMP, all lands within the Harvest Land Base would eventually be subject to sustained-yield timber harvest, which is incompatible with managing for wilderness characteristics.

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[76] Designated Wilderness Areas and existing Wilderness Study Areas would continue to be managed to protect their wilderness characteristics under all alternatives and the Proposed RMP. As a result, the alternatives and the Proposed RMP would not differ in their effects on designated Wilderness Areas and existing Wilderness Study Areas.

In this analysis, the BLM assumed that wilderness characteristics would persist where the BLM would manage lands with wilderness characteristics for their wilderness characteristics. Under Alternatives A, B, and C, and the Proposed RMP, the BLM would allocate areas to be managed for their wilderness characteristics to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics.

The BLM also assumed that wilderness characteristics would be lost over time where the BLM would manage lands with wilderness characteristics for other resources or land uses (e.g., sustained-yield timber production and incompatible recreation). The BLM assumed that any management action that would allow surface-disturbing activities that would degrade naturalness would cause adverse effects to wilderness characteristics.

Where wildfire threatens safety of property, wildfire response could degrade wilderness characteristics, even in the District-Designated Reserve – Lands Managed for their Wilderness Characteristics. However, there is no accurate way to predict the exact location and timing of wildfires or the specific wildfire response. Therefore, there is no reasonable basis on which to identify a difference in the effect of wildfire response under the alternatives or the Proposed RMP on wilderness characteristics at this scale of analysis.

Illegal activities, such as illegal motorized travel, could degrade wilderness characteristics, even in the District-Designated Reserve – Lands Managed for their Wilderness Characteristics. Although the BLM has some site-specific and anecdotal information about illegal public motorized travel activities, the BLM does not have a basis for predicting the location or effects of any widespread or systematic illegal public motorized travel activities. In addition, much of the decision area has physical limitations to potential illegal public motorized travel activities, including dense vegetation, steep slopes, and locked gates. Terrain, vegetation, and a greater amount of open spaces in most of the interior/south can lead to degradation and erosion in a greater proportion than most of the coastal/north where vegetation is denser and terrain is steeper. However, the BLM lacks a basis for characterizing current illegal public motorized travel activities or forecasting such potential illegal public motorized travel activities in the future under any of the alternatives or the Proposed RMP, at this scale of analysis. Therefore, in this analysis, the BLM assumed that members of the public participating in motorized travel recreation would operate vehicles consistent with BLM decisions about public motorized travel opportunities.

The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which is incorporated here by reference (USDI BLM 2014, pp. 125–126).

Background

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 FLPMA. However, the BLM retained the authority under Sections 201 and 202 of the FLPMA to inventory wilderness characteristics and to consider such information during land use planning.

As required under the FLPMA and current BLM policy, the BLM updated its inventories of lands with wilderness characteristics for the decision area in 2013. This update included BLM-administered lands contained in citizens' wilderness proposals. The impetus for this update was the need for accurate information for this RMP revision. In conducting these inventories, the BLM followed the guidance provided in BLM Manual 6310 – Conducting Wilderness Characteristics Inventory on BLM Lands (USDI BLM 2012). Those inventories are incorporated here by reference and are available at http://www.blm.gov/or/plans/rmpswesternoregon/lwci.php.

The BLM conducted the inventories using the criteria from Section 2(c) of the Wilderness Act to determine the presence or absence of wilderness characteristics: sufficient size of a roadless area, naturalness, and outstanding opportunities for solitude or primitive and unconfined recreation. The BLM received proposals from the public regarding lands with wilderness characteristics, but these proposals did not alter the results of the BLM inventory. The BLM received several proposals for areas that the BLM determined do not to meet the minimum size criteria. The Medford District received a detailed citizen proposal for the Green Springs Mountain inventory unit, totaling 3,077 acres. The BLM reviewed this information and found that this unit did not meet the minimum size requirement, consistent with BLM Manual 6310 – Conducting Wilderness Characteristics Inventory on BLM Lands, Section .06 C.2.A (USDI BLM 2012).

As part of this inventory and consistent with Section 2(c) of the Wilderness Act, the BLM evaluated lands adjacent to other Federal ownerships. Where these adjacent lands contained wilderness characteristics, the BLM included these acres in determining if BLM-lands would meet the minimum size requirement. All inventoried lands with wilderness characteristics identified on the Coos Bay and Salem Districts are dependent on adjacent Forest Service lands to meet the minimum size requirement.

Under Alternatives A, B, and C, and the Proposed RMP, the BLM would allocate areas to be managed for their wilderness characteristics to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics. In the design of Alternatives A, B, and C, and the Proposed RMP, if management of a portion of an area identified as having wilderness characteristics for other resources or land uses would result in an area of less than 5,000 acres that could be managed for wilderness characteristics, none of the area would be allocated to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics. However, if management of a portion of an area identified as having wilderness characteristics for other resources or land uses would result an area of more than 5,000 acres that could be managed for wilderness characteristics, the remaining area would be allocated to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics.

In Alternative A and the Proposed RMP, the BLM would allocate to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics all identified lands with wilderness characteristics that are not within the Harvest Land Base on O&C lands and meet the minimum size requirement. In Alternatives B and C, the BLM would allocate to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics all identified lands with wilderness characteristics that are outside of the Harvest Land Base on O&C lands, are outside of Recreation Management Areas with potentially non-compatible recreation opportunities (motorized and mechanized uses), and meet the minimum size requirement. In Alternative D, the BLM would not allocate any lands to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics and thus would not protect any identified lands with wilderness characteristics. The 1995 RMPs did not identify lands with wilderness characteristics and did not direct any protection of lands with wilderness characteristics. Therefore, the No Action alternative would not protect any identified lands with wilderness characteristics.

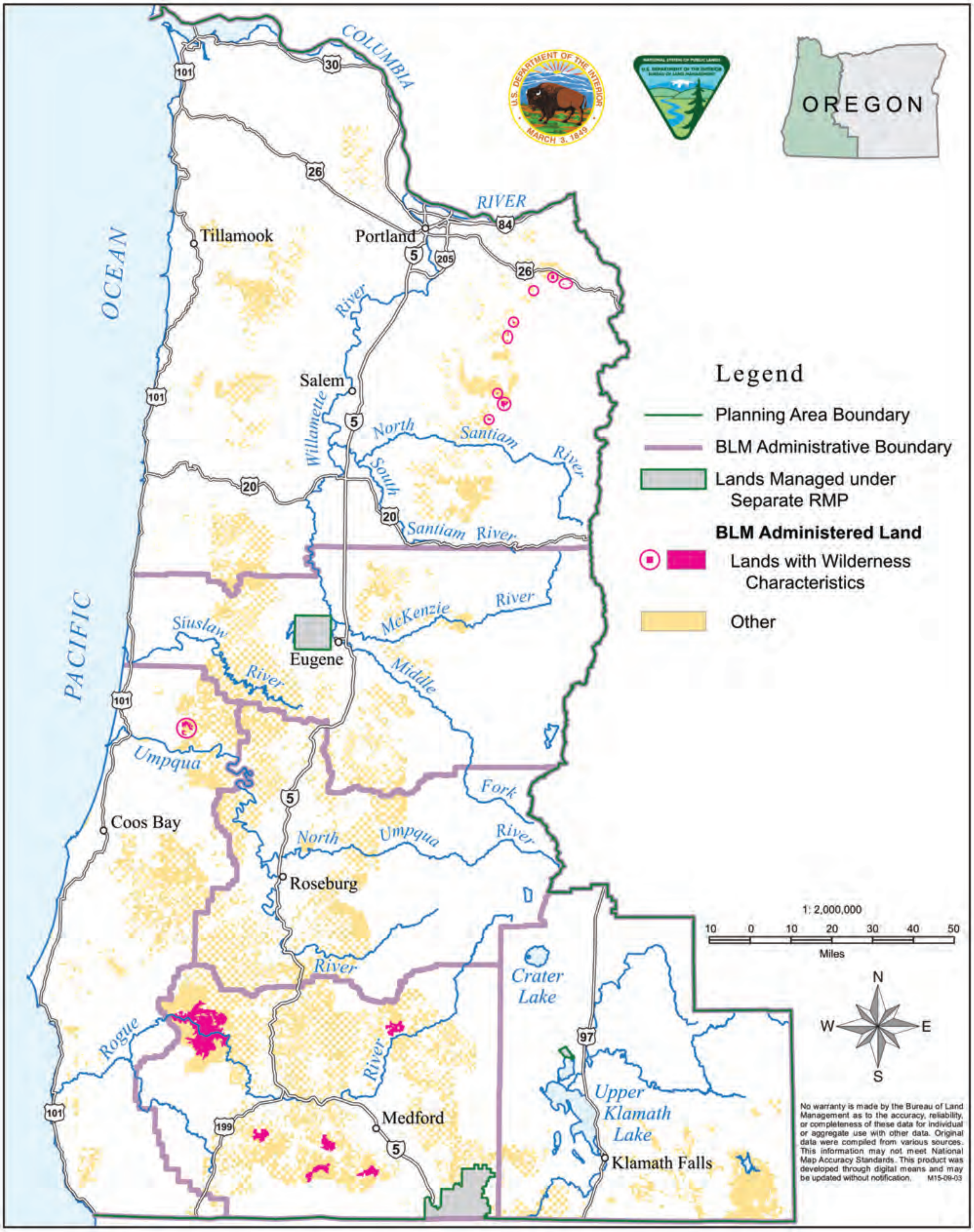
Affected Environment

Through inventories, the BLM identified 91,003 acres of lands with wilderness characteristics in the Coos Bay, Medford, and Salem Districts. Inventories did not identify any lands with wilderness characteristics in the Eugene and Roseburg Districts or the Klamath Falls Field Office.

The Coos Bay District inventory found one area of 2,473 acres that possesses wilderness characteristics, refining the area from their 2006 inventory updates. The interdisciplinary review by the BLM concluded that these acres of the Wasson Creek unit remain valid in terms of relevance and supporting rationale. This area on the Coos Bay District relies on adjacent U.S. Forest Service lands containing identified wilderness characteristics to meet the size criterion. The Medford District inventory found seven areas that possess wilderness characteristics, totaling 85,899 acres. The Salem District inventory found 4 areas, including 9 sub-units that possess wilderness characteristics, resulting in a total of 2,631 acres. All areas in the Salem District rely on adjacent designated Wilderness on BLM-administered lands or adjacent areas on other Federal lands containing wilderness characteristics to meet the size criterion. **Table 3-83** lists and **Map 3-4** displays the areas with wilderness characteristics identified by the BLM through inventories.

Table 3-83. BLM-administered lands with wilderness characteristics in the decision area

District/ Field Office	Sub-unit (Name)	Identified BLM-administered Lands (Acres)
Coos Bay		
Wasson Creek	-	2,473
Eugene		
No lands were found to possess wilderness characteristics		
Klamath Falls		
No lands were found to possess with wilderness characteristics		
Medford		
Berry Creek	-	6,254
Burton Nine Mile	-	6,103
Dakubetede	-	5,099
Round Top Mountain	-	5,295
Wellington	-	5,712
Whiskey Creek	-	6,187
Wild Rogue	-	51,249
Roseburg		
No lands were found to possess wilderness characteristics		
Salem		
Bull of the Woods/Opal Creek Additions	Nasty Rock	1,197
Bull of the Woods/Opal Creek Additions	Evans Mountain	280
Table Rock Wilderness Additions	Table Rock	95
Salmon Huckleberry Additions	Boulder Creek	506
Salmon Huckleberry Additions	Eagle River	14
Salmon Huckleberry Additions	Salmon River	119
Clackamas Wilderness/South Fork Clackamas River	Memaloose Creek	200
Clackamas Wilderness/South Fork Clackamas River	South Fork Clackamas #1	178
Clackamas Wilderness/South Fork Clackamas River	South Fork Clackamas #2	42
	Totals	**91,003**



Map 3-4: Lands with Wilderness Characteristics within the Decision Area

Environmental Consequences

The No Action alternative would not protect any identified lands with wilderness characteristics. Management actions would degrade wilderness characteristics over time, and, eventually, wilderness characteristics would be lost in all 91,003 acres of identified lands with wilderness characteristics.

The action alternatives and the Proposed RMP vary in the acreage of identified lands with wilderness characteristics that would be allocated to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics. **Table 3-84** and **Figure 3-104** show the acres of identified lands with wilderness characteristics that the BLM would allocate to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics.

Table 3-84. Inventoried lands with wilderness characteristics within the decision area allocated to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics

District	Unit Name	Identified BLM-administered Lands (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	Alt. D (Acres)	PRMP (Acres)
Coos Bay	Wasson Creek	2,473	2,473	2,473	2,472	-	2,473
Medford	Berry Creek	6,254	6,058	5,160	5,468	-	5,288
	Burton Nine Mile	6,103	5,949	6,103	-*	-	6,103
	Dakubetede	5,099	-*	-*	-*	-	-*
	Round Top Mountain	5,295	5,295	5,295	-*	-	5,295
	Wellington	5,712	-*	-*	-*	-	-*
	Whiskey Creek	6,187	6,187	6,187	6,187	-	6,187
	Wild Rogue	51,249	51,214	51,249	51,249	-	51,246
Salem	Bull of the Woods/Opal Creek Additions–Nasty Rock†	1,197	1,187	-	837	-	1,185
	Bull of the Woods/Opal Creek Additions–Evans Mountain	280	250	-	142	-	234
	Table Rock Wilderness Additions	95	95	58	55	-	95
	Salmon Huckleberry Additions–Boulder Creek	506	506	-	-	-	506
	Salmon Huckleberry Additions–Eagle River	14	7	-	-	-	7
	Salmon Huckleberry Additions–Salmon River	119	119	-	119	-	119
	Clackamas Wilderness Additions–Memaloose Creek	200	169	-	163	-	169
	Clackamas Wilderness Additions–South Fork Clackamas #1	178	158	-	158	-	158
	Clackamas Wilderness Additions–South Fork Clackamas #2	42	42	-	42	-	42
	Totals	**91,003**	**79,709**	**76,525**	**66,190**	**-**	**79,107**

* The total acres of contiguous inventoried lands with wilderness characteristics remaining outside the Harvest Land Base or incompatible Recreation Management Areas would drop below 5,000 acres and would no longer meet the minimum requirements to be considered for allocation to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics.
† Bull of the Woods/Opal Creek Additions-Nasty Rock contains 8 acres of overlapping Harvest Land Base, which are also overlapping Recreation Management Areas.

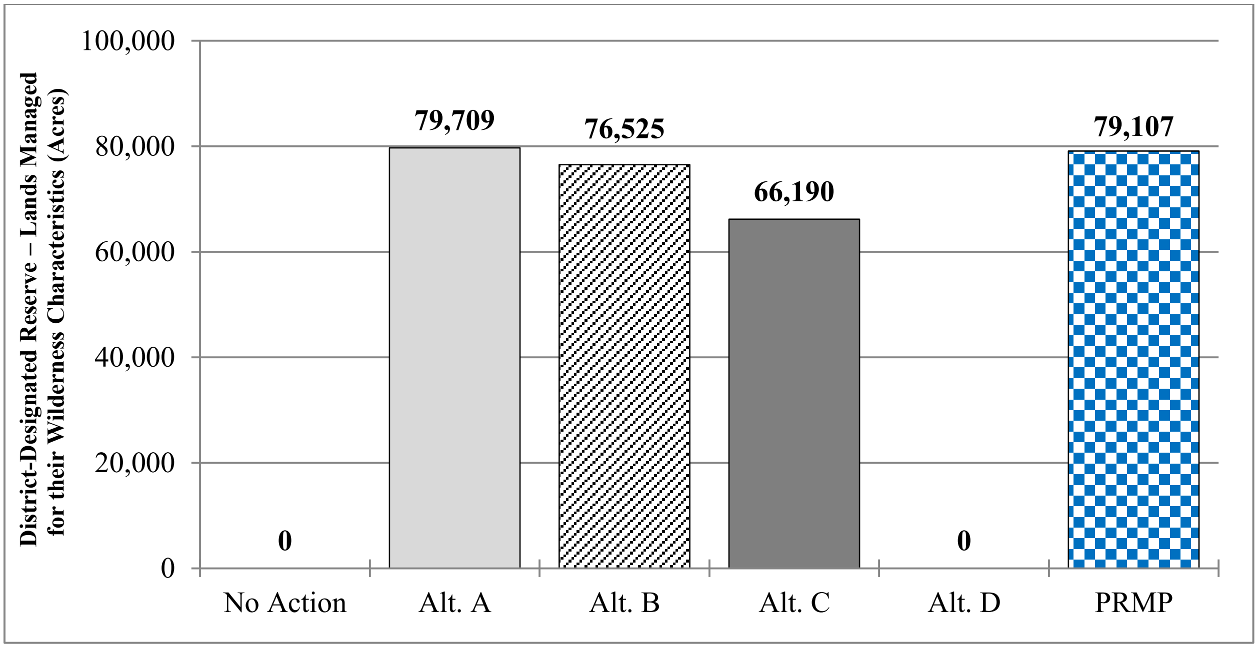


Figure 3-104. Acres of inventoried lands with wilderness characteristics allocated to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics

Under Alternatives A, B, and C, and the Proposed RMP, the BLM would manage the District-Designated Reserve – Lands Managed for their Wilderness Characteristics with a suite of measures to protect wilderness characteristics, including—

- Designating the area as *closed* to public motorized travel activities;
- Designating the area as a right-of-way exclusion area;
- Designating the area as Visual Resources Management Class II;
- Closing the area to salable mineral material disposal;
- Requiring stipulations on leasable minerals; and
- Recommending the area for withdrawal from locatable mineral entry.

Through these protective measures, the BLM would successfully protect lands with wilderness characteristics where allocated to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics.

Under Alternative A, the BLM would allocate 79,709 acres (88 percent) of identified lands with wilderness characteristics to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics. On the remaining 11,294 acres (12 percent) of identified lands with wilderness characteristics, management actions would degrade wilderness characteristics over time, and, eventually, wilderness characteristics would be lost. Identified lands with wilderness characteristics within the Dakubetede and Wellington units would drop below the 5,000-acre minimum size requirement under Alternative A, and therefore the entire units would not be allocated to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics.

Under Alternative B, the BLM would allocate 7 units, totaling 76,525 acres (84 percent) of identified lands with wilderness characteristics to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics. On the remaining 14,478 acres (16 percent) of identified lands with wilderness characteristics, management actions would degrade wilderness characteristics over time, and, eventually, wilderness characteristics would be lost. Identified lands with wilderness characteristics within the Dakubetede and Wellington units would drop below the 5,000-acre minimum size requirement under Alternative B, and therefore the entire units would not be allocated to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics.

Under Alternative C, the BLM would allocate 11 units, totaling 66,190 acres (73 percent) of identified lands with wilderness characteristics to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics. On the remaining 24,813 acres (27 percent) of identified lands with wilderness characteristics, management actions would degrade wilderness characteristics over time, and, eventually, wilderness characteristics would be lost. Identified lands with wilderness characteristics within the Burton Nine Mile, Dakubetede, Round Top Mountain, and Wellington units would drop below the 5,000-acre minimum size requirement under Alternative C, and therefore the entire units would not be allocated to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics.

Under Alternative D, the BLM would not allocate any lands to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics and therefore would not protect any identified lands with wilderness characteristics, similar to the No Action alternative. Management actions would degrade wilderness characteristics over time, and, eventually, wilderness characteristics would be lost in all 91,003 acres of identified lands with wilderness characteristics.

Under the Proposed RMP, the BLM would allocate 79,107 acres (87 percent) of identified lands with wilderness characteristics to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics. On the remaining 11,896 acres (13 percent) of identified lands with wilderness characteristics, management actions would degrade wilderness characteristics over time, and, eventually, wilderness characteristics would be lost. Identified lands with wilderness characteristics within the Dakubetede and Wellington units would drop below the 5,000-acre minimum size requirement under the Proposed RMP, and therefore the entire units would not be allocated to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics. The Proposed RMP includes additional management direction not included in Alternatives A, B, and C, which would provide specific restrictions on management actions that could adversely affect wilderness characteristics within the District-Designated Reserve – Lands Managed for their Wilderness Characteristics (see **Appendix B**).

Lands with Wilderness Characteristics in the Harvest Land Base

In lands with wilderness characteristics that would not be allocated to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics, wilderness characteristics would be lost over time. However, that loss would occur only as the BLM would implement management actions over time, and the rate and extent of implementation of management actions that would adversely affect wilderness characteristics would vary by land use allocation. Lands with wilderness characteristics that would be allocated to the Harvest Land Base would be most susceptible of all land use allocations to rapid and extensive loss of wilderness characteristics, because the BLM would implement timber harvest eventually on all lands within the Harvest Land Base and because of the inherent incompatibility of managing for wilderness characteristics and sustained-yield timber harvest. **Table 3-85** shows the acres of lands with wilderness characteristics that would be allocated to the Harvest Land Base.

Table 3-85. Inventoried BLM-administered lands with wilderness characteristics allocated to the Harvest Land Base

District	Unit Name	Identified BLM-administered Lands (Acres)	No Action[77] (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	Alt. D (Acres)	PRMP (Acres)
Coos Bay	Wasson Creek	2,473	-	-	-	1	146	-
Medford	Berry Creek	6,254	2,572	196	1,094	786	613	966
	Burton Nine Mile	6,103	5,051	154	-	-	2,522	-
	Dakubetede	5,099	4,322	222	734	769	634	455
	Round Top Mountain	5,295	-	-	-	-	25	-
	Wellington	5,712	4,530	1,425	1,837	1,923	1,520	1,540
	Whiskey Creek	6,187	2,892	-	-	-	350	-
	Wild Rogue	51,249	3,705	35	-	-	2,835	3
Salem	Bull of the Woods/Opal Creek Additions–Nasty Rock	1,197	-	10	12	112	125	12
	Bull of the Woods/Opal Creek Additions–Evans Mountain	280	222	30	47	138	11	46
	Table Rock Wilderness Additions	95	-	-	37	37	42	-
	Salmon Huckleberry Additions–Boulder Creek	506	67	-	-	93	-	-
	Salmon Huckleberry Additions–Eagle River	14	7	7	7	8	8	7
	Salmon Huckleberry Additions–Salmon River	119	-	-	-	-	-	-
	Clackamas Wilderness Additions–Memaloose Creek	200	42	31	29	37	22	31
	Clackamas Wilderness Additions–South Fork Clackamas #1	178	73	20	20	20	20	20
	Clackamas Wilderness Additions–South Fork Clackamas #2	42	20	-	-	-	-	-
Totals		**91,003**	**23,502**	**2,130**	**3,817**	**3,924**	**8,873**	**3,080**

Under the No Action alternative, the BLM would allocate 23,502 (26 percent) of identified lands with wilderness characteristics to the Harvest Land Base, more than any other alternative or the Proposed RMP. Under the Alternative A, the BLM would allocate 2,130 acres (2 percent) of identified lands with wilderness characteristics to the Harvest Land Base, less than any other alternative and the Proposed RMP. Under the Proposed RMP, the BLM would allocate 3,080 acres (3 percent) of identified lands with wilderness characteristics to the Harvest Land Base, less than any alternative except Alternative A.

[77] The Matrix and Adaptive Management Area allocations in the No Action alternative are equivalent to the Harvest Land Base in the action alternatives and Proposed RMP.

Lands with Wilderness Characteristics in Recreation Management Areas

Wilderness characteristics would be lost within Recreation Management Areas where the BLM would manage for non-compatible public motorized and mechanized recreation use. **Table 3-86** shows the acres of lands with wilderness characteristics that would be in the Recreation Management Areas where the BLM would manage for non-compatible motorized and mechanized recreation use. These acreages overlap to some extent with the acreages allocated to the Harvest Land Base. That is, some lands with wilderness characteristics would be both allocated to the Harvest Land Base and would be within Recreation Management Areas where the BLM would manage for non-compatible public motorized and mechanized recreation.

Table 3-86. Inventoried BLM-administered lands with wilderness characteristics with incompatible recreation management designations[78]

District	Unit Name	Identified BLM-administered Lands (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	Alt. D (Acres)	PRMP (Acres)
Coos Bay	Wasson Creek	2,473	-	-	-	2,473	-
Medford	Berry Creek	6,254	-	-	-	-	-
	Burton Nine Mile	6,103	-	-	5,829	5,829	-
	Dakubetede	5,099	-	1	3,917	3,917	-
	Round Top Mountain	5,295	-	-	5,295	5,295	-
	Wellington	5,712	-	-	8	170	-
	Whiskey Creek	6,187	-	-	-	-	-
	Wild Rogue	51,249	-	-	-	-	-
Salem	Bull of the Woods/Opal Creek Additions–Nasty Rock	1,197	-	121	121	121	-
	Bull of the Woods/Opal Creek Additions–Evans Mountain	280	-	-	-	-	-
	Table Rock Wilderness Additions	95	-	-	3	3	-
	Salmon Huckleberry Additions–Boulder Creek	506	-	-	-	-	-
	Salmon Huckleberry Additions–Eagle River	14	-	14	14	14	-
	Salmon Huckleberry Additions–Salmon River	119	-	-	-	-	-
	Clackamas Wilderness Additions–Memaloose Creek	200	-	-	-	200	-
	Clackamas Wilderness Additions-South Fork Clackamas #1	178	-	-	-	-	-
	Clackamas Wilderness Additions-South Fork Clackamas #2	42	-	-	-	-	-
Totals		**91,003**	**-**	**136**	**15,188**	**18,022**	**-**

[78] This table does not include the No Action alternative because the Recreation Management Area designations under the 1995 RMPs differ from the action alternatives and the Proposed RMP (see the Recreation section of this chapter).

Under Alternative A and the Proposed RMP, no lands with wilderness characteristics would be within Recreation Management Areas where the BLM would manage for non-compatible public motorized and mechanized recreation use. Under Alternative B, 136 acres (less than 1 percent) of lands with wilderness characteristics would be within Recreation Management Areas where the BLM would manage for non-compatible public motorized and mechanized recreation use. Under Alternative C, 15,188 acres (17 percent) of lands with wilderness characteristics would be within Recreation Management Areas where the BLM would manage for non-compatible public motorized and mechanized recreation use. Under Alternative D, 18,022 acres (20 percent) of lands with wilderness characteristics would be within Recreation Management Areas where the BLM would manage for non-compatible public motorized and mechanized recreation use, more than any other action alternative and the Proposed RMP.

Summary

The No Action alternative and Alternative D would provide no protection for lands with wilderness characteristics, and would allocate the most acreage of lands with wilderness characteristics to the Harvest Land Base or would include the most acreage within Recreation Management Areas where the BLM would manage for non-compatible public motorized and mechanized recreation use than in other alternatives or the Proposed RMP. As a result, wilderness characteristics would most quickly be lost under the No Action alternative and Alternative D and would eventually be lost on all identified lands with wilderness characteristics in the decision area under these alternatives.

Alternatives B and C would provide more protection of wilderness characteristics than the No Action alternative and Alternative D, but less than Alternative A and the Proposed RMP.

Alternative A and the Proposed RMP—

- Would allocate the most lands with wilderness characteristics to the District-Designated Reserve – Lands Managed for their Wilderness Characteristics,
- Would allocate the least acreage of lands with wilderness characteristics to the Harvest Land Base, and
- Would not include any lands with wilderness characteristics within Recreation Management Areas where the BLM would manage for non-compatible public motorized and mechanized recreation use.

As a result, Alternative A and the Proposed RMP would provide the most protection of wilderness characteristics.

References

USDI BLM. 2012. Conducting Wilderness Characteristics Inventory on BLM Lands Manual 6310. Release 6-129. March 14, 2012. Washington, D. C. http://www.blm.gov/or/plans/rmpswesternoregon/files/lwci-manual.pdf.

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Livestock Grazing

Key Points

- Under Alternatives A, B, and C, BLM-administered lands available for livestock grazing would decrease (from the No Action alternative), from 490,047 acres (20 percent of the decision area) to 366,231 acres (15 percent of the decision area). This change would occur through the BLM making 47 allotments or leases unavailable for livestock grazing.
- Under the Proposed RMP, BLM-administered lands available for livestock grazing would decrease (from the No Action alternative), from 490,047 acres (20 percent of the decision area) to 360,303 acres (15 percent of the decision area). This change would occur through the BLM making 52 allotments or leases unavailable for livestock grazing.
- Under Alternative D, the BLM would no longer authorize livestock grazing within the decision area, a change that would affect 490,047 acres (20 percent of the decision area). This change would occur by the BLM terminating existing livestock grazing authorizations and making all allotments unavailable for livestock grazing.

Summary of Notable Changes from the Draft RMP/EIS

The BLM identified five additional allotments as appropriate to consider making unavailable for livestock grazing in the Medford District. These five allotments are Upper Table Rock, Clear Creek, Deer Creek, Ferns Lease, and Billy Mountain. Upper Table Rock and Clear Creek held active permits, but the allotments had been in non-use status for more than 5 years, and the BLM worked with the permittees to close these permits since the release of the Draft RMP/EIS. The Deer Creek allotment has been vacant since 2005, and there are no proposals from current permittees to graze the allotment. The Ferns Lease allotment has no current livestock grazing authorization, no existing permit, and has been vacant for more than 10 years. There are no proposals from current permittees to graze livestock on this allotment. The Billy Mountain allotment underwent proclamation and relinquishment in December 2015.

Issue 1 includes additional information related to Special Recreation Management Area and Area of Critical Environmental Concern designations. Issues 2 and 3 were moved to the 'considered, but not analyzed in detail' because of a lack of variation amongst the alternatives and the Proposed RMP.

Background

The 1934 Taylor Grazing Act (43 U.S.C. 315 *et seq.*) which established a system for granting livestock grazing privileges on Federal land provides for livestock grazing management on both BLM-administered lands within a livestock grazing district (through Section 3 permits) and those outside a livestock grazing district (through Section 15 leases). The BLM manages Section 3 permits and Section 15 leases under different policies. The only permits administered under Section 3 in the decision area are within a livestock grazing district described as the 'Gerber Block' in the Klamath Falls Field Office.

The majority of BLM-administered lands within the decision area are outside of established livestock grazing districts. Where livestock grazing does take place, Section 15 of the Taylor Grazing Act permits livestock grazing on this land through leases. These allotments are comprised of private land intermingled with BLM-administered lands. The private land typically provides the majority of livestock grazing acres. The BLM gives preference for leases to the owner of the private land nearby and adjoining BLM-administered lands. The term of BLM permit or leases is generally for a period of 10 years.

Only the Coos Bay District, Klamath Falls Field Office, and Medford District administer livestock grazing in the decision area. The BLM does not currently administer livestock grazing within the Eugene, Roseburg, or Salem Districts.

Issue 1

How would each of the alternatives affect the number of allotments available for livestock grazing and the associated acres of BLM-administered lands and animal unit months of forage allocated for livestock grazing?

Summary of Analytical Methods

The BLM compared the number of allotments that would be available for livestock grazing on BLM-administered lands under each alternative and the Proposed RMP. The number of acres and animal unit months (AUMs) associated with the available allotments were also considered. The BLM did not include small exclosures within an allotment that exclude livestock grazing for the purpose of this analysis. Variability exists between legacy acreage and geospatial acreage; for consistency, geospatial data was typically used.

The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which is incorporated here by reference (USDI BLM 2014, pp. 62–65).

Affected Environment

The Coos Bay District, Klamath Falls Field Office, and Medford District currently have 490,047 acres (20 percent of the decision area) of BLM-administered lands that authorize livestock grazing allotments in the planning area (**Table 3-87**).

Table 3-87. BLM-administered livestock grazing allotments in the decision area

District/ Field Office	Allotments* (Number)	Total BLM-administered Lands Within Allotments (Acres)	Active Use (AUMs)	Permittees (Number)
Coos Bay	4	544	120	4
Klamath Falls	94	203,582	13,219	63
Medford	91†	285,920	11,886	43
Totals	**189**	**490,047**	**25,225**	**110**

* Allotments include those vacant and without a current permit/lease and closed. These do not include unallotted lands.
† This count includes 11 allotments that have been removed from the reporting system due to inactivity (no livestock grazing has occurred) since before the 1995 RMP but have never had decisions considered regarding their availability for livestock grazing.

Since adoption of the 1995 RMP, the number of vacant allotments has increased across the planning area. A vacant allotment is an allotment that currently does not have an active permit or lease. Some allotments have been vacant since the 1970s. The reasons for the increase in vacant allotments include:

- Relinquishment by operators
- Cancellation due to nonuse or noncompliance
- Lack of interest
- Difficulties within an allotment because of intermingled private land

- Conflicts with other users of public land
- Lack of fencing to control livestock on public land
- Change of boundary fencing that excludes BLM-administered lands

Table 3-88. Current livestock grazing levels compared to 1995 RMP levels

District/ Field Office*	1995 RMP Levels			2014 Levels†		
	Available AUMs	Active Allotments	Vacant Allotments	Active Use (AUMs)	Active Allotments	Vacant Allotments
Coos Bay	270	7	-	120	0	4
Klamath Falls	13,662	95	-	13,210	82	13‡
Medford	17,458	99	18	12,000	46	45
Totals	**31,390**	**201**	**18**	**25,225**	**128**	**63**

* For reporting purposes, all allotments and AUMs the districts administer are counted including vacant allotments and their associated AUMs. Active allotments in this table are allotments with a current permit or lease. Some of these allotment acres and associated AUMs do not occur within the planning area. Suspended AUMs are not counted in this table.
† Previous decisions within the planning area have made allotments unavailable since 1995 levels and are not reflected in the 2014 levels.
‡ Several of these vacant allotments in the Klamath Falls Field Office have been made unavailable to livestock grazing through decisions preceding this RMP revision.

Existing livestock grazing leases or permits within the BLM-administered lands in the decision area authorize 25,225 AUMs. Current levels of available livestock grazing are 6,165 AUMs less than permitted levels in 1995. These AUMs are available for livestock grazing, but some allotments are vacant and not being used. Actual levels of livestock use vary due to annual fluctuations of individual livestock operations or environmental conditions such as relinquishment by operators, transfers, and drought, or changes in livestock grazing leases or permits due to nonuse, noncompliance, or lack of interest. The change in use of allotments is due to several reasons including the voluntary elimination of livestock grazing associated with the Cascade-Siskiyou National Monument, the combination of multiple allotments into one, the division of allotments into more than one, and the reduction in livestock grazing for resource protection.

There are six allotments within the planning area containing acreage in the Cascade-Siskiyou National Monument in addition to acreage in the decision area. All acres within the monument are outside the decision area. **Table 3-89** displays the acres of each allotment that overlaps the decision area and the monument. The Klamath Falls Field Office administers the Dixie and Buck Mountain Allotments, and the Medford District administers the Deadwood Allotment. The Keene Creek Allotment, Siskiyou Allotment, and Soda Mountain Allotment have been made unavailable to livestock grazing through previous decisions and public law and are not evaluated as part of this analysis.

Table 3-89. BLM-administered livestock grazing allotments in the decision area that overlap the Cascade Siskiyou National Monument (CSNM)

Allotment Name	Allotment Number	CSNM (Acres)	Decision Area (Acres)	Total AUMs	Availability Status
Buck Mountain	00103	739	7,416	204	Available
Deadwood	20106	37	7,967	788	Available
Dixie	00107	1283	4,439	320	Available
Keene Creek	10115	10,600	13,019	-	Made unavailable for livestock grazing through previous decision and law (Pub. L. 111-11)
Siskiyou	10118	2,163	260	-	Made unavailable for livestock grazing through previous decision and law (Pub. L. 111-11)
Soda Mountain	10110	35,619	413	-	Made unavailable for livestock grazing through previous decision and law (Pub. L. 111-11)

Environmental Consequences

Under all alternatives and the Proposed RMP, all components of livestock grazing authorizations (acres for livestock grazing, number of allotments, AUMs, and permittees/lessees) would either remain the same or decrease as shown in **Table 3-90**. The No Action alternative would retain all allotments in their current management status and level of livestock grazing authorizations. Alternatives A, B, and C, would make allotments that have generally been vacant or inactive for 5 or more years unavailable for livestock grazing. Under the Proposed RMP, the BLM would make unavailable to livestock grazing those allotments that have generally been vacant, inactive, or in non-use status for 5 years or more (see **Appendix B** for those allotments proposed to be made unavailable). Under Alternative D, the BLM would cease to authorize any livestock grazing within the decision area and receive no payments for AUMs.

Table 3-90. Livestock grazing availability for the Coos Bay District, Klamath Falls Field Office, and Medford District

District/ Field Office	Alternative/ Proposed RMP	Allotments Available for Livestock Grazing (Number)	BLM-administered Lands (Acres)	Active Use (AUMs)	Permittees (Number)
Coos Bay	No Action	4	544	120	4
	Alt. A, B, C	-	-	-	-
	Alt. D	-	-	-	-
	PRMP	-	-	-	-
Klamath Falls	No Action	94	203,582	13,219	63
	Alt. A, B, C	92	203,377	13,199	63
	Alt. D	-	-	-	-
	PRMP	92	203,377	13,199	63
Medford	No Action	91	285,920	11,886	43
	Alt. A, B, C	50	162,854	9,588	43
	Alt. D	-	-	-	-
	PRMP	45	151,949	9,197	41
Totals	**No Action**	**189**	**490,047**	**25,225**	**106**
	Alt. A, B, C	**142**	**366,231**	**22,787**	**106**
	Alt. D	**-**	**-**	**-**	**-**
	PRMP	**137**	**355,326**	**22,396**	**104**

Although the Proposed RMP shows a decrease in permittees and allotments, these were allotments in non-use or vacant status. Therefore, these decreases would not reduce the number of allotments or permittees that currently have an active permit or lease in 2015.

Under Alternatives A, B, and C, the number of allotments available for livestock grazing would decrease from 189 to 142. The associated acres of BLM-administered lands and AUMs of forage available for livestock grazing through the issuance of livestock grazing leases or permits would decrease from 490,047 acres (20 percent of the decision area) and 25,225 AUMs, to 366,231 acres (15 percent of the decision area) and 22,787 AUMs (**Table 3-90**). In the Proposed RMP, an additional four allotments would be made unavailable for livestock grazing. The associated acres of BLM-administered lands and AUMs of forage available for livestock grazing would decrease an additional 5,928 acres and 216 AUMs on the Medford District compared to Alternatives A, B, and C. In Alternative D, the BLM would terminate existing livestock grazing authorizations and make all allotments unavailable for livestock grazing. The number of AUMs billed would remain at current levels in all alternatives except Alternative D.

Figure 3-105 and **Figure 3-106** show the acres and number of allotments available for livestock grazing and **Figure 3-107** shows the associated AUMs available.

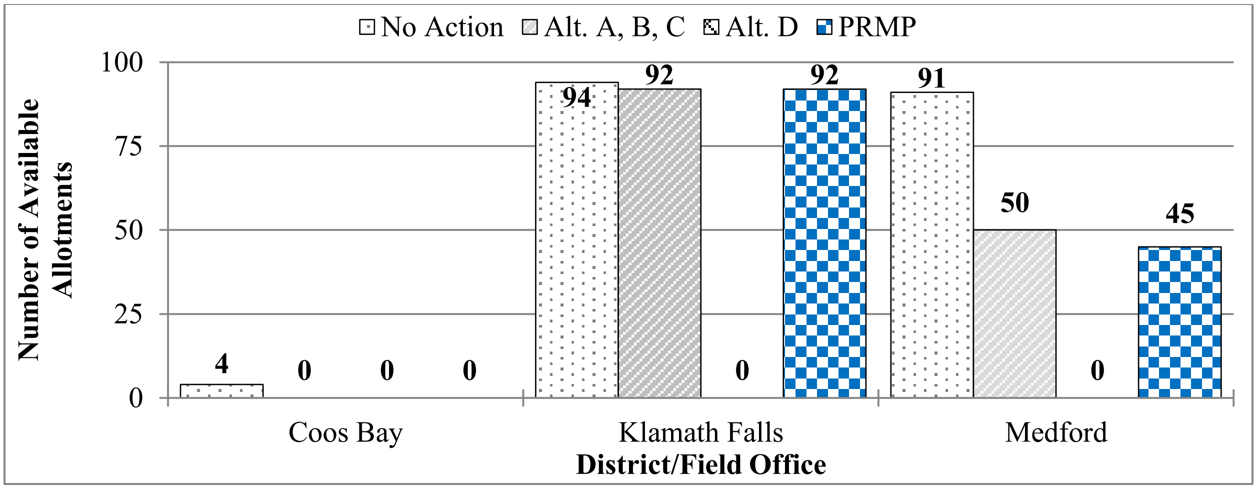

Figure 3-105. Allotments available for livestock grazing

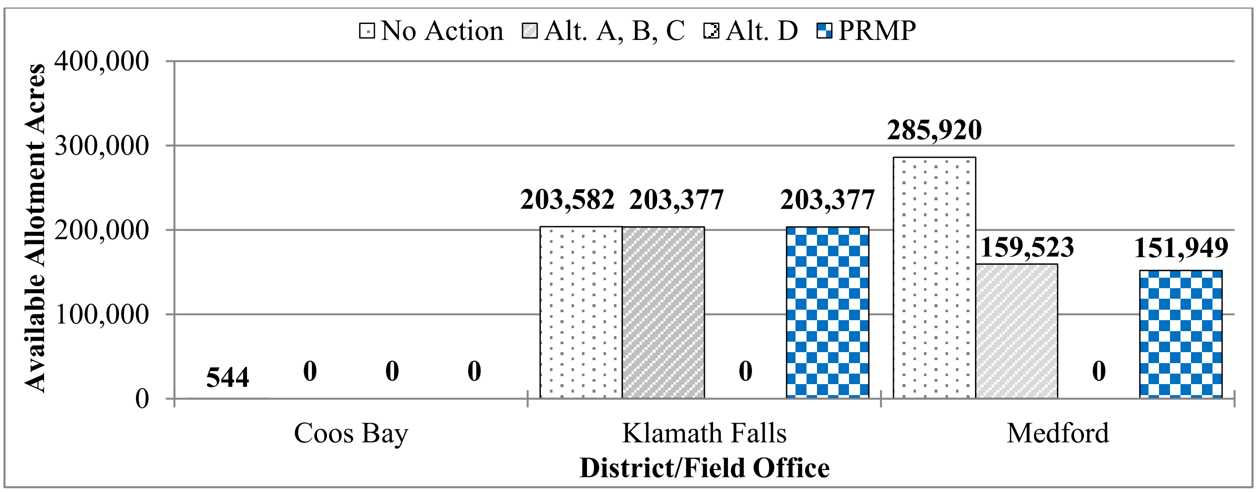

Figure 3-106. Acres available for livestock grazing

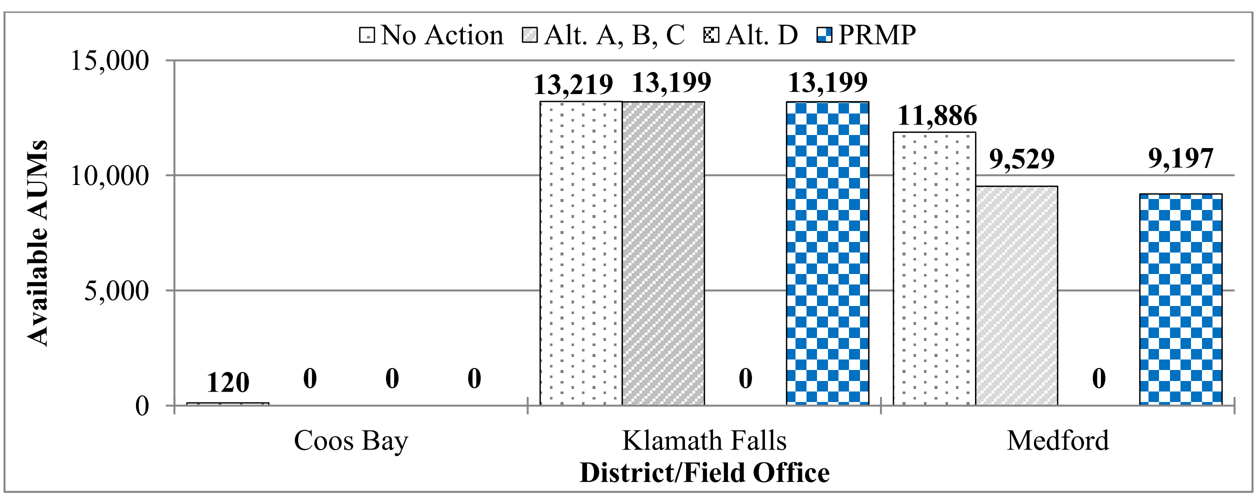

Figure 3-107. Allocated livestock grazing AUMs

In the Medford District, Alternatives A, B, and C, and the Proposed RMP would decrease the number of available allotments as compared to the No Action alternative. This decrease would occur on allotments vacant for 5 years or more. In Alternatives A, B, and C, the BLM would reduce the number of available allotments by 47. The associated BLM-administered lands would decrease by 127,146 acres and by 2,497 AUMs. Under the Proposed RMP, the number of allotments would decrease by 52 from the No Action alternative with a decrease of 134,720 acres and of 2,829 AUMs.

In the Klamath Falls Field Office, Alternatives A, B, C, and Proposed RMP would decrease the number of allotments available to livestock grazing by two compared to the No Action alternative. A portion of the Edge Creek, Chicken Hills, and Chase Mountain allotments (5,908 acres) is fenced off from livestock grazing and is included in the Klamath River Area of Critical Environmental Concern. The BLM would cease authorizations for livestock grazing in Alternatives A, B, and C, and the Proposed RMP. No AUMs are currently associated with these ACEC acres and no livestock grazing is currently occurring. The remainder of the Edge Creek Allotment would continue to be available for livestock grazing. The BLM would also cease authorizations for the Plum Hills Allotment, a vacant allotment with 160 acres and 20 available AUMs.

In the Coos Bay District, all action alternatives and the Proposed RMP would decrease the number of available leases as compared to the No Action alternative. The decrease would occur on four allotments covering approximately 544 acres with 120 AUMs that would be unavailable for livestock grazing. As these allotments are currently vacant, the number of permittees would not change.

Under Alternative D, the BLM would no longer authorize livestock grazing within the decision area, a change that would make 189 allotments unavailable. This would occur on 490,047 acres (20 percent of the decision area) compared to the No Action alternative. A total 25,225 AUMs would be unavailable for livestock grazing, and the BLM would terminate existing permits and leases for 106 permittees. The BLM would no longer collect fees on these AUMs. The BLM addresses the effect of the termination of grazing permits under Alternative D on revenues to the BLM under Issue 1 and on jobs and earnings in the planning area under Issue 2 of the Socioeconomics section of this chapter. Alternative D would have the greatest effect to livestock grazing for the Klamath Falls Field Office and the Medford District when compared to the other alternatives and the Proposed RMP.

Figure 3-108 shows allotted BLM-administered lands within the planning area by allotment status within the Coos Bay District, the Klamath Falls Field Office, and the Medford District.

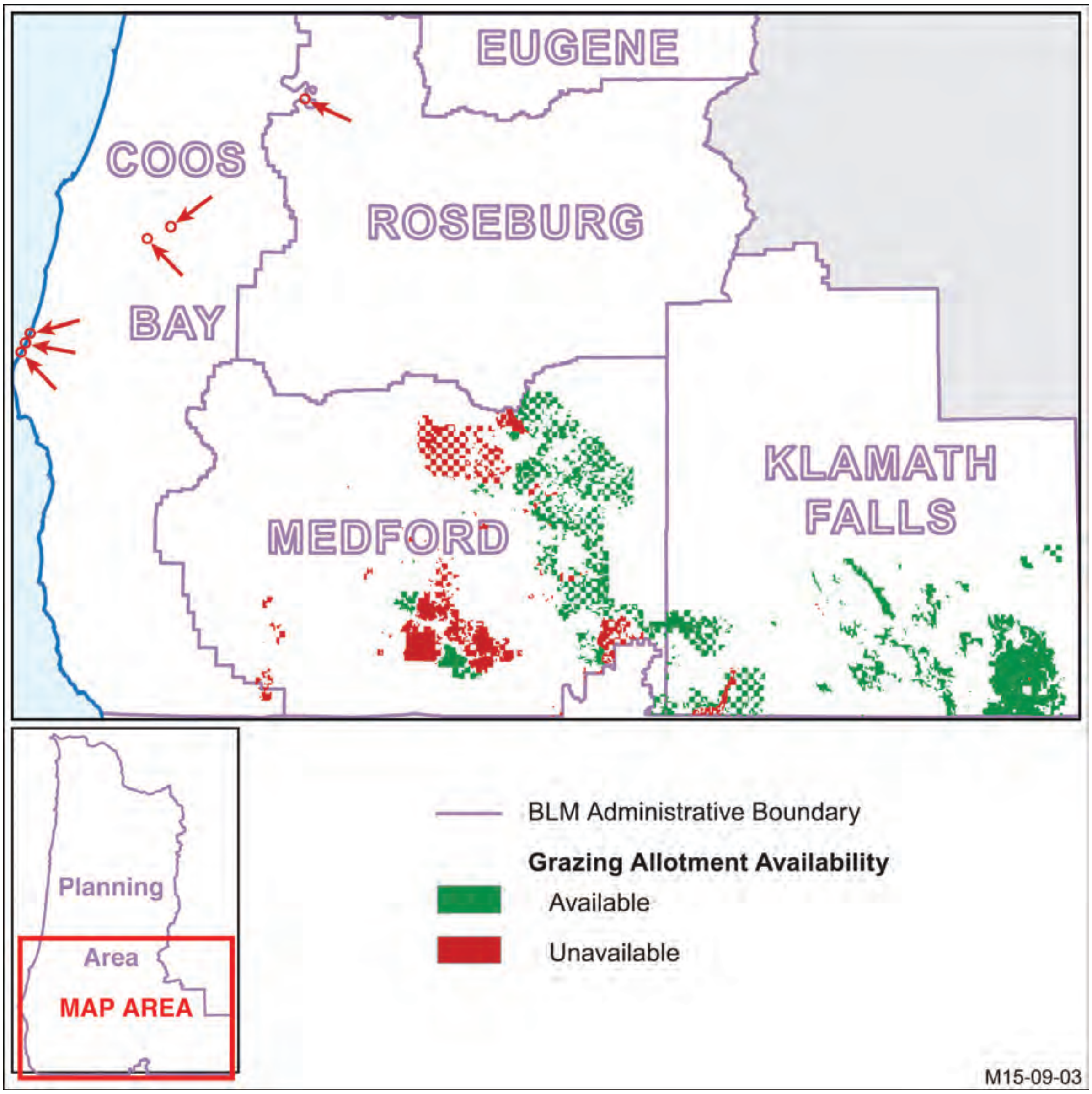

Figure 3-108. Livestock grazing allotments on BLM-administered lands by livestock grazing availability under the Proposed RMP

Livestock Grazing within SRMAs and ACECs

Acres and total number of allotments within Special Recreation Management Areas (SRMA) or Areas of Critical Environmental Concern (ACEC) vary by alternative (see Chapter 2). Some SRMAs and ACECs may additionally regulate or restrict livestock grazing within the designated areas' boundaries. These discussions do not include Alternative D, under which all allotments would be unavailable to livestock grazing.

Special Recreation Management Areas

In the Medford District and the Klamath Falls Field Office in Alternatives A, B, and C, and the Proposed RMP, management of SRMAs could have an effect on the number of acres available for livestock grazing through site-specific protection (e.g., exclosures) or management actions (e.g., restricting season of use).

The BLM may decrease stocking levels through subsequent agreements or necessary decisions.

The BLM would still issue land use authorizations through leases, permits, and easements if livestock grazing was compatible with SRMA recreation objectives and not interfere with recreation opportunities and setting characteristics.[79] Those areas designated as SRMAs would decrease acres available to livestock grazing as shown in **Table 3-91** if livestock grazing is determined to be incompatible within those areas. Alternatives B and C, and the Proposed RMP would decrease 3 percent and Alternative A would decrease 0.4 percent of acres currently available to livestock grazing.

Table 3-91. Acres of SRMAs within available allotments within the planning area

SRMA Lands Within Allotments	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	PRMP (Acres)
Allotments Available for Livestock Grazing	1,426	10,809	10,531	9,372

Areas of Critical Environmental Concern

In the Coos Bay District, the Klamath Falls Field Office, and the Medford District, under the No Action alternative, Alternatives A, B, and C, and the Proposed RMP, ACEC designations may affect the number of acres available for livestock grazing. Effects may occur through site-specific protection (e.g., exclosures) or management actions (e.g., restricting season of use) to maintain or enhance relevant and important values. The BLM may decrease stocking levels through subsequent agreements or decisions.

Designation of ACECs would allow land use authorizations through leases, permits, and easements when compatible with the special management needed to retain relevant and important values of the ACEC. Where livestock grazing is found to be incompatible with protection of the relevant and important values of the ACEC, those areas may require management that would decrease acres available to livestock grazing. **Table 3-92** shows the total acres of ACECs that would be designated that occur within authorized grazing allotments under the alternatives and the Proposed RMP. The No Action Alternative would decrease the largest number of acres available to livestock grazing, affecting 16,453 acres (3 percent) of the planning area. The Proposed RMP would decrease 7,165 acres (2 percent) of acres available to livestock grazing. Alternative A would decrease 8,195 acres (2 percent), and Alternative B would decrease 4,622 acres (1 percent) available for livestock grazing.

Table 3-92. Acres of ACECs within authorized allotments for each alternative and the Proposed RMP within the planning area

ACEC Lands Within Allotments	No Action (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	PRMP (Acres)
Allotments Available for Livestock Grazing	16,453	8,195	4,622	4,713	7,165

[79] New guidance on applying RMA allocations on BLM-administered lands creates a marked difference in how RMA designations are defined under the No Action alternative and the action alternatives and the Proposed RMP. SRMAs, under the No Action alternative, would include lands not managed for recreation as the primary use, and the BLM would not manage SRMAs under the No Action in a manner that would prioritize recreational uses over other land management uses, including livestock grazing. Because the RMA designation definitions differ between the No Action alternative, the action alternatives, and the Proposed RMP, the relative ranking analysis can only be used for the action alternatives and the Proposed RMP.

Issues Considered but not Analyzed in Detail

How would each of the alternatives affect the attainment of Standards for Rangeland Health and Guidelines for Livestock Grazing Management on those lands allocated for livestock grazing?

Current livestock grazing regulations direct the BLM to manage livestock grazing in accordance with Standards for Rangeland Health. The BLM developed the 1997 Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington (USDI BLM 1997) in consultation with Resource Advisory Councils, Provincial Advisory Committees, tribes, and others. These standards are the basis for assessing and monitoring rangeland conditions and trend. The BLM implements appropriate action to address the failure to meet standards or conform to guidelines resulting from livestock grazing management or practices on BLM-administered lands through 43 CFR 4180.2(c). Implementation of livestock grazing under all alternatives and the Proposed RMP except Alternative D would be required to conform to these standards, guidelines, and regulations. Alternative D does not authorize livestock grazing and therefore these standards, guidelines, and regulations are not applicable.

The BLM has assessed 65 percent of livestock grazing allotments and leases within the decision area to determine whether they are meeting rangeland health standards. Completed Rangeland Health Assessments by allotment are available on BLM web sites for the Lakeview and Medford Districts. As shown in **Table 3-93**, the BLM found livestock grazing to be a contributing factor in not meeting rangeland health standards in twelve allotments: five in Medford and seven in Klamath Falls. In those allotments, the BLM has taken appropriate action by adjusting livestock grazing management pursuant to direction in 43 CFR 4180.2(c) to ensure significant progress toward meeting the standards and to eliminate livestock grazing as the causal factor for not meeting the health standard. Adjusting livestock grazing management generally requires changes in livestock numbers, season of use, and animal unit months, construction of range improvements, or implementation of intensive livestock grazing systems. Under all alternatives and the Proposed RMP, except Alternative D, the BLM would continue to manage livestock grazing on these twelve allotments in a manner that will result in significant progress toward fulfillment of the standards. Under Alternative D, the BLM would cease to authorize livestock grazing. This removal of livestock grazing would allow some allotments not meeting rangeland health standards to recover at a faster rate when compared to the other alternatives and the Proposed RMP.

Table 3-93. Rangeland Health Standards Assessments for the Coos Bay District, Klamath Falls Field Office, and Medford District

Assessments	Coos Bay		Klamath Falls		Medford	
	Allotments	Acres	Allotments	Acres	Allotments	Acres
Rangelands Meeting All Standards or are Making Significant Progress Toward Meeting the Standards	4	543	52	108,417	20	32,383
Rangelands Not Meeting All Standards with Appropriate Action Taken to Ensure Significant Progress Toward Meeting the Standard (Livestock was a contributing factor)	-	-	7	35,376	5	15,312
Rangelands Not Meeting All Standards or Making Significant Progress Toward Meeting the Standard Due to Causes Other Than Livestock Grazing	-	-	11	50,236	25	125,117
Allotments Assessed and Closed to Livestock Grazing with a Previous Decision	-	-	-	-	3	13,692
Total Assessed	4	543	70	194,029	50	186,504
Allotments Not Assessed	-	-	25	15,349	41	113,202
Totals	**4**	**543**	**95**	**209,377**	**91**	**299,706**

The BLM is completing Rangeland Health Assessments on the grazed allotments lacking an assessment within the decision area based on district priorities. Should assessments find livestock grazing to be a contributing factor to not meeting rangeland standards, the BLM would take appropriate action by adjusting livestock grazing management pursuant to direction in 43 CFR 4180.2 to ensure significant progress toward meeting the standards and to eliminate livestock grazing as the causal factor for not meeting the health standard.

Across 36 allotments within the decision area, 11 in Klamath Falls and 25 in Medford are currently not meeting all standards or making significant progress towards meeting standards for reasons other than livestock grazing. Opportunities to achieve desired rangeland health conditions may be limited in some areas due to past management activities and may not be possible to achieve through changes in livestock grazing management or even through removal of livestock grazing. An example of this would be historic vegetative treatments that converted an area from a perennial grass/forb understory to an invasive plant understory (e.g., medusahead, dogtail, and bulbous bluegrass). In this situation, the upland Rangeland Health Standard 1 may not be met though any livestock grazing management to include the removal of livestock unless intensive reseeding combined with intensive weed treatments are additionally implemented.

How would each of the alternatives affect the BLM's ability to provide forage on those lands allocated for livestock grazing?

Current forage conditions within individual allotments are variable based on historic livestock grazing levels, past management actions, and current livestock grazing management. Past timber harvest activities within allotments created canopy openings that provide increased forage for livestock. Forest management actions proposed under the alternatives considered in this analysis would be expected to continue to influence forage conditions. In alternatives including regeneration harvest within the analysis area (i.e., BLM-administered lands within allotments), forage production is assumed to temporarily improve during the initial years post-harvest due to the decreased competition between understory and overstory vegetation. Alternatives A, B, and C, and the Proposed RMP include varying intensities of regeneration harvest on varying acres within the analysis area; however, the overwhelming majority of the Harvest Land Base in the allotments are within the uneven-aged timber are and would receive uneven-aged forest management. Changes to forage production by alternative or the Proposed RMP, including the moderate increases of forage availability within the analysis area, may affect livestock distribution within allotments; however, no increases in stocking rate would occur due to increases in available forage. These alternatives and the Proposed RMP would continue to provide adequate livestock forage for livestock grazing levels. Alternative D closes all allotments and so there are no acres to consider for forage production.

References

USDI BLM. 1997. Standards for rangeland health and guidelines for livestock grazing management for public lands administered by the Bureau of Land Management in the states of Oregon and Washington. Oregon State Office, Portland, OR. 22 pp. http://www.blm.gov/or/resources/recreation/csnm/files/rangeland_standards.pdf.

---. 2014. Resource management plans for western Oregon planning criteria. Bureau of Land Management, Oregon/Washington State Office, Portland, OR. http://www.blm.gov/or/plans/rmpswesternoregon/plandocs.php.

Walburger, K. T., T. DelCurto, and M. Vavra. 2007. Influence of forest management and previous herbivory on cattle diets. Rangeland Ecology & Management **60**(2): 172–178. http://dx.doi.org/10.2111/05-223R3.1.

Minerals

Key Points

- Lands closed to salable mineral material disposal would decrease from 13 percent of the decision area under the No Action alternative to between 9 and 10 percent for the action alternatives and the Proposed RMP. The locations of these closed areas would be more widely dispersed in the action alternatives and the Proposed RMP than in the No Action alternative.
- Under the action alternatives and the Proposed RMP, the BLM would recommend for withdrawal from locatable mineral entry between 6 and 8 percent of the decision area, in addition to the 4 percent already withdrawn.
  - Almost half of lands recommended for withdrawal under the Proposed RMP are ranked as high for mineral occurrence and development. The withdrawal of these lands from locatable mineral entry would curb the development of mineral resources.
- The decision area would remain open to leasable mineral development under various stipulations in the alternatives and the Proposed RMP except where lands are already closed by legislation.

Summary of Notable Changes from the Draft RMP/EIS

The BLM updated information on mining claims, Notices, and pending or authorized Plans of Operation in the decision area based on recent data and analysis. The analysis of areas closed to salable mineral material disposal and recommended for withdrawal from locatable mineral entry does not present acreage by specific criteria (e.g., ACECs and Recreation Management Areas) because these criteria overlap geographically, creating confusion and errors related to the acreage associated with each specific criterion. Thus, the Proposed RMP/Final EIS identifies the criteria but presents acreage by areas closed to salable mineral material disposal and recommended for withdrawal from locatable mineral entry for the alternatives and the Proposed RMP.

Background

The BLM oversees the mineral estate on nearly 40 million acres of BLM-administered lands, U.S. Forest Service lands, and other federally administered and Indian Trust lands in Oregon. Within the decision area, the BLM manages approximately 2.5 million acres of Federal surface ownership and an additional 68,700 acres of sub-surface Federal minerals with private surface ownership. **Table 3-94** lists acres by district.

Table 3-94. Acres of surface and mineral estate within the decision area

District/ Field Office	Federal Surface and Mineral Estate (Acres)*	Federal Minerals and Private Surface (Acres)*
Coos Bay	329,600	12,200
Eugene	317,400	1,300
Klamath Falls	212,000	21,000
Medford	866,300	4,700
Roseburg	425,600	1,700
Salem	398,100	27,800
Totals	**2,549,000**	**68,700**

* Data from the 2008 Final EIS (USDI BLM 2008) and district-specific information

Physiography

The planning area contains five geologic physiographic regions: the Coast Range, Willamette Valley, Cascade Mountains (High and Western), Klamath Mountains, and the Basin and Range (**Figure 3-109**).[80] Each region's unique geology influences the mineral occurrences.

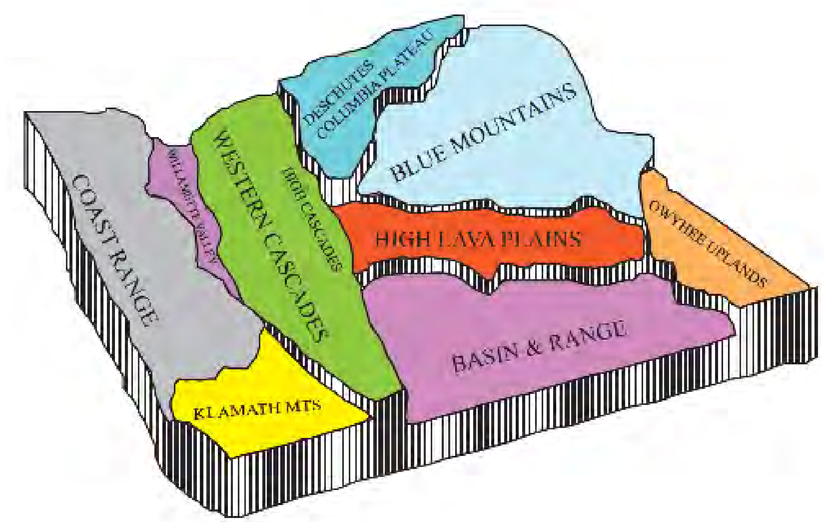

Figure 3-109. Physiographic regions in Oregon
(Orr and Orr 2012)

Mineral Resources of the Planning Area

The Oregon Department of Geology and Mineral Industries (DOGAMI) database (MILO) shows that the vast majority of mineral resources used in Oregon are common rock used in construction and road surfacing (http://www.oregongeology.org/sub/milo/index.htm). There are over 5,500 mapped quarry sites throughout the planning area. The MILO database shows 300 occurrences for other mineral commodities such as clay, limestone, pumice, and silica sand throughout the planning area. There are 150 occurrences

[80] These regions are different from the terrestrial physiographic regions described in the FEMAT Report (1993) and illustrated in **Figure 3-187**.

for coal with most sites in coastal areas concentrated around Coos Bay. In addition, the database shows 3,300 metal occurrences with gold, silver, copper, nickel, chromite, and other minerals with nearly all minerals located in southwest Oregon.

Coast Range Mineral Resources

Coal seams occur throughout the Coast Range with the majority in Coos County. In the Coos Bay District, there is a coalbed natural gas area of mutual interest. The Coast Range has potential for oil and gas development. The State's first commercial gas field was located in 1979 near Mist, Oregon in Columbia County. This field has 18 wells, which have produced 65 billion cubic feet of gas. Other economically valuable minerals include beach placers containing gold and platinum in locations from Cape Blanco to Cape Arago.

Willamette Valley Mineral Resources

Deeply weathered basalts with bauxite enriched with aluminum and iron occur in the Willamette Valley with the thickest deposits in Washington and Columbia counties. Limonite localities also occur in Lake Oswego. A 20-mile-wide belt of cinnabar exists in Lane, Douglas, and Jackson Counties, which has been mined for mercury, especially near the southern end of the Willamette Valley.

Cascade Mountains Mineral Resources

Gold and silver have been mined in the Bohemia Mountain region south of Cottage Grove and the Quartzville and Blue River mining districts by McKenzie Bridge. The North Santiam mining district has also historically yielded copper, zinc, lead, silver, and gold. A series of hot springs (in an irregular 12-mile-wide north/south-oriented belt) mark a thermal boundary existing between the High Cascades and Western Cascades. Temperatures of the waters can range between 90 and 190 °F in certain areas. The thermal gradients of the region may represent a large potential source of renewable geothermal energy. More information is available in the Sustainable Energy section of this chapter.

Klamath Mountains Mineral Resources

The Klamath Mountains has substantial mineral resources due to its geologic diversity. Mineralization is primarily attributed to tectonic plate evolution and secondarily to later plutonic intrusion. This area has historically produced gold, silver, copper, nickel, and chromite along with other minerals. Most of these minerals are closely associated with ophiolites and plutons in the areas of Ashland, Gold Hill, and Grants Pass. As much as 75 percent of the gold produced from this area has come from placers deposits. Copper was historically mined from the Josephine ophiolite near Grants Pass. Nickel was historically mined from weathered ophiolites near the town of Riddle and chromite was mined from ophiolites throughout the Klamath Mountains. Chromite-rich beach sands derived from the Klamath Mountains can be found on the southern Oregon coast.

Basin and Range Mineral Resources

Historically, uranium, mercury, and borax have been produced in this area. Diatomite occurs near the Sprague River. This region has a thin crust with numerous faults and high heat flow, which creates an increased possibility for geothermal resources. More information is available in the Sustainable Energy section of this chapter.

Issue 1

How would the alternatives affect salable mineral material disposal?

Summary of Analytical Methods

The BLM evaluated how the acreage proposed for closure to salable mineral material disposal under each alternative and the Proposed RMP would affect potential future development of this resource. Under each action alternative and the Proposed RMP, the BLM would close District-Designated Reserve – Lands Managed for their Wilderness Characteristics, eligible Wild and Scenic River segments, some Areas of Critical Environmental Concern (ACECs), and some Recreation Management Areas (RMAs) to salable mineral material disposal. Upon the completion of this RMP revision, the BLM would display the areas closed to salable mineral material disposal on map(s) accompanying the approved RMP.

The BLM evaluated data supplied by LR2000,[81] by each district, and from the Oregon Department of Geology and Mineral Industries to determine the location of mineral material sites, which are primarily rock quarries in the decision area. The BLM determined that this data could not be utilized to predict the location of future mineral material sites. The BLM did not complete reasonably foreseeable development scenarios and Mineral Potential Reports for salable mineral materials for this Proposed EIS/Final EIS. All estimates are based on broad-scaled "trends" review, which presents professional opinion rather than a methodological approach.

The Planning Criteria, which the BLM incorporates here by reference (USDI BLM 2014, p.104), provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales.

Background

Salable mineral materials include common variety quarry rock used in construction and road surfacing as well as sand and gravel, clay, and volcanic pumice and cinders. Regulations found in 43 CFR 3600 – Mineral Materials Disposal, guide the exploration, development, and disposal of mineral material resources and the protection of resources and the environment. The disposal of mineral materials includes direct sales to the public at fair market value, and issuing free-use permits to government entities or non-profit organizations. Disposal of these mineral materials is at the discretion of the BLM.

The primary salable mineral material in the decision area is quarry rock. The BLM, private companies, and local governments use the majority of this quarry rock for road surfacing. Other uses of quarry rock include rock material for fish enhancement projects, jetties, boat ramps, and reclamation projects. The BLM also disposes sand, gravel, soil, fill material, clay, volcanic pumice and cinders, and specialty stone through open sales and free use permits.

Affected Environment

The use of mineral materials is dependent on demand by the BLM, private companies, local governments, and the public. **Figure 3-110** and **Figure 3-111** display the number of sales across the decision area and the mineral material production by cubic yard for the years 2007–2013 (LR2000).

[81] LR2000 is a BLM database containing information about minerals.

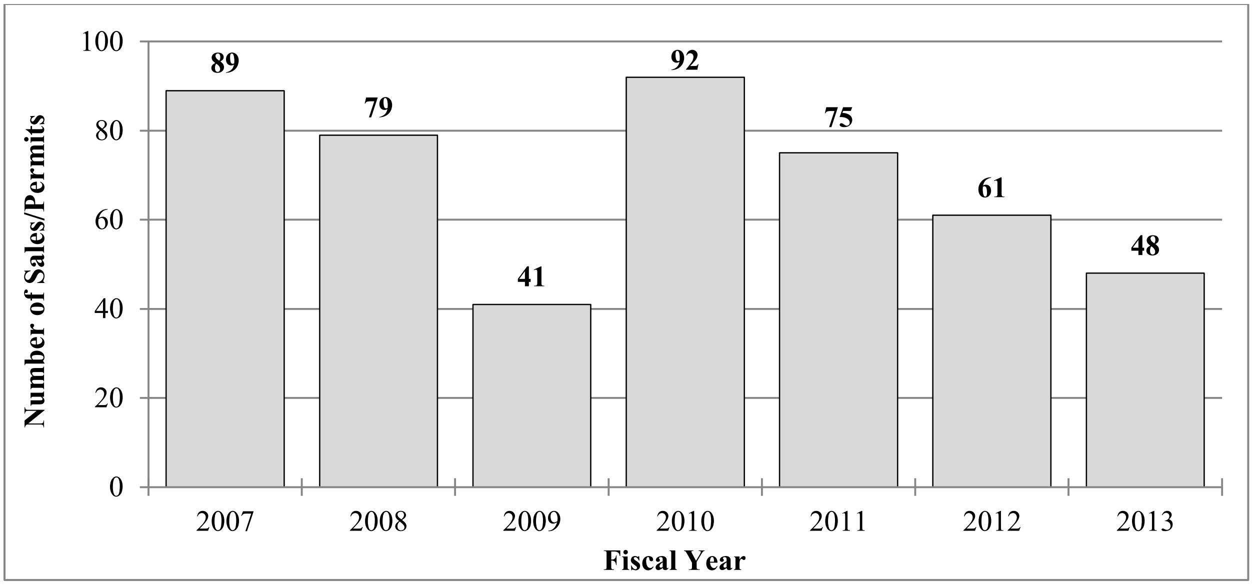

Figure 3-110. Number of sales or permits for mineral material by year in the decision area

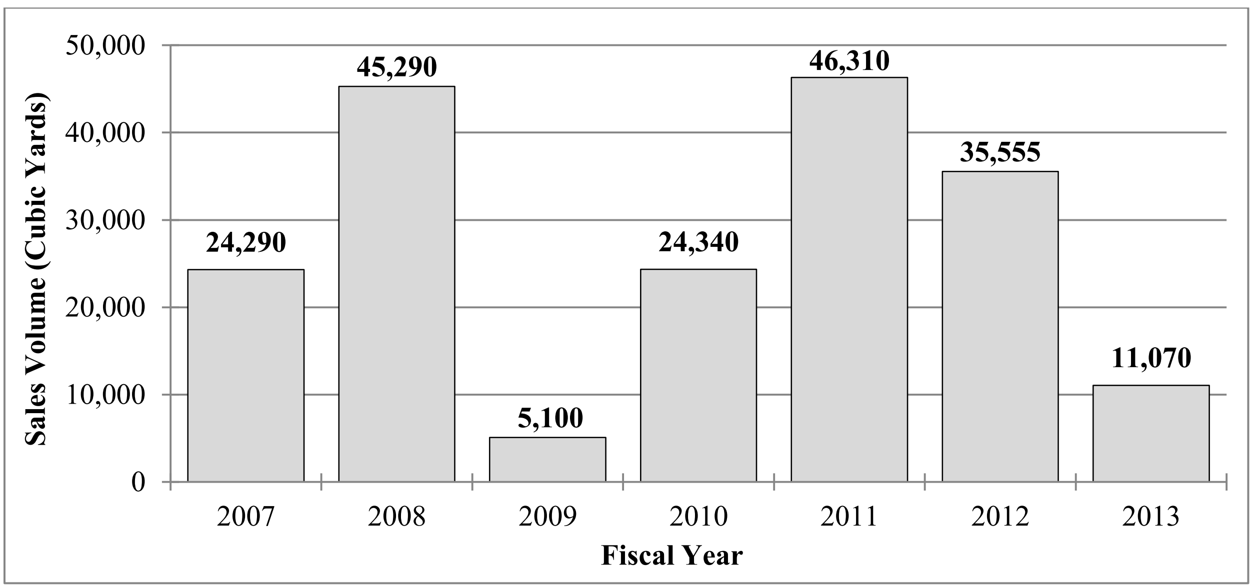

Figure 3-111. Sales volume of mineral material produced by years 2007–2013 in the decision area

This mineral material disposal data from 2007 to 2013 includes 192 small sales of less than 5 cubic yards each. These sales account for 40 percent of the total mineral material sales, but constitute a small fraction of the total volume of mineral material sold. These small sales are from the Medford District and represent public purchases from designated rock quarries for home landscaping projects.

There are 681 developed quarry sites in the decision area, based on the BLM inventory of existing rock quarry sites. **Figure 3-112** illustrates the spatial distribution of existing quarry sites in the decision area. The majority of these sites are hard rock quarries, though a limited number of sites produce pumice, sand, gravel, or dimension stone. Many of these sites were developed before the 1990s and have been in use intermittently. The footprint—or area of disturbance—of quarry sites is variable and ranges approximately from 0.01 to 5 acres. A typical quarry is less than 0.5 acre in size. The BLM estimates that that approximately 25–33 percent of rock quarries are near depletion, with a few thousand cubic yards of rock remaining at each site. At some quarries, continued removal would require expansion of the existing footprint.

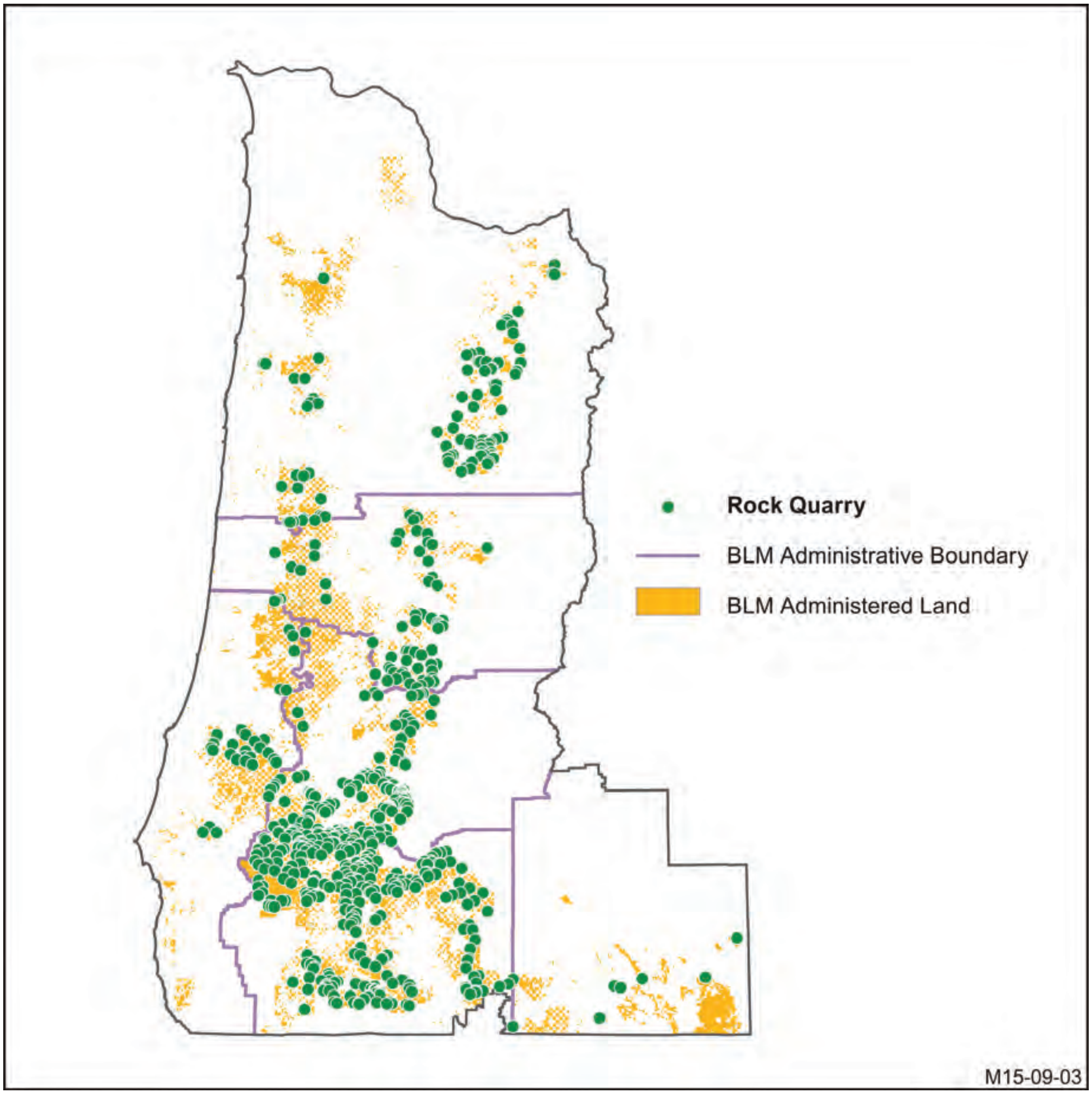

Figure 3-112. Developed quarry sites in the decision area from 2014 district inventories

The BLM does not have a complete inventory of potential rock quarry sites in the decision area. The BLM locates rock quarries based on the suitability of the available rock to meet required specifications. However, access, proximity to area of use, and environmental considerations are also important factors in determining quarry development.

Table 3-95 shows the number of rock quarry sites in the decision area as of 2014 based on district inventories.

Table 3-95. Rock quarry sites in the decision area

District/ Field Office	Quarry Sites
Coos Bay	31
Eugene	87
Klamath Falls	13
Medford	250
Roseburg	203
Salem	97
Total	**681**

All of the salable activity previously described takes place on BLM-administered lands that are open to salable mineral material disposal. **Table 3-96** provides a breakdown by district of the acres of BLM-administered lands that are currently closed to salable mineral material disposal. Closed non-discretionary lands, which total 31,530 acres, would remain closed under the alternatives and the Proposed RMP. The Salem District has the most lands closed to discretionary salable mineral material disposal and Roseburg the least.

Table 3-96. Acres of lands currently closed to salable mineral material disposal (i.e., the No Action alternative)

District/ Field Office	Closed Non-discretionary*† (Acres)	Closed Discretionary*† (Acres)	Totals (Acres)
Coos Bay	600	14,700	**15,300**
Eugene	100	9,100	**9,200**
Klamath Falls	300	14,500	**14,800**
Medford	24,600	20,800	**45,400**
Roseburg	30	8,400	**8,430**
Salem	5,900	220,400	**226,300**
Totals	**31,530**	**287,900**	**319,430**

* Legal mandates establish non-discretionary closures while a discretionary closure is the result of an agency management decision.
† Data from the 2008 Final EIS (USDI BLM 2008)

See **Appendix M** for more information regarding trends in salable mineral material developments.

Environmental Consequences

Figure 3-113 and **Table 3-97** list acres that the BLM would close to salable mineral material disposal for the alternatives and the Proposed RMP.

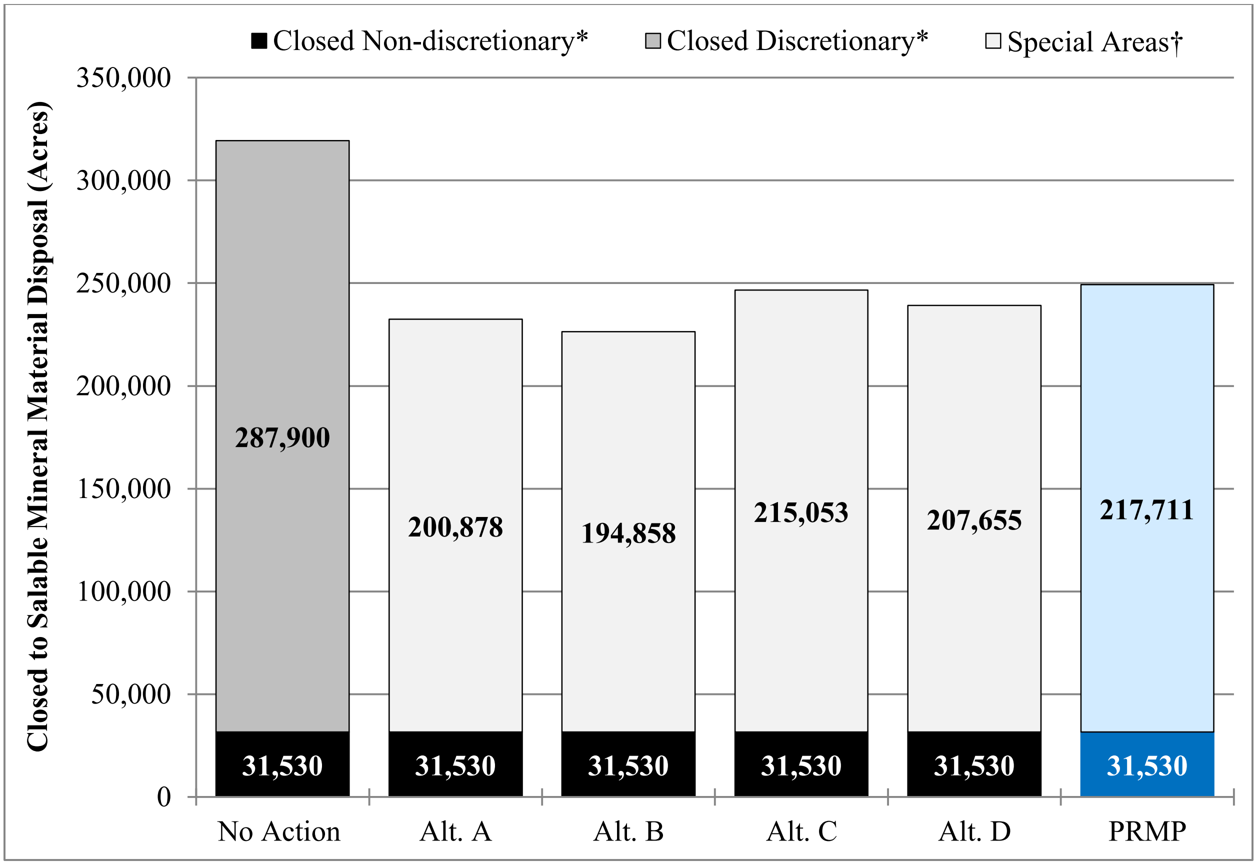

Figure 3-113. Acres closed to salable mineral material disposal in the decision area

* Legal mandates establish non-discretionary closures while a discretionary closure is the result of an agency management decision.

† ACECs, RMAs, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible Wild and Scenic Rivers

Table 3-97. Acres closed to salable mineral material disposal in the decision area

Land Category	No Action	Alt. A	Alt. B	Alt. C	Alt. D	PRMP
Closed Discretionary* under the 1995 RMPs (Acres)	287,900					
Closed Discretionary* under the 1995 RMPs (Percent)	12%					
Special Areas† (Acres)		200,878	194,858	215,053	207,655	217,711
Special Areas† (Percent)		8%	8%	9%	9%	9%
Closed Non-discretionary* (Acres)	31,530					
Closed Non-discretionary* (Percent)	1%					
Totals (Acres)	**319,430**	**232,408**	**226,388.09**	**246,583.1**	**239,185.1**	**249,241**
Totals (Percent)	**13%**	**9%**	**9%**	**10%**	**10%**	**10%**

* Legal mandates establish non-discretionary closures while a discretionary closure is the result of an agency management decision.

† ACECs, RMAs, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible Wild and Scenic Rivers

The action alternatives and the Proposed RMP would open more land to salable mineral material disposal than the No Action alternative. Under the No Action alternative, 13 percent of the decision area is closed to salable mineral material disposal with the majority in the Salem District (**Table 3-96**). Under the action alternatives and the Proposed RMP, the BLM would reduce the total acres closed to salable mineral material disposal to between 9 and 10 percent of the decision area (**Table 3-97)**. Because of uncertainties with regard to opportunities for salable mineral material disposal on BLM-administered lands, such as location and extent, specific environmental or socioeconomic effects of increasing the acreage of lands available for salable mineral material disposal would be speculative.

Data is not readily available to display spatially the areas closed to salable mineral material disposal under the No Action alternative; therefore, a comparison map is not included in this analysis.

Appendix F lists each ACEC and **Appendix O** lists each RMA and each status of open or closed to salable mineral material disposal under the action alternatives and the Proposed RMP.

Appendix M contains a review of trends in salable mineral developments.

Issue 2

How would the alternatives affect acres of land recommended for withdrawal from locatable mineral entry?

Summary of Analytical Methods

The BLM identified by the alternatives and the Proposed RMP acres of land recommended for withdrawal from locatable mineral entry, subject to valid existing rights (see **Appendix X**). The BLM assumed that areas recommended for withdrawal from locatable mineral entry to be withdrawn for the purposes of this analysis. The BLM would make recommendations for withdrawals, but adoption of the Proposed RMP would not actually withdraw lands from locatable mineral entry because the BLM does not have the authority to withdraw lands from locatable mineral entry. Congress can designate withdrawals from locatable mineral entry or the BLM can begin a withdrawal process for a decision to be signed by the Secretary of Interior. Any such future withdrawals would affect only new claims and would not alter or affect valid existing claims.

The BLM ranked each ACEC, RMA, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible Wild and Scenic River (WSR) that would be recommended for withdrawal as high, medium, or low, in terms of the their potential development for mineral resources. While not a Mineral Potential Report, this ranking is based on geology, mining claim density, historic mines, prospects, and occurrences. This ranking can be used to determine the potential impact to mineral development for each recommended withdrawal. Withdrawing areas ranked as high would be expected to have a greater impact to the possible development of a mineral resource then withdrawing areas ranked as low. The BLM also analyzed the potential impacts on mining claim fee revenue.

While the BLM will not complete a formal mineral potential report for locatable minerals for this RMP revision, prior to an actual withdrawal, the BLM must prepare a mineral potential report for each recommended withdrawal proposal.

The BLM estimated the historic mineral occurrence and development for each ACEC, RMA, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible WSRs that the BLM would recommend for withdrawal from locatable mineral entry under each action alternative and the Proposed RMP. For this evaluation, the BLM relied on the Mineral Resource Map of Oregon (1984) for geology, location of mineral deposits, and mining history, and on LR2000 for the number of claims per quarter section of closed and active mining claims. The rankings vary from high to low in terms of historic mineral occurrence or development.

Under the action alternatives and the Proposed RMP, the BLM would recommend areas such as ACECs, RMAs, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible WSRs for withdrawal from locatable mineral entry because locatable mineral development in such areas would conflict with or preclude management of the special values for which the BLM would designate such areas. If not withdrawn, locatable mineral development under the Mining Law of 1872 could still occur within these areas, which could result in loss of the special values for which the BLM would designate these areas through this RMP revision.

High historic mineral occurrence or development areas include—

- Regions with historic gold mining;
- Areas with laterites and beach placers that contain more than 10 active or closed mining claims:
- Areas with favorable geology for mineral production or potential and also containing more than 10 active or closed mining claims; and
- Areas with more than 30 active or closed mining claims.

Medium historic mineral occurrence or development areas include—

- Areas with favorable geology for mineral production or potential;
- Areas with laterites, beach placers, and no mining claims; and
- Areas with 1–30 active or closed mining claims.

Low historic mineral occurrence or development areas are any areas that do not fall into the high or medium categories.

The Planning Criteria, which the BLM incorporates here by reference (USDI BLM 2014, p.104), provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales.

Background

Locatable minerals include gold, silver, copper, lead, zinc, nickel, and chromite as well as certain nonmetallic minerals determined to be uncommon such as fluorspar and certain varieties of limestone. The Mining Law of 1872 as amended gives citizens the right to prospect, explore, and develop locatable minerals on lands open to mineral entry. BLM regulations in 43 CFR 3000 – Minerals Management: General, 3700 – Multiple Use; Mining, and 3800 – Mining Claims under the General Mining Laws, establish procedures for locating mining claims and the surface management and occupancy of mining claims. Regulations include preventing unnecessary or undue degradation, compliance with Federal and state laws, and operation performance standards. Development of locatable minerals on O&C lands and Coos Bay Wagon Road lands are covered under specific regulations (43 CFR 3821).

A withdrawal from locatable mineral entry removes lands from the location of new mining claims and places certain requirements on existing mining claims for development of the minerals. After lands are withdrawn, the BLM will not approve a Plan of Operations or allow Notices to proceed until the BLM has prepared a mineral examination report to determine mining claim validity. Cost recovery applies to this process. The action alternatives and the Proposed RMP would make recommendations for withdrawals but would not actually withdraw lands from locatable mineral entry. As explained above in Analytical Methods, the BLM does not have the authority to withdraw lands from locatable mineral entry.

Surface management regulations at 43 CFR 3809.11(c) require a Plan of Operations for any mining operations causing surface disturbance greater that casual use in some special areas, including designated ACECs, areas designated as part of the National Wilderness Preservation System, areas in the National Wild and Scenic Rivers System, and areas designated as *closed* for public motorized access (as defined in 43 CFR 8340.0–5). In addition, the regulations at 43 CFR 3809.11(c)(6) require a Plan of Operations for any mining operations causing surface disturbance greater than casual use in any lands or waters known to contain federally proposed or ESA-listed threatened or endangered species or their proposed or designated critical habitat, unless BLM allows for other action under a formal land-use plan or threatened or endangered species recovery plan.

The Proposed RMP, pursuant to 43 CFR 3809.11(c)(6), would create two exceptions to the requirement such that a Plan of Operations is required for any mining activities greater than casual use such as Notice-level operations when the activities are located within lands or waters known to contain federally proposed or ESA-listed threatened or endangered species or their proposed or designated critical habitat. Under the Proposed RMP, an operator would not be required to submit a Plan of Operations for Notice-level activities in the following two situations:

- When pursuant to Section 7 of the ESA, the BLM determines that the notice-level activity will have no effect on federally proposed or listed threatened or endangered species or their proposed or designated critical habitat
- When the BLM has completed consultation to the extent required under section 7(a)(2) of the ESA and the U.S. Fish and Wildlife Service or National Marine Fisheries Service has concurred with the BLM's finding that the notice-level activity is not likely to adversely affect federally proposed or listed threatened or endangered species or their proposed or designated critical habitat (**Appendix B**)

In contrast, the action alternatives would allow Notice-level mining proposals located in lands or waters known to contain federally proposed or ESA-listed threatened or endangered species or their proposed or designated critical habitat to remain a Notice if the BLM determines that the proposal would have no effect on ESA-listed species or their proposed or designated critical habitat (USDI BLM 2015, p. 923).

Affected Environment

The planning area contains over 3,300 occurrences of locatable mineral resources and has a long history of mineral development (DOGAMI MILO). BLM mining claim records show that approximately 39,500 claims have been located on public lands in the planning area since the BLM recording requirements began with the passage of the FLPMA. The 1,292 mining claims in the decision area indicate ongoing interest in locatable minerals.

Table 3-98 lists the number of mining claims, Notices, and pending or authorized Plans of Operation in the decision area by district. **Figure 3-114** illustrates the general locations of mining claims in the decision area.

Table 3-98. Mining claims, Notices, and pending or authorized Plans of Operation in the decision area as of 2015

District/ Field Office	Mining Claims	Notices	Plans of Operation- Pending or Authorized
Coos Bay	42	1	-
Eugene	47	1	-
Klamath Falls	1	-	-
Medford	1,039	21	8
Roseburg	149	-	1
Salem	14	1	-
Totals	**1,292**	**24**	**9**

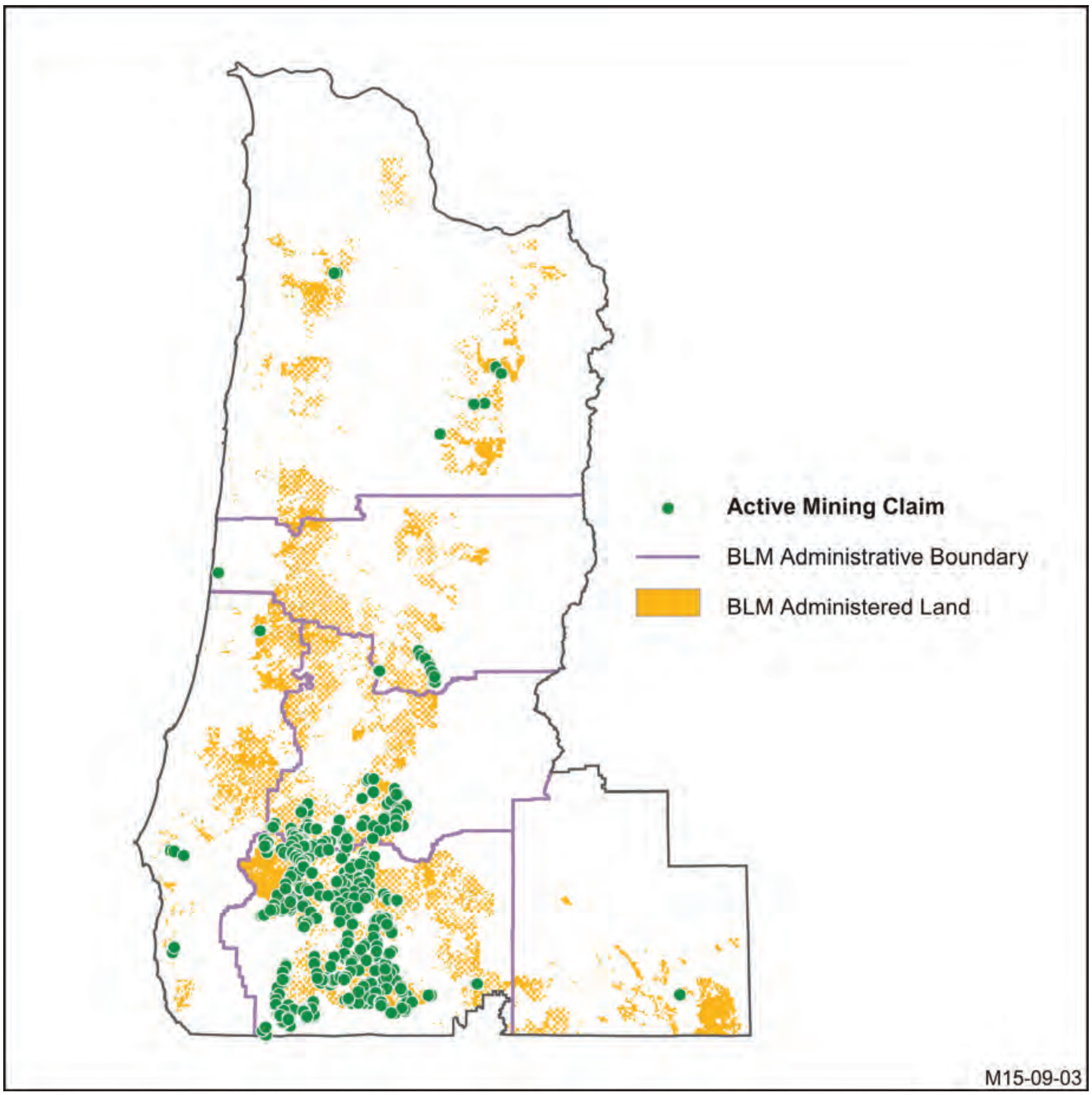

Figure 3-114. Mining claims in the decision area in 2015

Table 3-99 shows by district the 98,400 acres currently withdrawn from locatable mineral entry. These lands would continue to be withdrawn acres under the alternatives and the Proposed RMP.

Table 3-99. Acres of lands previously withdrawn from locatable mineral entry in the decision area

District/ Field Office	Previously Withdrawn From Locatable Minerals (Acres)*
Coos Bay	12,500
Eugene	15,700
Klamath Falls	5,400
Medford	37,600
Roseburg	5,100
Salem	22,100
Total	**98,400**

* Data from the 2008 Final EIS (USDI BLM 2008)

See **Appendix M** for a description of the trends in locatable mineral developments and regulations.

Environmental Consequences

Figure 3-115 and **Table 3-100** illustrate previously withdrawn acres in addition to the acres that the BLM would recommend for withdrawal from locatable mineral entry by alternative and the Proposed RMP for ACECs, RMAs, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible WSRs.

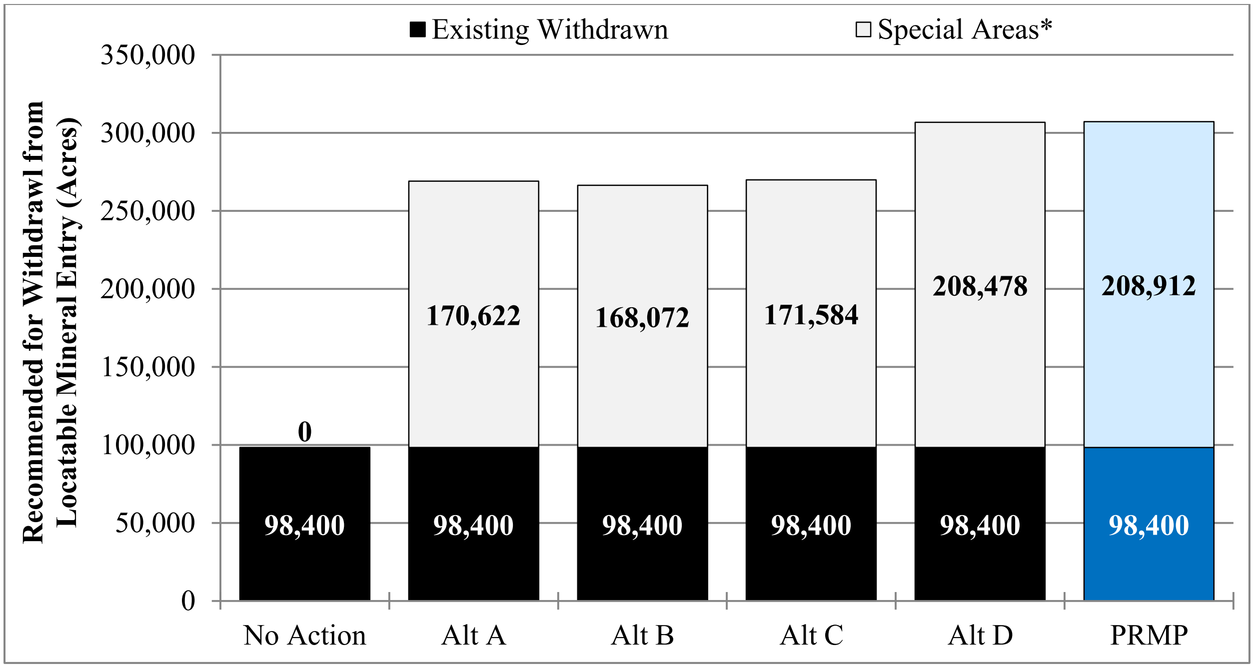

Figure 3-115. Acres that the BLM would recommend for withdrawal from locatable mineral entry and previously withdrawn acres in the decision area

* ACECs, RMAs, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible Wild and Scenic Rivers.

Table 3-100. Acres the BLM would recommend for withdrawal from locatable mineral entry and previously withdrawn acres in the decision area

Land Category	No Action	Alt. A	Alt. B	Alt. C	Alt. D	PRMP
Special Areas* (Acres)		170,622	168,072	171,584	208,478	208,912
Special Areas* (Percent)		6%	6%	6%	8%	8%
Previously Withdrawn (Acres)	98,400					
Previously Withdrawn (Percent)	4%					
Totals (Acres)	**98,400**	**269,022**	**266,472**	**269,984**	**306,878**	**307,312**
Totals (Percent)	**4%**	**10%**	**10%**	**10%**	**12%**	**12%**

* ACECs, RMAs, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible Wild and Scenic Rivers

About 4 percent of the 2.5 million acre decision area is currently withdrawn from locatable mineral entry (**Table 3-100**). These acres would remain withdrawn under the alternatives and the Proposed RMP. Under the action alternatives and the Proposed RMP, the BLM would recommend increasing the lands withdrawn from locatable mineral entry; this increase would range from 168,072 acres under Alternative B to 208,912 acres in the Proposed RMP. Alternative D and the Proposed RMP would more than triple the acres of lands withdrawn by recommending the most acres for withdrawal. Given the variances in acreage data because of geographic overlap, there is no appreciable deviation in acreage recommended for withdrawal under Alternative D and the Proposed RMP (**Table 3-100**).

Recommending the withdrawal of an additional 6–8 percent of the decision area would affect the development of locatable mineral resources. To understand the effects of the recommended withdrawals, the BLM ranked the estimated historic mineral occurrence or development for the acres of land for each ACEC, RMA, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible WSRs that the BLM would recommend for withdrawal under each action alternative and the Proposed RMP. **Figure 3-116** shows this ranking by alternative and the Proposed RMP with the proportion of acres that fall into each mineral ranking category (High, Medium, and Low). Existing withdrawals are not analyzed or ranked, but the acres are included in **Figure 3-116**.

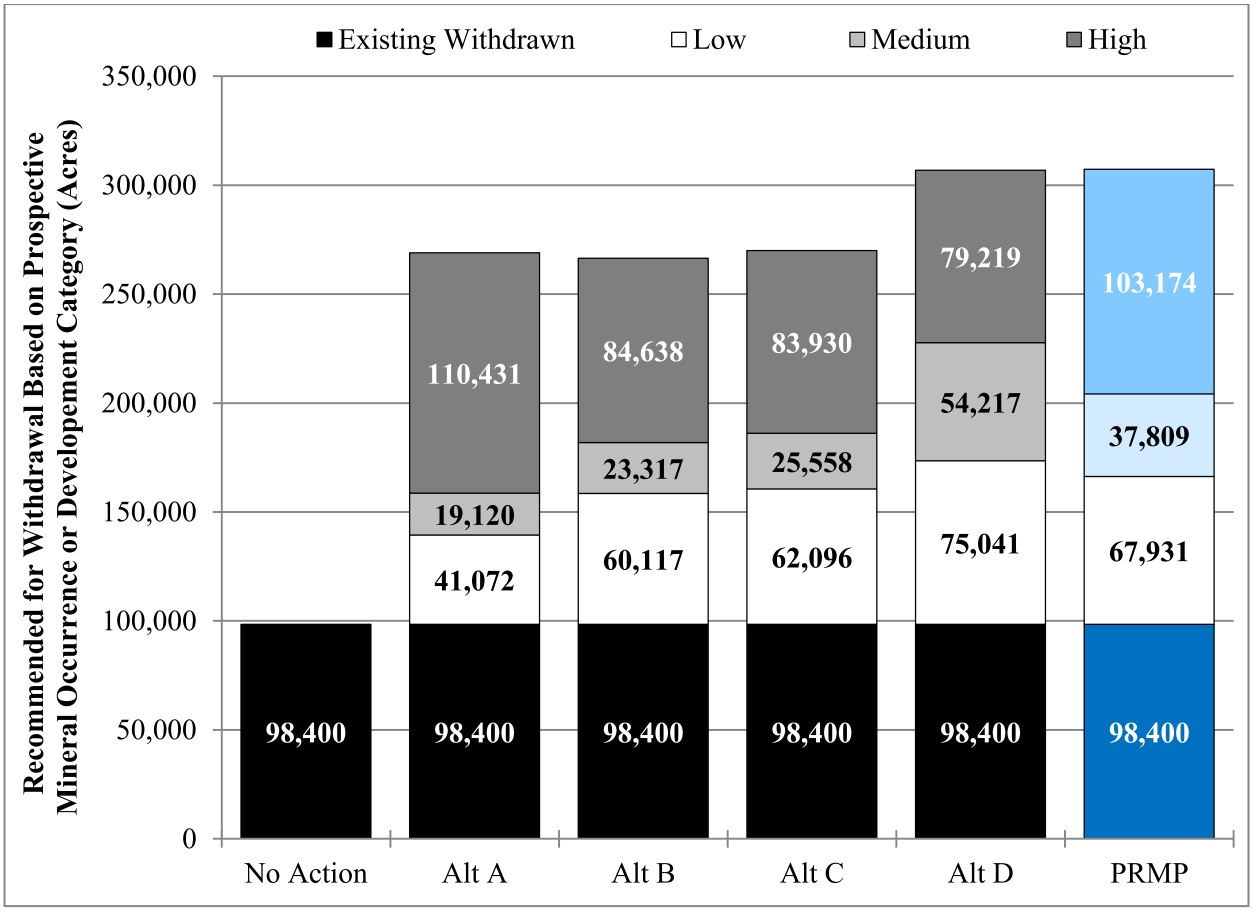

Figure 3-116. Acres that the BLM would recommend for withdrawal, with mineral ranking of estimated prospective mineral occurrence or development for each land category (includes previously withdrawn acres)

Figure 3-116 shows that the alternatives vary in the acreage of lands recommended for withdrawal as High for prospective mineral occurrence or development. Recommendations for withdrawal of lands ranked Medium or Low would have substantially less risk of curbing the development of known and undiscovered mineral resources. Alternative A would recommend for withdrawal of the largest acreage of lands that ranked High (110,431 acres) and Alternative D would recommend for withdrawal of the least acreage of lands that ranked High (79,219 acres). The Proposed RMP would recommend for withdrawal 103,174 acres of lands ranked High, which is approximately half of the total acres recommended for withdrawal. Removal of these High-ranked lands from locatable mineral exploration and development would influence the development of mineral resources. Although Alternative D and the Proposed RMP would recommend the largest acres for withdrawal, Alternative A would have the largest impact on the development of mineral resources, as it would recommend for withdrawal of the largest acreage of High-ranked lands.

Appendix M contains the estimated ranking of each ACEC, RMA, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible WSR recommended for withdrawal from locatable mineral entry.

An additional effect that would occur in association with withdrawing additional lands from locatable mineral entry is a potential reduction of revenue collected from public lands through mining claim fees paid to the government. To illustrate how this type of withdrawal would affect fees, LR2000 records list about 3,500 mining claims located in the areas that the BLM would recommend for withdrawal from locatable mineral entry under the action alternatives and the Proposed RMP. Using the current fee structure for mining claim location, this amount represents approximately $742,000 in revenue paid to the government. In addition to these filing fees, there are mining claim maintenance fees (currently $140 per year) that in most cases must be paid annually; however these fees are not included in this estimate. While withdrawals would not extinguish existing claims, the public cannot file new claims in lands that are withdrawn from locatable mineral entry, which results in no new fees collected. However, holders of existing claims would still pay maintenance fees as applicable.

Issues Considered but not Analyzed in Detail

How would the alternatives affect the acres of land with fluid leasable mineral restrictions of no surface occupancy, conditional surface use, and timing limitations?

Site-specific stipulations such as no surface occupancy, conditional surface uses, and timing restrictions would be imposed on each lease as necessary to protect other resource values under the alternatives and the Proposed RMP. The BLM is identifying such stipulations for certain areas (**Appendix M**), but as access to fluid resources is not closed, and there are no interests in development, there would be no foreseeable effects of the alternatives and the Proposed RMP regarding mineral leasing of oil, gas, or Coalbed Natural Gas resources. The stipulation of no surface occupancy may affect geothermal resources the most. The Sustainable Energy section in this chapter contains more information.

The action alternatives and the Proposed RMP would impose fluid mineral stipulations on each ACEC, RMA, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible WSR. **Table 3-101** lists the acres for which the BLM would propose stipulations. The No Action alternative contains the most acreage with stipulations, and Alternative A would contain the least. The Proposed RMP would propose stipulations on 246,747 acres. The differences in the action alternatives and the Proposed RMP are due to differing arrangements in each alternative and the Proposed RMP across ACECs, RMAs, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible WSRs. It is important to note that while the No Action alternative acreage includes only acres to which the BLM has applied no surface occupancy stipulations, the action alternatives and the Proposed RMP acreages include all proposed stipulations to include no surface occupancy or conditional surface uses based on resource protection needs (**Appendix M**).

Table 3-101. Acres that would have leasable stipulations in the decision area for ACECs, RMAs, District-Designated Reserve – Lands Managed for their Wilderness Characteristics, and eligible WSRs

	No Action (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	Alt. D (Acres)	PRMP (Acres)
Leasable stipulations	692,100*	190,389	211,638	318,915	498,525	246,747

* The No Action alternative acres include only those acres with no surface occupancy

Acreage not included in **Table 3-101** are site-specific stipulations as needed to protect ESA-listed threatened and endangered species and their critical habitats.

The BLM did not complete reasonably foreseeable development scenarios and Mineral Potential Reports for leasable minerals for this Proposed EIS/Final EIS. All estimates are based on a broad-scaled 'trends' review, which presents professional opinion rather than a methodological approach.

Appendix M includes a review in trends in leasable mineral developments and development guidance.

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National Trails System

Key Points

- Alternative D would provide the largest National Trail Management Corridor and would protect the largest number of acres within the viewshed. However, these acres would only account for 9 percent of all viewable acres.
- Under the Proposed RMP, the BLM would administer 23 percent of the visible acres of BLM-administered lands within the viewshed as the Pacific Crest Trail's National Trail Management Corridor.

Summary of Notable Changes from the Draft RMP/EIS

- The BLM conducted an updated viewshed analysis that captures the entire section of the Pacific Crest Trail within the planning area. This updated analysis includes acres of BLM-administered lands that are visible anywhere along the Pacific Crest National Scenic Trail within the planning area regardless of ownership.

Issue 1

How would the alternatives affect the BLM's ability to protect National Trails?

Summary of Analytical Methods

The BLM considered how the designation of various widths of National Trail Management Corridors by alternative and the Proposed RMP would affect the values and uses associated with the trails. The BLM conducted a trail viewshed analysis for the portion of the Pacific Crest Trail that passes through BLM-administered lands in the planning area to determine the percent of BLM-administered lands within the trail's viewshed.

For the purposes of this analysis, the BLM assumed that the management decisions for National Trail Management Corridors would adequately protect the values and uses associated with the National Trails. The BLM bases this assumption on the management direction applied to these corridors under all alternatives and the Proposed RMP. Within the corridors, the BLM will—

- Manage the trail consistent with the intended uses and designated classifications under the National Trails System Act of 1968;
- Designate a Special Recreation Management Area;
- Authorize special recreation permits if they do not adversely affect Pacific Crest Trail values and Resources;
- Manage for Visual Resource Management Class II;
- Designate as *closed* to public motorized access;
- Close to recreational target shooting;
- Conduct timber harvest to protect or maintain recreation setting characteristics or to achieve recreation objectives;
- Apply a controlled surface use stipulation on surface occupancy and surface-disturbing activities;
- Recommend for withdrawal from locatable mineral entry;
- Close to salable mineral material disposal; and

- Apply stipulations for leasable minerals, including no surface occupancy, controlled surface use, and timing limitations (**Appendix M**).

Background

Congress designated three classifications of trails for public use under separate criteria established in the National Trails System Act of 1968, Sec. 3(a). The following definitions provide an overview of the scenic and historic classification types, the allocation through which agencies manage the trails, and the specific trails that pass through the BLM-administered lands within the planning area. See the discussion for Alternatives Considered but Not Analyzed in Detail at the end of this section for discussion of recreation classification trails.

A National Trail Management Corridor is a designation based on Section 7(a) of the National Trails System Act 'rights-of-way.' A National Trail Management Corridor includes public land area of sufficient width to encompass National Trail System resources, qualities, values, and associated settings. For the purposes of this planning effort, a National Trail Management Corridor includes all BLM-administered lands containing resources, values, and associated settings that support purposes of a given National Trail.

A BLM-designated National Trail Corridor includes other Federal lands, State trust lands, private land, or other interests in lands, including split estates, which contain National Trail resources, qualities, values, and associate settings. Although these lands are included within the management corridor, they are not subject to BLM management. Interested landowners may voluntarily elect to participate in National Trail management on private or State lands through a cooperative agreement.

National Recreation Trail

The Secretary of the Interior can designate National Recreation Trails within parks, forests, and recreation areas; or where other lands administered by the Department of the Interior are involved. These would be subject to the consent of the appropriate administering agency having jurisdiction over the lands involved. There are four designated National Recreation Trails within the planning area that overlap with BLM-administered lands within the decision area. These four trails are discussed under "Issued Considered but Not Analyzed in Detail" at the end of this section.

National Scenic Trail

Only Congress can establish National Scenic Trails, which are extended trails intended to provide for maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historical, natural, or cultural qualities of the areas through which the trails pass. A portion the Pacific Crest National Scenic Trail is within the decision area.

Pacific Crest National Scenic Trail

The Pacific Crest National Scenic Trail (Pacific Crest Trail) is a long-distance hiking and equestrian trail closely aligned with the highest portion of the Sierra Nevada and Cascade mountain ranges. The Pacific Crest Trail was designated a National Scenic Trail in 1968. The trail's southern terminus is on the U.S. border with Mexico and its northern terminus is on the U.S. border with Canada; the trail travels through the states of California, Oregon, and Washington. The Pacific Crest Trail is 2,663 miles long and ranges in elevation from just above sea level at the Oregon-Washington border to 13,153 feet in the Sierra Nevada mountain range.

The Pacific Crest Trail enters BLM-administered lands in the decision area from California along the crest of the Siskiyou Mountains east of Mt. Ashland, proceeds east towards Soda Mountain, and then continues northeasterly along the western Cascades to the Rogue River-Siskiyou National Forest boundary. Hikers can access the Pacific Crest Trail by numerous Federal, State, and county roads. Although the trail is accessible from roads, the trail itself is *closed* to motorized and mechanized use. **Table 3-102** shows the Pacific Crest Trail mileage by ownership within the decision area.

Table 3-102. Pacific Crest Trail mileage by ownership within the decision area

Landowner	Trail Length (Approximate Mileage)
BLM	17.0*
Private	10.7
State of Oregon	0.9
U.S. Forest Service	16.6
Totals	**45.2**

* The BLM manages approximately 14 additional miles of the Pacific Crest Trail outside of the planning area in the Cascade-Siskiyou National Monument.

The main use of the BLM-administered segment of the Pacific Crest Trail is for day hikes, primarily by residents of the Rogue Valley. The main recreational activity within the Pacific Crest Trail on BLM-administered lands is hiking, followed by equestrian use. In addition to these activities, sightseeing, wildlife observation, photography, camping, and hunting occur. Cross-country skiing occurs along the trail in the winter. The BLM estimates that day use along the BLM-administered segment of the Pacific Crest Trail is approximately 25,000 visitors annually.

The purpose of the Pacific Crest Trail is to provide a high quality hiking and horseback-riding experience, highlighting the scenic, natural, historic, and cultural resources along the high ridges of the Pacific mountains. The Pacific Crest Trail was designed and is managed to provide the most primitive recreational experience possible, as identified through the BLM's Recreation Opportunity Spectrum (USDI BLM 2011). A National Trail Management Corridor permanently protects the Pacific Crest Trail including side and connecting trails and facilities such as campsites, water sources, and viewpoints. Public lands within the trail corridor, including lands acquired and managed for the Pacific Crest Trail, are managed to maximize a natural appearing landscape where human development does not dominate the viewer's experience, and meet a minimum visual quality retention objective. The Pacific Crest Trail experience is managed cooperatively and seamlessly across unit and agency boundaries and with substantial involvement of citizen stewards.

National Historic Trail

Only Congress can establish National Historic Trails, which are extended trails that follow as closely as practicable to the original routes of travel of national historic significance. Their purpose is to protect historic routes and their historic remnants for public use and enjoyment. Portions of the California National Historic Trail-Applegate Trail route and the Oregon National Historic Trail route are within the decision area. The Oregon National Historic Trail is discussed under "Issued Considered but Not Analyzed in Detail" at the end of this section.

California National Historic Trail-Applegate Trail Route

The National Park Service is preparing a feasibility study to evaluate 41 routes as possible additions to the California National Historic Trail. The Applegate Trail route is one route under evaluation. Congress authorized this study under the Omnibus Public Land Management Act of 2009 (Pub. L. 111-11). Approximately 10.9 miles of the Applegate Trail route are located on BLM-administered lands within the planning area. **Table 3-103** shows a mileage breakdown by ownership, within the planning area boundaries.

Table 3-103. California National Scenic Trail-Applegate Trail route mileage breakdown by ownership within the planning area

Landowner	Trail Length (Approximate Mileage)
BLM	10.9
Private	410.6
State of Oregon	5.0
Totals	**426.5**

The California National Historic Trail follows the route taken by farmers, settlers, gold miners, and others who forged their way from Missouri to the Pacific Coast during the California gold rush. The California National Historic Trail is approximately 2,400 miles in length spanning across the western half of North America. The first half of the California National Historic Trail followed the same corridor of networked river valley trails as the Oregon Trail and the Mormon Trail. The California National Historic Trail splits into the Applegate Trail route just north of the Oregon-California border.

The purposes of the California National Historic Trail are to enable all people to envision and experience the heritage and effects of the western overland migration and to encourage preservation of its history and physical remnants. The California National Historic Trail is significant for several reasons. First, it was one of the major highways of the 19th century and provided a 2,400-mile path for emigrants to the West. The arrival of these emigrants dramatically changed the peoples, cultures, and landscapes of the northwest. The California National Historic Trail's route originated through earlier use by Native American and western explorers and travelers.

Affected Environment

Pacific Crest National Scenic Trail

The BLM's Medford District currently manages as a Special Recreation Management Area (SRMA) the approximately 16 miles of the Pacific Crest Trail (**Figure 3-117**) that passes through the planning area. The current SRMA plan established a 100-foot wide (50 feet off centerline) National Trail Management Corridor for the trail. The BLM administers approximately 488 acres within this corridor. The Klamath Falls Field Office manages an additional mile of the Pacific Crest Trail. The BLM has not established a National Trail Management Corridor for the portion of the Pacific Crest Trail that passes through the Klamath Falls Field Office.

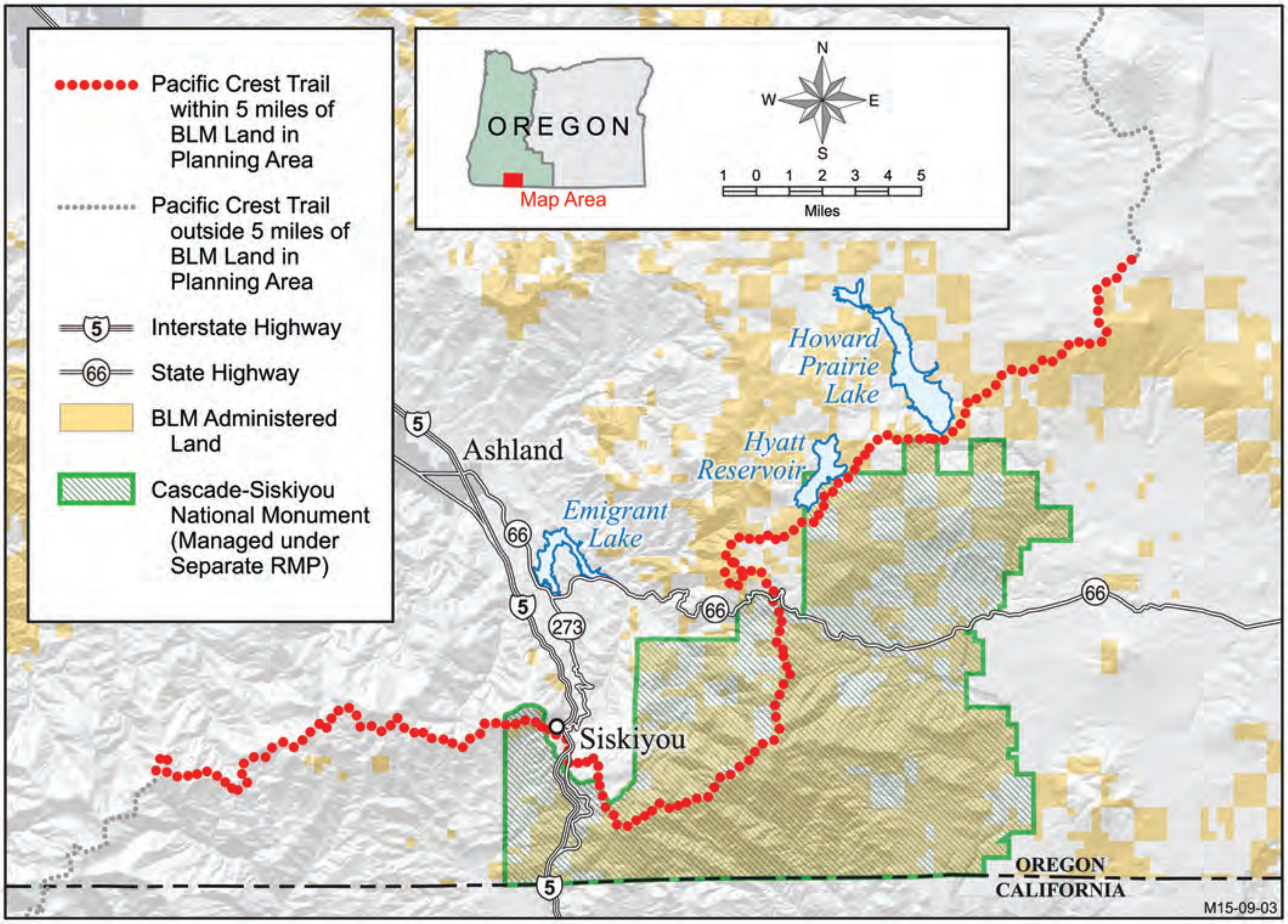

Figure 3-117. Pacific Crest National Scenic Trail route on BLM-administered lands within the planning area

Pacific Crest National Scenic Trail Viewshed Analysis

A viewshed is the area of a landscape that can be directly seen under favorable atmospheric conditions from a viewpoint or along a corridor. Within the planning area, the Pacific Crest Trail viewshed area is defined as the area of the landscape within 5 miles on either side of the Pacific Crest Trail route. This definition is based on the assumption that the average traveler along the Pacific Crest Trail has the ability to see 5 miles from any point along the trail. This 5-mile viewshed is a fixed-distance measurement and includes areas outside of the planning area and areas that are not visible from the trail, such as back-face slopes or terrain blocked by trees. Thus, in addition to determining the acres of BLM-administered lands within the 5-mile viewshed, the BLM also determined the acres of BLM-administered lands actually visible from the trail. The BLM conducted the viewshed analysis based on available digital elevation data. The results of this analysis are displayed in **Figure 3-118** and **Table 3-104**.

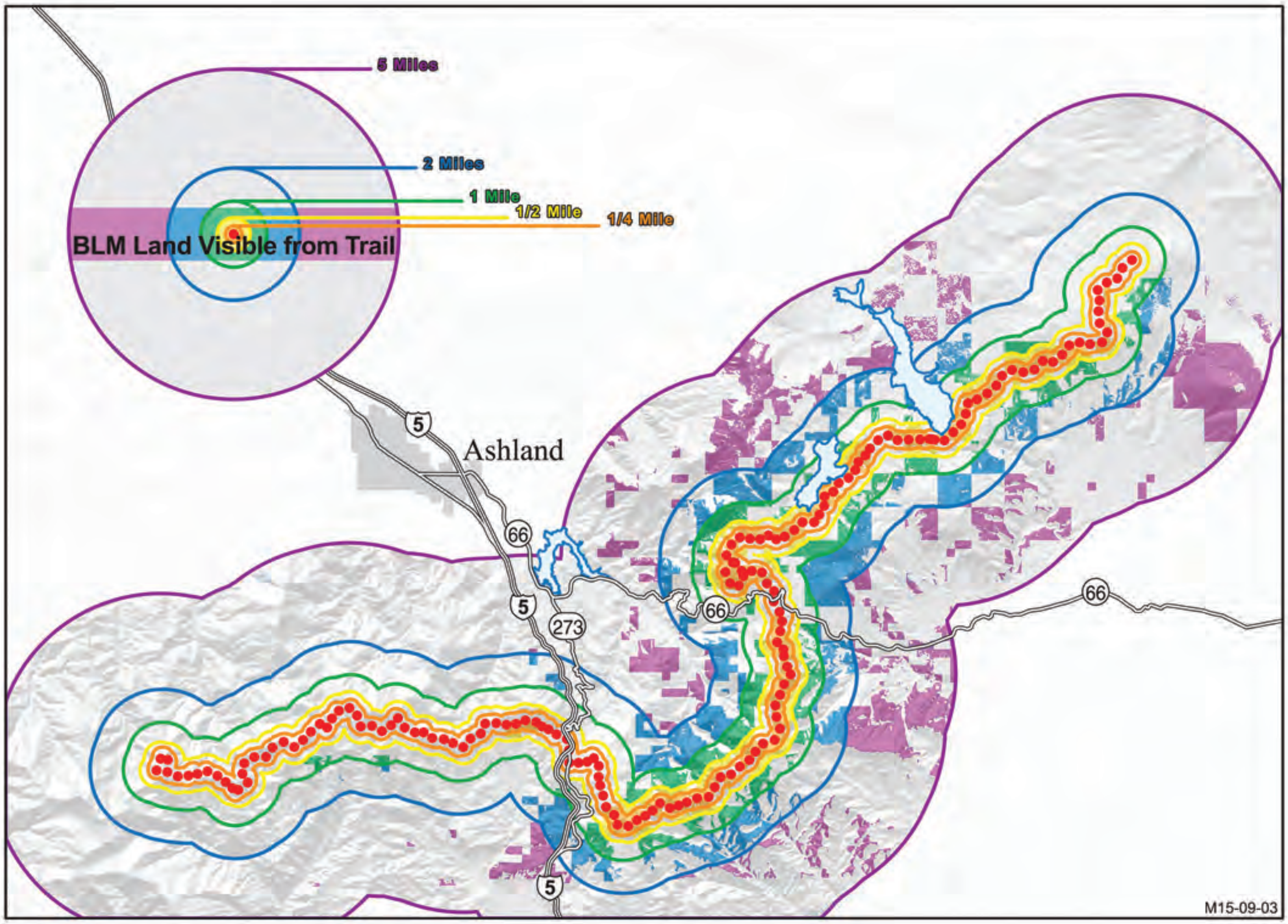

Figure 3-118. BLM-administered lands visible within the 5-mile Pacific Crest Trail viewshed of trail portions within the planning area

Table 3-104. Pacific Crest Trail viewshed results for BLM-administered lands within the 5-mile viewshed distance of trail portions

Description	All Lands (Percent)
BLM-administered lands within the Pacific Crest Trail Viewshed	30%
BLM-administered lands within the Pacific Crest Trail Viewshed that are visible from anywhere along the Pacific Crest Trail	60%
BLM-administered lands within the Pacific Crest Trail Viewshed that are visible and within the planning area (does not include lands within the Cascade-Siskiyou National Monument).	64%

California National Historic Trail-Applegate Trail Route

The BLM does not currently have an established National Trail Management Corridor for the portion of the Applegate Trail route that passes though BLM-administered lands within the planning area. **Figure 3-119** illustrates the portions of the Applegate Trail route under evaluation as an addition to the California National Historic Trail on BLM-administered lands within the planning area.

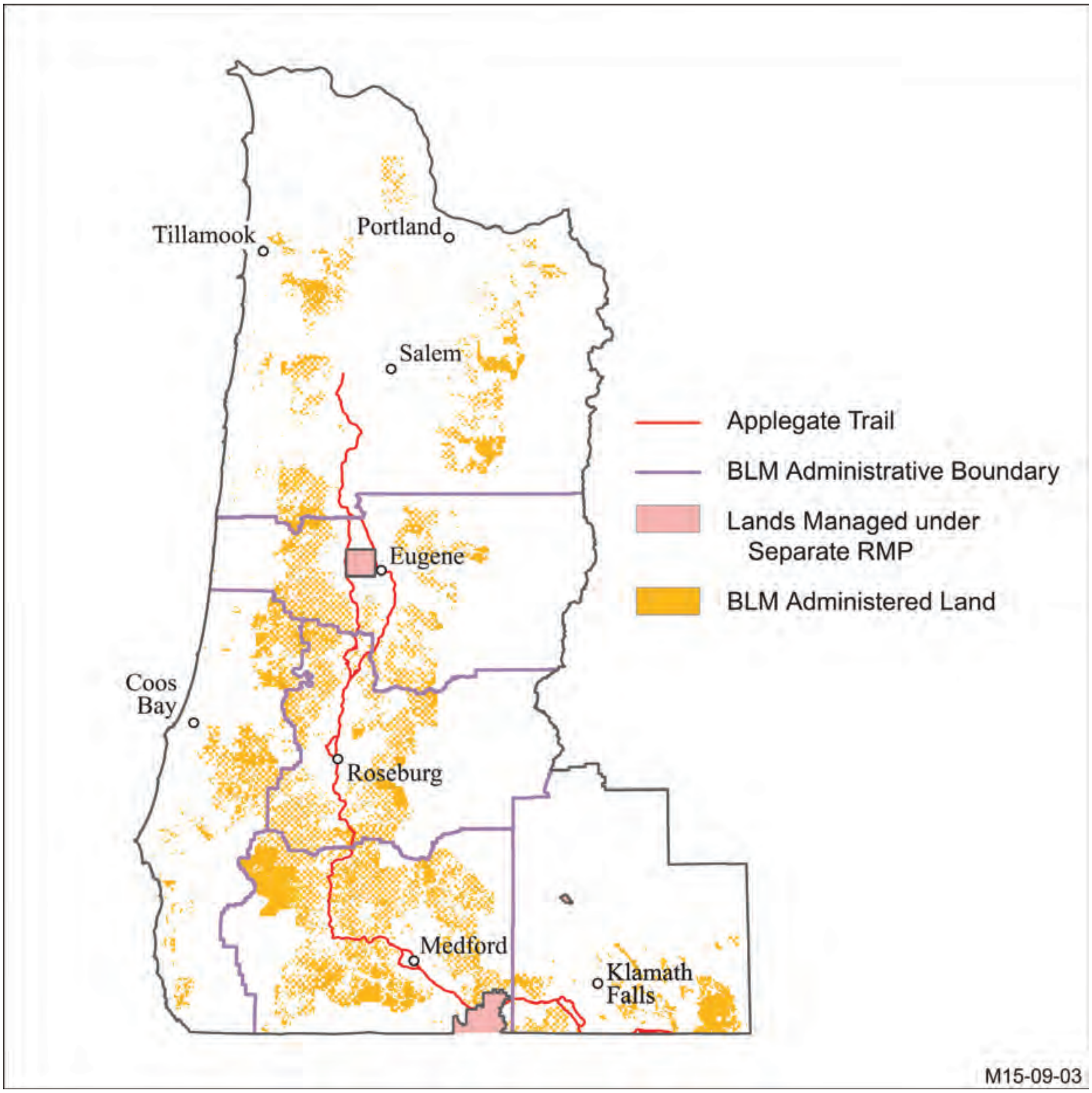

Figure 3-119. Applegate Trail route on BLM-administered lands in the planning area

Environmental Consequences

The variation in effects between alternatives and the PRMP is driven by the application of differing widths of the National Trail Management Corridor. As described above, the management within the corridor would be permanent and protective across alternatives and the Proposed RMP.

California National Historic Trail-Applegate Trail Route

The No Action alternative does not provide protections for the Applegate Trail route portion of the California National Historic Trail because no National Trail Management Corridor currently exists. The No Action alternative would result in impacts to the Applegate Trail route of the California National Historic Trail's resources, values, recreation setting, and primary uses because protective management direction does not exist for BLM-administered lands within the planning area.

Under all action alternatives and the Proposed RMP, the BLM would establish a 100-foot wide National Trail Management Corridor (50-feet off centerline) along all portions of the Applegate Trail route of the California National Historic Trail study route that cross BLM-administered lands within the planning area. The BLM established this corridor based on the trail's purposes, significance, and values warranting protection as identified through inventory assessments conducted by the National Park Service as part of the Comprehensive Management Plan (USDI NPS 1999) analysis, local knowledge of the route's terrain and vegetation within the planning area, and based on professional judgment. Application of this 100-foot buffer under all action alternatives and the Proposed RMP would result in adequate protection of National Historic Trail's resources, values, setting characteristics, and primary uses for which the Applegate Trail route of the California National Historic Trail is currently being studied.

Pacific Crest National Scenic Trail

The BLM would establish a National Trail Management Corridor on the 17 miles of the Pacific Crest Trail that crosses BLM-administered lands within the planning area. This corridor width would vary across the alternatives and the Proposed RMP. In this analysis, the BLM considers the effects of these widths on Pacific Crest Trail resources, values, recreation settings, and primary uses.

Despite the differing National Trail Corridor widths, all alternatives and the Proposed RMP would provide for outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historical, natural, or cultural qualities of the areas through which the trail passes. The smallest width, under the No Action alternative, would still meet the minimum requirement for protection of these resources. The management of the Trail Management Corridor would provide beneficial recreational outcomes for users and protect the trail setting characteristics.

The variance of the National Trail Corridor widths under the alternatives and the Proposed RMP would influence the acres managed within the Pacific Crest Trail viewshed under differing Visual Resource Management Classes. **Table 3-105** shows the BLM acres, percentage, and percentage of visible acres present in the Pacific Crest Trail corridor by alternative and the Proposed RMP. This table also shows the total acres of BLM-administered lands visible from the BLM portion of the Pacific Crest Trail.

Table 3-105. Acres of BLM-administered lands in the planning area within Pacific Crest Trail National Trail Management Corridor

Areas	No Action	Alt. A	Alt. B	Alt. C	Alt. D	PRMP
Trail corridor width	100 feet	500 feet	0.25 mile	1 mile	2 miles	1 mile
BLM-administered lands within the corridor (Acres)	210	987	2,338	6,891	10,928	6,891
BLM-administered lands within the corridor (Percent of all lands)	30%	29%	27%	22%	19%	22%
Percent of BLM-administered lands within the 5-mile viewshed and within the corridor (Percent of all lands)	< 1%	2.5%	6%	17.8%	28.2%	17.8%
Percent of BLM-administered lands visible within 5 mile viewshed and within the corridor (Percent of all visible lands)	< 1%	3.7%	8.5%	23.2%	34.4%	23.2%

Under the most protective management (Alternative D), the BLM would administer 34 percent of the total visible acres of BLM-administered lands within the viewshed as the Pacific Crest Trail's National Trail Management Corridor. The BLM would administer less than 1 percent of these acres for these purposes under the least protective management (No Action alternative). The Proposed RMP would administer 23 percent of the visible acres of BLM-administered lands within the viewshed as the Pacific Crest Trail's National Trail Management Corridor. Within the 1-mile corridor under Proposed RMP, 77 percent of lands within the corridor on either side of the Pacific Crest Trail are not BLM-administered lands and would be subject to landscape changes outside of the BLM's control.

Under all alternatives and the Proposed RMP, the BLM would manage BLM-administered lands outside of the relevant National Trail Management Corridor width, but visible within the 5-mile viewshed, under the Visual Resource Management class assigned to those acres. Visual Resource Management Class IV and, to some extent, Class III lands exist within the viewshed, therefore, the BLM could implement management activities that result in visible changes to the landscape.

No Action Alternative

Under the No Action alternative, the BLM would continue to provide a 100-foot National Trail Management Corridor off centerline (50 feet on each side) on the Pacific Crest Trail. This would result in the protection of 210 acres of BLM-administered lands along the 17-mile segment of the Pacific Crest Trail within the planning area. Compared to the acres of visible BLM-administered lands from the Pacific Crest Trail (24,765 acres), the No Action alternative would preserve less than 1 percent of the visible BLM-administered lands within the planning area from the Pacific Crest Trail for the enjoyment of the nationally significant, scenic, historic, natural, or cultural qualities of the areas through which the trail passes. The No Action alternative provides the least amount of protection to the Pacific Crest Trail's resources when compared with all alternatives and the Proposed RMP. Visible changes to the natural landscape within the majority of the viewshed of the Pacific Crest Trail would be possible based on ownerships and Visual Resource Management classes, including more than 99 percent of visible BLM-managed lands.

Alternative A

Under Alternative A, the BLM would establish a 500-foot National Trail Management Corridor off the centerline (250 feet on each side) on the Pacific Crest Trail. This would result in the protection of 987 acres of BLM-administered lands along the 17-mile segment of the Pacific Crest Trail within the planning area. Alternative A would protect 4 percent of the 24,765 acres of BLM-administered lands within the planning area that are visible from the Pacific Crest Trail using the protective management direction described in the Analytical Methods section above.

Alternative A provides greater protection to the Pacific Crest Trail's resources when compared with the No Action alternative and less protection when compared to the remaining action alternatives and the Proposed RMP. Visible changes to the natural landscape within the majority of the viewshed of the Pacific Crest Trail would be possible based on ownerships and Visual Resource Management classes, including approximately 96 percent of visible BLM-managed lands.

Alternative B

In Alternative B, the BLM would establish a 0.25-mile National Trail Management Corridor off the centerline on the Pacific Crest Trail (660 feet on each side). This would result in the protection of 2,338 acres of BLM-administered lands along the 17-mile segment of the Pacific Crest Trail within the planning area. Alternative B would protect 9 percent of the 24,765 acres of BLM-administered lands within the planning area that are visible from the Pacific Crest Trail using the protective management direction described in the Analytical Methods section above.

Alternative B provides greater protection to the Pacific Crest Trail's resources than the No Action alternative and Alternative A, and less protection than Alternatives C and D, and the Proposed RMP. Visible changes to the natural landscape within the majority of the viewshed of the Pacific Crest Trail would be possible based on ownerships and Visual Resource Management classes, including approximately 91 percent of visible BLM-managed lands.

Alternative C and the Proposed RMP

In Alternative C and the Proposed RMP, the BLM would establish a 1-mile National Trail Management Corridor off the centerline (1/2 mile on each side) on the Pacific Crest Trail. This would result in the protection of 6,891 acres of BLM-administered lands along the 17-mile segment of the Pacific Crest Trail within the planning area. Alternative C and the Proposed RMP would protect 23 percent of the 24,765 acres of BLM-administered lands within the planning area that are visible from the Pacific Crest Trail using the protective management direction described in the Analytical Methods section above.

Alternative C and the Proposed RMP provides greater protection to the Pacific Crest Trail's resources than the No Action alternative and Alternatives A and B, and less protection than Alternative D. Visible changes to the natural landscape within the majority of the viewshed of the Pacific Crest Trail would be possible based on ownerships and Visual Resource Management classes, including approximately 77 percent of visible BLM-managed lands.

Users of the Pacific Crest Trail would be able to see variation in the landscape, including the forested landscapes of both BLM-administered lands beyond 1-mile and privately owned forested lands within all distances, along the trail route. Within the 1-mile National Trail Management Corridor, the BLM would protect BLM-administered lands within the corridor from visible change through land management actions. However, due to the checkerboard nature of the BLM-administered lands within the planning area, users on the trail would still experience changes within the 1-mile corridor on non-BLM-administered lands not managed for the Pacific Crest Trail's scenic values. Additionally, the visibility of changes to the landscape, both within the National Trail Management Corridor and in the visible area outside the corridor, would not be visible from all sections of the trail, as many portions traverse through densely forested stands, which prevent opportunities for long-distance views and scenic vistas. Users of the Pacific Crest Trail typically seek opportunities for the scenic values offered by both forested stands and opportunities for scenic vistas over valley floors. Because of the intermixed ownership, the designation of a 1-mile National Trail Management Corridor would continue to provide both these opportunities along the trail route within the planning area.

Alternative D

In Alternative D, the BLM would establish a 2-mile National Trail Management Corridor off the centerline (1 mile on each side) on the Pacific Crest Trail. This would result in the protection of 10,928 acres of BLM-administered lands along the 17-mile segment of the Pacific Crest Trail within the planning area. Alternative D would protect 34 percent of the 24,765 acres of BLM-administered lands within the planning area that are visible from the Pacific Crest Trail using the protective management direction described in the Analytical Methods section above.

Alternative D provides the largest level of protection to the Pacific Crest Trail's resources compared to the other alternatives and the Proposed RMP. Alternative D provides protection on five times the acres as the No Action alternative. Visible changes to the natural landscape within the majority of the viewshed of the Pacific Crest Trail would be possible based on ownerships and Visual Resource Management classes, including approximately 66 percent of visible BLM-managed lands.

Issues Considered but Not Analyzed in Detail

How would the alternatives affect the management of designated National Recreation Trails within the decision area?

The Secretary of the Interior can designate National Recreation Trails within parks, forests, and recreation areas; or where other lands administered by the Department of the Interior are involved. The National Trails System Act of 1968 authorizes the National Recreation Trail designations, which are given to existing trails that have been nominated and meet the requirements for connecting people to local resources and improving their quality of life. To be designated, a trail must be open to public use and be designed, constructed, and maintained according to best management practices, in keeping with the use anticipated. Designation must be supported by the appropriate administering agency or by the landowner having jurisdiction over the lands involved. The Secretary of Interior or the Secretary of Agriculture may designate National Recreation Trails to recognize exemplary trails of local and regional significance in response to an application from the trail's managing agency or organization.

Unlike National Historic Trails or National Scenic Trails, National Recreation Trails are managed solely for the recreational use of the designated trail. No additional management beyond the trail management (i.e., for scenic or historical values) are needed. There are four designated National Recreation Trails within the decision area (**Table 3-106**).

Table 3-106. National Recreation Trails within the planning area

Trail Name	District	Year Designated	Total Trail Length (Miles)	BLM Trail Ownership (Miles)
North Umpqua	Medford	1992	15.7	8.6
Old Growth Ridge	Eugene	1994	1.5	1.5
Row River	Eugene	2005	15.5	15.5
Rogue River	Medford	1981	40.0	21.5

Effects to these trails would occur as analyzed in detail for Recreation Management Areas in the Recreation and Visitor Services section of this chapter. In summary, each of these trails would receive management of the recreational values consistent with the designed uses through designation as Recreation Management Areas under all alternatives and the Proposed RMP, except the No Action alternative and Alternative A. Under the No Action alternative, these trails would continue to receive management consistent with the BLM's 1981 recreation management policy, which could allow other land management actions to result in undesired changes to managed recreation sites. Under Alternative A, trailheads for these trails would be managed recreation sites, but the trails themselves would not be designated for recreation management. These existing trails would deteriorate over time and could be removed from the landscape in favor of other resource uses.

How would the alternatives affect the management of the Oregon National Historic Trail?

Approximately 2.5 miles of the Oregon National Historic Trail occurs within the decision area, but is managed by the National Park Service throughout this length. The cultural resources program inventories the trail. The portions of the trail within the decision area are established, paved roads, and the roads are largely not under the management and ownership of the BLM. Established BLM-managed roads would be designated to the District-Designated Reserve land use allocation under all alternatives, which directs for the management of roads for the purposes for which the BLM constructed them, and would result in the maintenance of the BLM-managed sections of the trail route. BLM-managed lands that occur along the trail route include Congressionally Reserved Lands along the Sandy River (approximately 2 miles) and lands designated as Late-Successional Reserve (approximately 0.5 miles). The management of these land use allocations would retain the existing character of the Oregon National Historic Trail route.

References

USDI NPS. 1999. Comprehensive Management and Use Plan/Final Environmental Impact Statement: California National Historic Trail, Pony Express National Historic Trail; Management and Use Plan Update/Final Environmental Impact Statement: Oregon National Historic Trail, Mormon Pioneer National Historic Trail. USDI National Park Service, Salt Lake City, UT. 339 pp. http://www.nps.gov/cali/learn/management/upload/CALI-CMP-SM-updated.pdf.

Rare Plants and Fungi

Key Points

- Only two ESA-listed plant species potentially occur within the Harvest Land Base under all alternatives and the Proposed RMP: Kincaid's lupine and Gentner's fritillary. The BLM would conduct pre-disturbance surveys and apply conservation measures for these two species under all alternatives and the Proposed RMP.
- The six ESA-listed plant species within the decision area are shade-intolerant.
- The BLM would manage Bureau Sensitive plant and fungi species under the Bureau's Special Status Species program under all alternatives and the Proposed RMP. However, under Alternative D, the BLM would manage these species on O&C lands only in such a way that would not conflict with sustained-yield timber production.
- None of the action alternatives or the Proposed RMP would include the Survey and Manage Measures; therefore, species that are Survey and Manage and not included on the Bureau Sensitive species list would receive no specific protections.
- All action alternatives and the Proposed RMP allocate more acres to the Late-Successional Reserve than the No Action alternative, which would benefit rare plants and fungi associated with Mature and Structurally-complex forest.

Summary of Notable Changes from Draft RMP/EIS

In this Proposed RMP/Final EIS, the BLM has made the following major changes from the Draft RMP/EIS:

- Updated information to reflect that the Siskiyou mariposa lily is no longer a candidate for ESA-listing
- Updated and revised numbers of Bureau Special Status and Survey and Manage species based upon the most recent lists
- Corrected the table on Survey and Manage species sites to reflect only current rather than historic sites
- Expanded the analysis of Survey and Manage species to address specifically the species that a prior analysis determined would have insufficient habitat or for which there was insufficient data to make a determination of outcomes if the Survey and Manage mitigation measure were removed under the Northwest Forest Plan.
- Added specific analysis of effects of designation of reserves on Bureau Special Status vascular plant sites
- Expanded analysis of effects of livestock grazing on Bureau Sensitive plant and fungi species within active livestock grazing allotments
- Expanded the discussion of the effect of management activities on oak communities as a separate issue

Issue 1

How would management activities (such as timber harvest, livestock grazing, and mineral development) affect Bureau Special Status plant and fungi species and Survey and Manage species?

Summary of Analytical Methods

Bureau Special Status Species include ESA-listed, proposed, candidate species, and Bureau Sensitive species. There are 258 Bureau Special Status plant and fungi species within the planning area: 163 vascular plants, 40 bryophytes (mosses and liverworts), 17 lichens, and 26 fungi. BLM State Directors can designate rare and threatened species known or suspected to occur on BLM-administered lands within their respective states as Bureau Sensitive. The BLM State Director of Oregon and Washington can also designate species as Bureau Strategic, a tracking or 'watch list' category that is not part of the Bureau Special Status Species program. These are species that botanists currently know little about and are known or suspected to occur on BLM-administered lands.

Of the 258 plant and fungi Bureau Special Status Species within the planning area, there are 169 documented species on BLM-administered lands. The remaining 89 species are suspected or likely to occur on BLM-administered lands. These suspected species are included on the Bureau Special Status Species list because known sites occur nearby, their range coincides with the decision area, or suitable habitat exists on BLM-administered lands.

Separate from the Bureau Special Status Species program, little-known species thought to be associated with late-successional or old-growth forests currently receive special management attention under the Survey and Manage measures (USDA FS and USDI BLM 1994). Some of the Survey and Manage species qualify for inclusion on the Bureau Sensitive species list. Of the 247 Survey and Manage plant and fungi species within the planning area, 39 are also on the Bureau Sensitive list and 59 are on the Bureau Strategic list.

Rare plant and fungi species are not evenly distributed across the landscape. Many rare plant and fungi species are difficult to detect through surveys. Distribution data is incomplete for rare plant and fungi species and special habitats within the decision area. Additionally, the BLM cannot accurately identify at this planning scale the location and timing of future management activities that might affect these species and their habitats. These compounding uncertainties complicate the analysis of effects on rare plant and fungi species.

The BLM used species occurrence data where it was available to evaluate the effects of management actions on rare plants and fungi. Botanists have surveyed only a portion the decision area, generally as a pre-disturbance survey for an individual project (e.g., timber harvest). For vascular species, site data in the BLM regional database (GeoBOB) is likely to overstate the actual number of sites and individuals per population due to the historical age of the data and lack of revisits to the sites. Conversely, this database may under-represent sites of non-vascular and fungi species, because these organisms are difficult to count and map. Despite these limitations, the BLM used this incomplete survey data to describe the relative differences among the alternatives and the Proposed RMP.

Because there is generally little existing information about the habitat needs and distribution of most of the rare plants and fungi to assess effects at the site level, this analysis assumed that the BLM will survey for rare plants and fungi prior to habitat-disturbing activities except within the Harvest Land Base under Alternative D. Surveys are considered 'likely,' as BLM botanists currently conduct surveys for habitat-disturbing projects, the surveys are considered practical to conduct, and yield good results to use in assessing project effects to rare botanical species. However, in some cases, other tools may be utilized to determine the effect of a project, particularly if the projects is small in size or timing is critical. Those tools may include the following:

- Evaluation of species-habitat associations and presence of suitable or potential habitat
- Application of conservation strategies, plans, and other formalized conservation mechanisms
- Review of existing survey records, inventories, and spatial data

- Utilization of professional research, literature, and other technology transfer sources
- Use of expertise, both internal and external, that is based on documented, substantiated professional rationale

For the analytical methods used in the assessment of impacts to rare plants and fungi, the BLM assumes project surveys to be the likely method used to assess project effects, but other tools may be utilized, as appropriate. As discussed in the background section, fungi are especially difficult to detect even with repeated visits. The BLM assumed that the surveys for rare fungi would be incidental to surveys for rare plants and that botanists would record all Bureau Special Status plant and fungi species encountered during surveys. However, targeted and repeated surveys for fungi would only occur under the No Action alternative where equivalent-effort fungi surveys are required for Survey and Manage fungi for projects in old-growth forests.

A variety of management actions can affect rare plants and fungi directly through the potential removal of sites or habitat and indirectly through increased risk of spread of non-native competing vegetation or risk of soil erosion. Some management actions may have both positive and negative impacts upon rare plants and fungi. Some individual management actions may favor one rare species over another. Because there are many rare plant and fungi species, survey and species data is incomplete, and effects from management actions are often variable, it is not feasible to quantify effects from each management activity and even less feasible to combine the effects of different actions on rare plants and fungi. For this analysis, the BLM analyzed the effects of management actions by alternative and the Proposed RMP on rare plants and fungi, but did not attempt to summarize quantitatively the overall effect on rare plants and fungi. Instead, the BLM provides a qualitative and comparative summary of the cumulative effect of different actions on rare plants and fungi.

Timber Harvest and other Vegetation Management

The BLM evaluated the effect of timber harvest and fertilization on rare plants and fungi. Other vegetation management treatments have the potential to affect rare plants and fungi, but it is not possible to identify differences in effects among the alternatives and the Proposed RMP at this scale of analysis with the data available.

Timber harvest methods (clearcuts, regeneration harvest with retention, selection harvest, and thinning) influence the magnitude of the effect of timber harvest on rare plants and fungi and the extent to which habitat and sites are within the Harvest Land Base. At this planning scale, it is not possible to identify accurately the location and timing of specific future timber harvests that would affect plant and fungi habitat. However, in this analysis the BLM evaluated the relative magnitude of the effect of timber harvest on rare plants and fungi based on some broad analytical assumptions.

In this analysis, the BLM evaluated effects of timber harvest on rare plant and fungi habitat based on the difference in the acreage of timber harvest among alternatives and the Proposed RMP. The BLM assumed that clearcut harvest would have a greater magnitude of effects on rare plant and fungi habitat than other harvest methods, because it would not retain any structural legacies within the harvested area. Although there would be differences in intensity of harvest among the other harvest methods, it is not possible at this scale of analysis with the data available to distinguish the potential differences in effects on rare plant and fungi habitat among the harvest methods other than clearcuts.

While rare fungi may be found in younger stands, Mature Multi-layered Canopy, and Structurally-Complex stands provide habitat for the majority of the rare fungi on the Bureau Sensitive and the Survey and Manage lists (USDA FS and USDI BLM 2000, p. 8; USDA FS and USDI BLM 2004, p. 30). The BLM specifically evaluated effects on rare fungi based on the acreage of Mature Multi-layered Canopy, and Structurally-Complex stands within the Harvest Land Base under each alternative and the Proposed RMP.

The BLM evaluated how the Harvest Land Base overlaps with rare plant and fungi habitat and known sites under each alternative and the Proposed RMP. The BLM assumed that timber harvest activities would not affect Survey and Manage plant and fungi sites directly in the No Action alternative because of Survey and Manage program requirements for pre-disturbance surveys and site protection. The BLM assumed that Bureau Sensitive plant sites and known Bureau Sensitive fungi sites would not be directly affected by timber harvest activities except under Alternative D, because of pre-disturbance surveys for plant species and site protection for all Bureau Sensitive plant and fungi species. Under Alternative D, some sites within the Harvest Land Base would be directly affected by timber harvest, because the BLM would only protect known sites on O&C lands where protection would not conflict with sustained-yield timber production. The BLM assumed that under Alternative D, there would be no additional pre-disturbance surveys for timber harvest and the BLM would rely on existing information and habitat evaluations to assess the site-specific effects of timber management activities on Bureau Sensitive species. For the purposes of this analysis, the BLM assumed that sites within the Harvest Land Base of Survey and Manage plant and fungi species that are not Bureau Sensitive would eventually be lost because of timber harvest under the action alternatives and the Proposed RMP. The BLM assumed that loss of host trees from timber harvest could directly affect rare plants and fungi. The BLM assumed that changes to their habitat from timber harvest under all alternatives and the Proposed RMP could indirectly affect rare plant and fungi species, such as through the introduction or spread of invasive species.

In this analysis, the BLM assumed that fertilization would reduce habitat quality for rare plants and fungi. Although fertilization would promote growth of all vascular species, many rare plant species are adapted to low nitrogen soils and cannot utilize added nitrogen as readily as conifer species. Non-native species also benefit from added nitrogen, giving them a competitive advantage over many rare plant species. Nitrogen fertilization reduces ectomycorrhizal fungi species richness, the higher the rate of added nitrogen, the greater the decrease in ectomycorrhizal fungi (Ryden *et al*. 1997, Berch *et al*. 2006).

Site preparation and fuel reduction treatments, including prescribed burning and biomass treatments, would reduce slash from timber harvest and silviculture activities would remove hazard fuels in the Wildland Urban Interface (see the Fire and Fuels and Forest Management sections of this chapter). These treatments would affect rare plant and fungi species in the conifer and mixed evergreen forests, shrub communities, serpentine areas, and oak and hardwood woodlands habitat groups. Site preparation and fuel reduction treatments associated with timber harvest would primarily affect the conifer forest habitat group and oak and hardwood woodlands habitat groups. These treatments could adversely affect rare species by removing the substrate, host species, or modifying the microenvironment upon which the rare plant and fungi species depend. The effects of prescribed fire vary due to many factors including method (e.g., pile burning, under burning, and broadcast burning), type of fuels present, and topography. Effects range from low, where the litter and duff are charred or partially consumed, and the there is little change to the vegetative cover, to high, where litter and duff are completely consumed and there is considerable vegetation mortality. An indirect effect of prescribed burning is the potential increase in non-native species due to removal of competing vegetation, soil disturbance, increased sunlight, and nitrogen availability. Site preparation and fuel reduction treatments may provide beneficial effects on some rare plants and fungi, such as by reducing competition and shade. Vascular plant species not in the conifer habitat group are generally shade-intolerant and respond to increased light and reduction in plant competition with increased growth, flowering, and fruiting (USDA USDI 2003, USDI FWS 2006 and 2010, Giles-Johnson *et al.* 2010). However, any such potential effects, either adverse or beneficial, are highly dependent on site-specific and project-specific factors that cannot be identified at this scale of analysis.

Designation of Late-Successional Reserve and Riparian Reserve

In the Late-Successional Reserve, management objectives include maintaining and promoting habitat for the northern spotted owl and marbled murrelet. In the Riparian Reserve, management objectives include providing for the conservation of Bureau Special Status fish and protecting water quality. Habitat conditions favorable for northern spotted owls, marbled murrelets, and Special Status fish species are also favorable for many of the Bureau Special Status plants and fungi, particularly for the bryophytes, lichens, and fungi. Most of the Bureau Special Status vascular plants, however, are sun loving and require open canopy conditions. The BLM assumed in this analysis that vascular plant sites that require full or partial sun for growth and reproduction would eventually disappear in the reserve allocations without management to reduce canopy cover.

Livestock Grazing

In this analysis, the BLM assumed that livestock grazing would have both positive and negative effects on rare plants and the plant communities in which they occur.

On the positive side, some rare plant species benefit directly from periodic livestock grazing through increased vigor and growth. In areas with a large component of non-native annual grasses, livestock grazing may reduce the biomass of these grasses, allowing native species, especially annual species, to persist (Rilla and Bush 2009). Livestock grazing may also reduce fire fuels and help maintain grasslands that are at risk from shrub or tree invasion.

On the negative side, livestock may directly eat rare plants, reducing the plant's ability to recover and reproduce. Livestock also trample vegetation and may introduce and spread noxious and invasive weed species. Trampling impacts, however, are typically concentrated. In summer, the presence of water is much more important than in the winter, and livestock do not stray far from water. Heavy trampling disturbance occurs around holding pens, water sources, salt blocks, and trails between favored livestock grazing areas; livestock may completely denude these areas. Away from these resources, effects from trampling are usually dispersed.

The BLM evaluated the effects of livestock grazing on rare plants by comparing the acreage open to livestock grazing in each alternative and the Proposed RMP. Additionally, the BLM considered the presence of ESA-listed threatened and endangered plant species in active allotments.

ACEC Designation

The BLM designates ACECs where special management attention is required to maintain and protect relevant and important values. In this analysis, the BLM assumed that management for these relevant and important values would also be protective of rare plants and fungi. The BLM compared the acreage of ACECs to evaluate the protection for rare plants and fungi under each alternative and the Proposed RMP. Although rare plant and fungi species are not evenly distributed across the landscape, the BLM assumed in this analysis that all acres designated as ACECs would provide equivalent protection for rare plants and fungi. At this scale of analysis, the BLM does not have sufficient information to identify specific effects of specific ACEC designations on rare plant and fungi species.

Road Construction

In this analysis, the BLM evaluated the effects of road construction on rare plants and fungi based on the miles of new road construction during the first decade under each alternative and the Proposed RMP. The BLM assumed that new road construction would adversely affect rare plants and fungi because of direct disturbance and removal plants and fungi and from disturbance and removal of habitat. Road construction directly removes all vegetation in the construction zone, increases water runoff on the compacted or hardened surface (which can result in increased soil erosion immediately adjacent to the road), fragments habitat, creates a conduit for the introduction of noxious and non-native invasive plants, and increases access routes for public motorized vehicle use and camping. In this analysis, the BLM assumed that road construction would cause habitat disturbance and removal across a 45-foot width (see the Soil Resources section of this chapter).

Public Motorized Access Designations

In this analysis, the BLM assumed that areas designated as *open* for public motorized access would experience habitat removal and disturbance for rare plants and fungi. Where cross-country travel would occur, vehicles would crush vegetation, displace soils, and create trails that could potentially degrade occupied habitat and damage sites of rare plant and fungi species that may be scattered throughout the area. These conditions would allow for the introduction and dispersal of noxious and non-native weed species.

Although the BLM has some site-specific and anecdotal information about illegal public motorized travel activities, the BLM does not have a basis for predicting the location or effects of any widespread or systematic illegal public motorized travel activities. In addition, much of the decision area has physical limitations to potential illegal public motorized travel activities, including dense vegetation, steep slopes, and locked gates. Terrain, vegetation, and a greater amount of open spaces in most of the interior/south can lead to degradation and erosion in a greater proportion than the coastal/north where vegetation is denser and terrain is steeper. However, the BLM lacks a basis for characterizing current illegal public motorized travel activities or forecasting potential illegal public motorized travel activities in the future under any of the alternatives and the Proposed RMP at this scale of analysis. In this analysis, the BLM assumed that members of the public participating in motorized travel recreation would operate vehicles consistent with BLM decisions about public motorized travel opportunities (see the Trails and Travel Management section of this chapter).

Areas designated as *closed* for public motorized access would not experience habitat disturbance for rare plants and fungi, because the BLM would not permit public motorized vehicle activities. Areas designated as *limited* would not experience measurable additional habitat disturbance for rare plants and fungi, because the BLM would limit public motorized vehicle use to existing or designated roads and trails, which have already experienced disturbance through the original construction of the roads or trails. Until the BLM completes route designations through implementation-level travel management planning, the BLM cannot identify which routes the BLM would designate under a particular alternative or the Proposed RMP. Therefore, the BLM cannot quantify more site-specific effects in this analysis, and would address effects in implementation-level analysis.

Mineral Development

Within the decision area, the BLM's primary salable mineral material is quarry rock. The majority of this quarry rock is crushed aggregate used by the BLM, private companies, and local governments for road surfacing (see the Minerals section of this chapter). Quarry activities could have a detrimental effect on a small amount of habitat associated with rare plants and fungi in the rocky areas/outcrops, scree, serpentine, and conifer groups. The BLM also considered the effects of quarry activities on rare plants and fungi based on the acreage closed to salable mineral material disposal under each alternative and the Proposed RMP.

In this analysis, the BLM assumed that leasable mineral development would have no foreseeable effect on rare plants and fungi, because the BLM can impose site-specific stipulations, such as no surface occupancy, on each lease as needed to protect rare plant and fungi sites and habitat.

The BLM assumed that locatable mineral entry would adversely affect rare plants and fungi because of habitat removal and disturbance. The BLM evaluated this habitat removal and disturbance based on the acres that the BLM would recommend for withdrawal from locatable mineral development by alternative and the Proposed RMP. The BLM assumed in this analysis that areas recommended for withdrawal would protect rare plant and fungi sites and habitats from effects from locatable mineral entry. Locatable mining operations occur primarily in areas occupied by species in the rocky areas/outcrops/scree, serpentine, conifer, and riparian and aquatic habitat groups. While the number of sites of rare plants and fungi that intersect with mining operations would be few, where they do occur, the BLM assumed that these sites would be lost. The mining laws (see the Minerals section of this chapter) explicitly allow for consideration of ESA-listed or proposed species, but not for other BLM Special Status Species; therefore, the BLM assumed that sites of Special Status Species other than ESA-listed or proposed species would likely be extirpated and occupied habitat would be destroyed because of equipment operations and ground disturbance.

Background

The planning area is vegetatively diverse due to the physical geography of the area. The planning area falls within five of the Level III ecoregions[82] mapped by the Environmental Protection Agency: Willamette Valley, Coast Range, Cascades, Klamath Mountains, and Eastern Cascades Slopes and Foothills (Omernik and Griffith 2012).

Within Oregon, there are more than 4,677 recognized taxa of vascular plants (Oregon Flora Project 2013). There is a substantial diversity of non-vascular plants (bryophytes and lichens) and fungi within the planning area; however, there is not a single comprehensive list of these organisms, because scientists have not studied and catalogued these species as well as vascular plants. The majority of the plants and fungi found in Oregon are common, and the current threat of extinction is slight. Some species are naturally rare or uncommon due to many biological and physical factors. For example, some rare plant species are strictly associated with serpentine soils that occur in the planning area within the Klamath Mountains ecoregion (e.g., crinite mariposa lily (*Calochortus coxii*); Oregon Biodiversity Information Center 2014). Rare species may occur in very small numbers or may be abundant within a narrow distribution. Other rare species may have a broad distribution, but occur in small numbers where found (e.g., clustered lady's-slipper (*Cypripedium fasciculatum*); Oregon Flora Project 2014). Some species are rare because of changes to their habitat (e.g., farming, urban and rural development, mining, and road construction).

The distribution of rare plant species is not even across the landscape. Mapping of species sites provides distribution and density patterns. 'Hot spots' are areas of high Bureau Special Status Species richness and density. Hot spots can occur at fine spatial scales, such as special habitat features (meadows, wetlands, rock outcrops, and other non-forested areas), and at larger geographic scales, where high levels of endemism occurs on the broader landscape level (**Appendix N**). The figure in **Appendix N** is based upon data in the BLM's Geographic Biologic Observations (GeoBOB) database. Because the BLM does not have complete botanical surveys, that figure shows the relative density of Bureau Special Status Species sites based upon current data. Both **Table 3-107** and **Table 3-108** indicate that the largest abundance and density of Bureau Sensitive/Strategic plant sites within the planning area is within the Medford District.

[82] Ecoregions are areas within which ecosystems are generally similar based upon geology, vegetation, climate, and hydrology. These are different from the physiographic provinces described in **Figure 3-187**.

This is because the Medford District lies primarily within the Klamath Province, which has the highest total species richness of any province within the planning area. The complex geology of the Klamath Province supports diverse plant communities.

Table 3-107. Bureau Sensitive and Strategic plant and fungi sites by status and taxonomic group

District/ Field Office	Bureau Sensitive				Bureau Strategic				Totals (Number of Sites)
	Bryophytes (Sites)	Lichens (Sites)	Vascular Plants (Sites)	Fungi (Sites)	Bryophytes (Sites)	Lichens (Sites)	Vascular Plants (Sites)	Fungi (Sites)	
Coos Bay	14	128	195	19	57	10	11	57	**491**
Eugene	8	23	92	8	7	19	1	24	**182**
Klamath Falls	-	-	53	6	-	-	2	4	**65**
Medford	9	-	2,918	11	35	165	48	38	**3,224**
Roseburg	1	40	103	9	5	18	-	18	**194**
Salem	16	171	29	102	3	14	-	73	**408**
Totals	**48**	**362**	**3,390**	**155**	**107**	**226**	**62**	**214**	**4,564**

Table 3-108. Bureau Special Status, Strategic, and Survey and Manage plant and fungi sites documented between January 2009 and July 2013 in the decision area

District/ Field Office	Special Status (Number of Sites)	Strategic (Number of Sites)	Survey and Manage (Number of Sites)	Surveyed (Acres)
Coos Bay	9	2	15	8,217
Eugene	8	5	16	36,197
Klamath Falls	-	-	-	234
Medford	207	74	94	47,917
Roseburg	7	6	45	19,117
Salem	3	1	10	9,615
Totals	**226**	**88**	**180**	**121,297**

Field surveys are the best method to confirm presence or absence of rare species and to increase knowledge of range, distribution, and habitat characteristics. Based upon data available in the GeoBOB database as of November 2014, the BLM surveyed approximately 121,297 acres within the decision area from January 2009 to July 2013 and found a total of 226 new Bureau Special Status Species sites, 88 new Bureau Strategic species sites, and 180 new Survey and Manage species sites. These were typical pre-project surveys, not the Survey and Manage 'equivalent-effort' surveys. Thus, the BLM found 1 new Bureau Special Status, Bureau Strategic, or Survey and Manage plant or fungi site for every 246 acres surveyed on average over this time period. However, BLM found the majority of the new sites within the Medford District, which has 92 percent of the Special Status sites, 84 percent of the Bureau Strategic sites, and 52 percent of the Survey and Manage sites. The detection rate for the Medford District was 1 new site for every 128 acres surveyed, while the detection rate for the Eugene District was much less, with 1 new site found for every 1,248 acres surveyed. During this period, surveyors did not document any new sites of Bureau Special Status, Bureau Strategic, or Survey and Manage plant or fungi species within the Klamath Falls Field Office while conducting typical pre-project surveys.[83]

[83] 'Equivalent-effort' surveys conducted between 2011 and 2013 in the Klamath Falls Field Office did yield numerous sites of Survey and Manage fungi.

Certain species, especially fungi, are difficult to detect during much of the year (USDA FS and USDI BLM 2004, pp. 148–149). Many fungi grow below the soil surface or within down woody debris and surveyors can only detect them when their fruiting bodies are present. Most of the structure (mycelium) of fungi species is not visible, because it is within whatever substrate the fungus lives (e.g., logs, tree stumps, duff, and soil). Generally, botanists consider fungi impractical to survey for, because they do not produce sporocarps (fruiting bodies) every year, or do not produce sporocarps everywhere that they may occur, and the sporocarps are usually present for a short time. Most of the Bureau Special Status and Survey and Manage fungi are mycorrhizal and associated with conifer trees. Other species are decomposers or are parasites on other fungi. Even when sporocarps are present, they are an unreliable indicator of location and activity of mycelia (Dahlberg and Stenlid 1995). The presence of sporocarps demonstrates that the species is present, but visual observation cannot determine the extent of a fungi population. The plant community composition gives an indication of the fungi community under the surface. The plant community influences the development of mycorrhizal populations (i.e., when the aboveground vegetation changes, the fungi community also changes).

Likewise, many vascular plant species may germinate only when growing conditions are favorable for the species, and the presence of flowers may be required for positive identification. To optimize detection, botanists must conduct surveys during the appropriate season and when local field conditions are favorable for the species. The numbers of Special Status Species sites listed in **Table 3-108** represent a snapshot in time and give an indication of relative abundance and diversity of rare plant and fungi species among the BLM administrative units in the planning area. The BLM conducted the majority of the surveys for pre-disturbance surveys for individual projects (e.g., timber sales, culvert replacements, and noxious weed treatments). Survey efforts for these species have been biased in their location based on proposed land management projects.

Many rare plants are associated with distinct and narrow habitat types within larger vegetative communities shaped by geologic features and substrate, climate, and hydrologic influences. These habitats 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. Because they have persisted over time, these habitats have become refugia for unusual plant communities and rare species adapted to specialized environments. However, even within these habitats, rare species occur very infrequently.

Rare vascular plant species occur in a broad range of plant communities, habitat types, and substrates. Since vascular plants are generally large and botanists have studied them extensively, botanists have a good understanding of the habitats associated with each of the rare vascular plants. Bryophytes and lichens also occur in a variety of habitats. Many of these species are closely associated with a particular substrate (e.g., conifer tree boles), habitat condition (e.g., moist forest), and environment (e.g., near the coast); however, because they are smaller and often more difficult to identify than vascular species, botanists do not know as much about their habitats and range than they do about vascular species. Fungi occur in a number of forms. Most are mycorrhizal and usually associated with host species in conifer and hardwood forest communities. Because the fruiting body (e.g., mushroom) of a fungus is often the only part of the fungus visible, biologists often know little about the distribution, range, and habitat needs of rare fungi species.

Mycorrhizal fungi grow in a symbiotic relationship with vascular plant species. One or both organisms are dependent upon the other for food or resources. Mycorrhizal fungi depend upon actively growing root tips of the vascular plant with which it is associated. Mycorrhizal fungi populations change when the vascular plant community changes. Tree removal results in a decline in fine root activity and a similar reduction in the diversity of mycorrhizal fungi (Hagerman *et al*. 1999). Clear-cutting results in the loss of fungi species richness, (i.e., the larger the clearcut, the greater the impact to the mycorrhizal fungi community; Dural *et al*. 1999, Hagerman *et al*. 1999, Kranabetter and Kroeger 2001). Green tree retention and smaller clearcuts allow fungi to continue to persist in the harvested area and allow for early recolonization of mycorrhizal species post-harvest (Miller *et al*. 1998, Wiensczyk *et al*. 2002, Kranabetter and Kroeger 2001, Luoma and Eberhart 2005).

Biological factors play important roles in determining the distribution and abundance of a species. These factors include reproductive strategies, inbreeding depression, pollinators and pollination, consumption by herbivores, weed invasion, habitat connectivity, disease, predation, habitat change, and global climate change. Often the biological factors that affect a species' rarity are difficult to isolate or are interrelated, creating uncertainty as to the real cause of rarity. Some rare Oregon species appear to be remnant populations from historic plant communities that have shifted since the last ice age. Other rare species in Oregon are narrow endemics adapted over long periods to specific habitats or substrates, such as the serpentine endemic group. Some rare species may have evolved as isolated populations that are diverging morphologically from the greater population, or may be the result of hybridization (e.g., Gentner's fritillary). Certain rare species of lichens and bryophytes, while geographically widespread, appear to be locally adapted to narrow environmental conditions along the Pacific Northwest coast. A number of species in Oregon are rare due to loss of habitat and the introduction and spread of invasive plants.

Natural disturbances, such as wildfires, windstorms, and floods, change plant communities and habitat conditions for rare plants and fungi. Many factors determine whether a population will survive a disturbance, including the following:

- Type, extent, duration, and intensity of the disturbance
- Frequency and season of the disturbance
- Habitat and life cycle requirements of a species
- Adaptability of a species to a changed environment

Some rare plant species are adapted to frequent, low-intensity fires and respond positively in most cases (e.g., Bradshaw's desert-parsley; Kaye *et al.* 2001). Species such as Gentner's fritillary and Kincaid's lupine can respond positively to the increased light and moisture from the loss of overtopping and competing vegetation and the increase in nutrients available after a fire. Although certain species respond positively to disturbance, they remain rare because of infrequent disturbances, loss of habitat, and rapid invasion by annual weeds. Alternatively, fire consumes many rare lichen, bryophytes, and fungi, along with some vascular plants without fire-adaptive mechanisms. These sites, as well as their habitat and hosts, would be lost unless protected in a niche or island where the fire was absent or less severe.

Floods and debris flows alter riparian and aquatic plant communities and can alter the rare plant populations that occur in disturbed areas. These types of events are very dynamic, with some rare plant sites benefiting whereas others are lost. Although floods may appear to destroy the existing riparian and aquatic vegetation initially, they also deposit sediment, distribute seed, and reduce native and invasive vegetation. This facilitates vigorous re-sprouting and reseeding of riparian-associated shrubs, perennial and annual grasses, and forbs. For example, many rare rush and sedge species associated with streams and wetlands are adapted to periodic floods by prolific seed production.

ESA-listed Species

Twelve ESA-listed plant species occur or have occurred historically within the planning area. The BLM has documented six of these species within the decision area: Gentner's fritillary, western lily, Cook's lomatium, rough popcorn flower, Kincaid's lupine, and Nelson's checker-mallow. The U.S. Fish and Wildlife Service has designated critical habitat for four of the ESA-listed plants: Willamette Valley daisy, large-flowered wooly meadow-foam, Cook's lomatium, and Kincaid's lupine. The U.S. Fish and Wildlife has completed recovery plans for all of the ESA-listed plants within the planning area.

Gentner's fritillary is a member of the lily family (*Liliaceae*) and has showy deep red to maroon flowers on a single erect flowering stem arising from an underground bulb. The bulbs produce small bulblets that are loosely attached to the parent individual. These asexually produced bulblets are the primary means of reproduction for the species (Amsberry and Meinke 2007). Many Gentner's fritillary plants do not flower or flower only in some years, making positive identification of newly discovered sites difficult, because leaves are indistinguishable from other co-occurring fritillary species. Gentner's fritillary occurs in scattered locations throughout the Rogue and Illinois River watersheds within the Medford District. Habitat is diverse, ranging from Oregon white oak woodlands, moist riparian areas, Douglas-fir forests, and serpentine areas. The Medford District has surveyed an average of 40,000 acres per year for the years 2008–2013. On average, the surveyors found 1 new Gentner's fritillary site for every 4,400 acres surveyed in suitable habitat. Most sites are very small (i.e., less than 12 individuals). However, a few sites contain several hundred flowering plants with many more bulbs producing only vegetative leaves. There are currently 162 sites within the decision area. There are an additional 36 sites on BLM-administered lands within the Cascade-Siskiyou National Monument, which is outside of the decision area. Gentner's fritillary occurs within eight active livestock grazing allotments. The Medford District has surveyed all suitable habitats within livestock grazing allotments, and populations generally occur on steeper slopes outside of riparian areas, where livestock use is light. Botanists monitor the effects of livestock grazing on Gentner's fritillary, and there is little evidence of direct livestock grazing or trampling by livestock (M. Wineteer, BLM, personal communication, 2014). The Medford District has worked to augment sites by outplanting bulblets since 2002.

Western lily is a perennial in the lily family (*Liliaceae*) and occurs in a narrow strip along the immediate Pacific coast between Coos Bay, Oregon, and Eureka, California, in a variety of early successional habitats: freshwater wetlands, coastal prairie and scrub, and the edges of Sitka spruce forest. The single natural BLM site occurs within the New River ACEC in the Coos Bay District. An experimental introduction of Western lily within the New River ACEC in 1996 produced its first flowering plant in 2011, but the researcher has not noted any natural reproduction as of 2014 (Guerrant 2015). Suitable habitat for additional introductions within the New River ACEC is limited (T. Rodenkirk, BLM Botanist, personal communication, 2014).

Cook's lomatium is a perennial forb in the carrot family (*Apiaceae*). The species occurs in the Medford District in the Agate Desert of Jackson County on the edge of vernal pools and in the Illinois Valley in seasonally wet grassy meadows, oak woodlands, and serpentine meadow and shrub habitats. The largest populations on BLM-administered lands are in and adjacent to the French Flat ACEC. Rural development and recreational use threaten Cook's lomatium habitat in the Illinois Valley as illegal uses such as public motorized vehicle trespass and refuse dumping occasionally damage sites on BLM-administered lands, although the use of barricades and law enforcement efforts have successfully reduced effects in recent years (R. Showalter, BLM, personal communication, 2014). The BLM does not authorize livestock grazing of any habitats containing Cook's lomatium.

Rough popcorn flower is an annual to perennial herb in the borage family (*Boraginaceae*) that occurs in seasonally wet meadows or Oregon ash-swale openings in northern Douglas County in the Roseburg District. There are no naturally occurring populations of rough popcorn flower on BLM-administered lands. The Oregon Department of Agriculture, in cooperation with the BLM, planted three sites within the North Bank Habitat Management Area ACEC starting in 1998. One of these populations is thriving and has expanded to fill the potential habitat within the area. The second site is still extant; however, the number of plants has declined drastically over the years, likely due to a change in the site's hydrology. The BLM planted additional suitable habitat adjacent to the original planted location in 2006. The third population occurs in marginal habitat that is too dry for the species, and it is unlikely that the species still occurs there.

Kincaid's lupine is a long-lived herbaceous perennial species in the pea family (*Fabaceae*). It ranges from Lewis County, Washington, to Douglas County, Oregon. Botanists first described the species from the Willamette Valley, where most of the known and historic populations occur. The habitat for Kincaid's lupine in the Willamette Valley consists primarily of upland prairie remnants. Within the decision area, the primary habitat is open woodland and meadow edges, often near roadsides, associated with Pacific madrone, incense cedar, and Douglas-fir trees with a relatively open canopy cover. There are currently ten Kincaid's lupine sites known to occur in the decision area. In addition, there are five sites on BLM-administered lands within the West Eugene Wetlands, which is outside of the decision area. In 2006, the U.S. Fish and Wildlife Service designated critical habitat for Kincaid's lupine in the Willamette Valley and Washington State, but not in the southern portion of its range in Douglas County. The only designated critical habitat for Kincaid's lupine on BLM-administered lands is within the West Eugene Wetlands. In April 2006, the Roseburg District, U.S. Fish and Wildlife Service, and the Umpqua National Forest completed a programmatic conservation agreement for Kincaid's lupine in Douglas County (USDI BLM, USDI FWS, and USDA FS 2006). The three cooperating agencies completed the "Management Plan for Kincaid's Lupine in Douglas County, Oregon" in March 2008 (USDI BLM, USDI FWS, and USDA FS 2008). The management actions specified in the management plan tier to the management goals and objectives for the recovery of Kincaid's lupine (USDI FWS 2010). The primary threats to Kincaid's lupine in the planning area are forest succession and resulting canopy shading, noxious weed invasions, and road maintenance. In addition, the populations in the decision area are generally small and isolated from each other. This isolation limits the likelihood of cross-pollination between populations, which could result in inbreeding depression.

Nelson's checker-mallow is a long-lived perennial in the mallow family (*Malvaceae*) that occurs in the Willamette Valley from Benton County, Oregon, and north into Cowlitz and Lewis Counties, Washington. In the Willamette Valley, Nelson's checker-mallow occurs in wet prairies, stream sides, and occasionally in Oregon ash woodlands or among woody shrubs. On BLM-administered lands, the species occurs at one site in the Walker Flat ACEC on the Salem District. Most of the plants in this population occur on adjacent City of McMinnville property. Nelson's checker-mallow requires open habitats; succession and canopy closure is a threat to the species (USDI FWS 2012).

Siskiyou mariposa lily, a former candidate for ESA-listing, also occurs within the planning area. The U.S. Fish and Wildlife Service determined that the species did not warrant listing at this time (80 FR 60834), and this analysis addresses the species as a Bureau Sensitive species. Siskiyou mariposa lily is a perennial in the lily family (*Liliaceae*). It is endemic to three disjunct ridge tops in the Klamath-Siskiyou Range on the California-Oregon border. The habitat for the species is rocky openings within a montane shrub plant community. The one site on BLM-administered lands consists of 1–5 plants within a 54-square-foot area (USDI BLM, USDI FWS, and USDA FS 2013).

The following six species occur or occurred historically within the planning area, but are unlikely to occur in the decision area: Applegate's milk-vetch, Willamette Valley daisy, large-flowered wooly meadow-foam, Bradshaw's desert parsley, golden paintbrush, and water howellia.

Applegate's milk-vetch in the pea family (*Fabaceae*) is a narrowly distributed endemic, known to occur only in southern Klamath County, Oregon. It occurs within interior alkali grassland with rabbitbrush and greasewood in areas with periodic flooding and drying. Very little of this habitat is present on BLM-administered and is unlikely to occur in the Klamath Falls Field Office (R. Currin, U.S. Fish and Wildlife Service, personal communication, 2014, and J. Blanchard, personal communication, 2014).

Willamette Valley daisy in the sunflower family (*Asteraceae*) occurs in both wet and dry prairie grasslands within the Willamette Valley where woody cover is nearly absent and where herbaceous vegetation is low in stature. Five sites occur on BLM-administered lands within the West Eugene Wetlands, which is outside of the decision area. The only designated critical habitat on BLM-administered lands within the planning area is also within the West Eugene Wetlands.

Large-flowered wooly meadowfoam in the meadowfoam family (*Limnanthaceae*) is associated exclusively with the margins around shallow vernal pools in the Agate Desert of the Rogue Valley in Jackson County, Oregon. There are 18 extant sites within the Agate Desert on private, State, and Federal land managed by the Bureau of Reclamation (USDI FWS 2012b). There is no designated critical habitat on BLM-administered lands.

Bradshaw's desert parsley in the carrot family (*Apiaceae*) is restricted to wet prairie habitats with heavy clay soils. The majority of the known sites occur between Salem and Creswell, Oregon; however, two sites are known in Clark County, Washington (USDI FWS 2010). Seven sites occur on BLM-administered lands within the West Eugene Wetlands, which is outside of the decision area.

Golden paintbrush in the broomrape family (*Orobanchaceae*) historically occurred in the grasslands and prairies of the Willamette Valley, but agricultural, residential, and commercial development has extirpated all sites in Oregon. The species is currently known from 11 populations in Washington and British Columbia (USDI FWS 2010). Golden paintbrush was last seen growing wild in Oregon in 1938 in Linn County. Researchers began planting small numbers of golden paintbrush within the Finley and Basket Butte Wildlife Refuges in 2005 from seed collected in Washington to test restoration methods for the species (USDI FWS 2010).

Water howellia in the bellflower family (*Campanulaceae*) no longer exists in Oregon, but there are herbarium records showing that the species used to occur in at least four locations within the Willamette Valley and Columbia River floodplain. The species currently occurs in a few sites in Washington, Idaho, Montana, and California. The species appears to be restricted to small, vernal, freshwater wetlands, glacial pothole ponds, or former river oxbows that have an annual cycle of filling with water over the fall, winter, and early spring, followed by drying during the summer months (USDI FWS 1994).

Bureau Sensitive and Strategic Species

Based on BLM Manual 6840 – Special Status Species Management, the BLM would address Bureau Sensitive species and their habitats in land use plans and would implement measures to conserve these species and their habitats, to promote their conservation, and reduce the likelihood and need for these species to be listed under the Endangered Species Act. While the Special Status Species policy applies to all lands managed by the BLM: "The application of the Special Status Species policy to provide specific protection to species that are listed by the BLM as sensitive on lands governed by the O&C Act must be consistent with timber production as the dominant use of those lands" (BLM Manual 6840 – Special Status Species Management; USDI BLM 2008).

Bureau Strategic species are not Bureau Special Status for management purposes (IM-OR-2015-028). The only requirement for this group of species is that information for species sites located during any survey efforts would be entered into the BLM corporate database (GeoBOB). This analysis includes discussion of Bureau Strategic species to provide a more comprehensive analysis of rare plants and fungi in the decision area; effects to these species are typically not analyzed in project-level analyses.

In Oregon, the Sensitive and Strategic lists are tied to the Oregon Biodiversity Information Center (ORBIC) rankings. ORBIC is part of the Institute for Natural Resources that was created by the Oregon

Legislature with the Oregon Sustainability Act of 2001 (ORS 184.421). The ranks that ORBIC produces are shared through a network of natural heritage programs and conservation centers, allowing information sharing among several countries in the western hemisphere. The BLM updates the Sensitive and Strategic Species lists approximately every three years.

In 2004, the BLM and Forest Service established an interagency program for the conservation and management of rare species in Oregon and Washington known as the Interagency Special Status/Sensitive Species Program (ISSSSP). The ISSSSP has funded a number of inventories, monitoring projects, and the development of species fact sheets and conservation assessments that aid in the management of Bureau Special Status Species. The Affected Environment section contains a summary of the results of these surveys.

Survey and Manage

The Northwest Forest Plan and the 1995 RMPs include the Survey and Manage measures, which require special management attention for little known species thought to be associated with late-successional or old-growth forests. Some species require pre-project surveys and have prescribed management actions if found.

The 2000 Final Supplemental EIS for Amendment to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines and the 2004 Final Supplemental EIS to Remove of Modify the Survey and Manage Mitigation Measure Standards and Guidelines discussed the origin and implementation of the Survey and Manage measures and the need for changes to the measures (USDA FS and USDI BLM 2000, pp. 3–10, 16–24; USDA FS and USDI BLM 2004, pp. 3–9, 15–21), and those discussions are incorporated here by reference.

Those two Supplemental EISs and the 2007 Final Supplement to the 2004 Supplemental EIS also described the Survey and Manage species and their habitat, distribution, and occurrence (USDA FS and USDI BLM 2000, pp. 213–319; USDA FS and USDI BLM 2004, pp. 141–183; USDA FS and USDI BLM 2007, pp. 181–244), and those descriptions are incorporated here by reference.

The 2012 Resource Management Plan Evaluation Report (USDI BLM 2012, pp. 12–13) summarized the history of proposed changes to the Survey and Manage measures and that summary is incorporated here by reference. The Wildlife section of this chapter contains additional information on the history of proposed changes to the Survey and Manage measures.

There are six categories of Survey and Manage species that are found in the planning area (**Table 3-109)**. The categories consider species relative rarity, their level of association with late-successional/old-growth forests, and if pre-disturbance surveys are practical **(Table 3-110)**. Strategic surveys are landscape-scale surveys designed to collect information about a species, including its presence and habitat, and are required for all Survey and Manage species. For Category A and C species, pre-disturbance surveys are required. The Survey and Manage measures specified that if strategic surveys were not completed for Category B species in fiscal year 2006 (fiscal year 2011 for fungi), then surveys equivalent to pre-disturbance surveys would be required prior to management disturbance in old-growth habitat. Twelve years of strategic surveys for fungi have increased the total known sites of Survey and Manage fungi from approximately 3,500 to 14,400 sites within the decision area. Over the course of the program, surveyors found enough sites of 39 fungi species that these fungi are no longer considered rare (Molina 2008).

“Equivalent effort” surveys are required for two lichens, four bryophytes,[84] and all Category B fungi species prior to disturbance in old-growth forest, defined by the Northwest Forest Plan as a forest stand, usually at least 180 to 220 years old, with moderate-to-high canopy closure, a multi-layered, multi-species canopy dominated by large overstory trees, a high incidence of large trees, some with broken tops and other indications of old and decaying wood, numerous large snags, and heavy accumulations of wood, including large logs on the ground (USDA FS and USDI BLM 1994a). The Survey and Manage Category B Fungi Equivalent-Effort Survey Protocol generally requires two years of surveys with visits scheduled in the autumn and spring when sporocarps are more likely present (USDA FS and USDI BLM 2011).

Table 3-109. Number of Survey and Manage plant and fungi species by taxonomic group and category found within the planning area using the current (2003) Survey and Manage species list

Taxa Group	Survey and Manage Categories						Total Species (Number)
	A (Number)	C (Number)	B (Number)	D (Number)	E (Number)	F (Number)	
Bryophytes	2	-	8	-	3	-	13
Fungi	1	-	163	13	4	3	184
Lichens	10	2	6	-	20	2	40
Vascular Plants	7	3	-	-	-	-	10
Totals	**20**	**5**	**177**	**13**	**27**	**5**	**247**

Source: USDI BLM 2014

Table 3-110. Survey and Manage categories and associated survey status by rarity

Relative Rarity	Pre-Disturbance Surveys Practical	Pre-Disturbance Surveys Not Practical	Survey Status Undetermined
Rare	Category A	Category B	Category E
Uncommon	Category C	Category D	Category F

Affected Environment

There are 213 known sites of ESA-listed plants on the decision area (**Table 3-111**). Most occupied sites of the ESA-listed species are very small: approximately 74 percent of all sites occupy 0.10 acre or less or comprise less than 10 individuals. All but two of these species occur in habitats uncommon in the planning area: wetlands, meadows, oak woodlands, or rocky areas. The two remaining species—Gentner’s fritillary and Kincaid’s lupine—occur in mixed woodlands and hardwood/conifer habitat. While the U.S. Fish and Wildlife Service has designated critical habitat for the large-flowered wooly meadow-foam, Cook’s lomatium, and Kincaid’s lupine, only 3,125 acres of Cook’s lomatium critical habitat occurs within the decision area.

[84] BLM Instruction Memorandum No. OR-2006-038. Lichens: *Bryoria subcana* and *Thorlurna dissimilis*; Bryophytes: *Kurzia makinoana*, *Marsupella emarginata* var. *aquatica*, *Orthodontium gracile*, and *Tritomaria exsectiformis*.

Table 3-111. ESA-listed plants within the decision area

Common Name	Scientific Name	Known Sites	District/Field Office within Range of Species	Notes
Endangered				
Gentner's fritillary	*Fritillaria gentneri*	162	Klamath Falls, Medford	All BLM sites are on Medford District with an additional 36 sites within Cascade-Siskiyou National Monument; potential habitat in Klamath Falls Field Office
Western lily	*Lillium occidentale*	1	Coos Bay	An additional introduced site is not yet established
Large-flowered wooly meadow-foam	*Limnanthes pumila* ssp. *grandiflora*	-	Medford	Potential habitat in Medford District
Bradshaw's desert parsley	*Lomatium bradshawii*	-	Eugene, Salem	No potential habitat on BLM within decision area; there are 7 sites within the West Eugene Wetlands.
Cook's lomatium	*Lomatium cookii*	35	Medford	Largest BLM populations in and adjacent to French Flat ACEC
Rough popcorn flower	*Plagiobothrys hirtus*	3	Roseburg	BLM populations are introduced within the North Bank Habitat Management Area
Threatened				
Golden paintbrush	*Castilleja levisecta*	-	Eugene, Salem	No potential habitat on BLM
Water howellia	*Howellia aquatilis*	-	Eugene, Salem	No potential habitat on BLM
Kincaid's lupine	*Lupinus oreganus*	10	Eugene, Roseburg	5 additional sites within West Eugene Wetlands
Nelson's checker-mallow	*Sidalcea nelsoniana*	1	Salem	Within the Walker Flat ACEC
	Total	**212**		

There are 4,564 known sites of Bureau Sensitive and Strategic plant and fungi species within the decision area (**Table 3-107**). Sites range in size from just one or a few individuals that occupy much less than 0.10 of an acre to thousands of individuals that comprise several acres. Nearly 90 percent of the known Sensitive and Strategic plant and fungi sites are less than 1 acre.

The BLM has conducted Survey and Manage fungi equivalent-effort surveys on 5,356 acres in the Medford District and 686 acres in the Klamath Falls Field Office from 2011 to 2013. Surveyors found 619 sites during this period, an average of 1 new site for every 9.8 acres surveyed within potential habitat. The Salem District conducted equivalent-effort fungi surveys on 2 acres and did not find any fungi.

There are currently 862,408 acres of Mature Multi-layered Canopy or Structurally-complex stands, which provides potential habitat for rare plants and fungi that are associated with late-successional and old growth habitat.

Environmental Consequences

Under all alternatives and the Proposed RMP, the BLM would—

- Manage ESA-listed species 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;
- Conduct surveys for ESA-listed and candidate plant species on BLM-administered lands with suitable habitat;
- Maintain or restore natural processes, native species composition, and vegetation structure in natural communities outside of the Harvest Land Base through conducting prescribed fires, thinning, removal of encroaching vegetation, retention of legacy components (e.g., large trees, snags, and down logs), and planting or seeding native species;
- Use only species native to the plant community when re-vegetating degraded or disturbed areas; and
- Retain or reconnect the hydrologic flows to wetlands (see **Appendix B**).

The alternatives and the Proposed RMP vary in the approach to pre-disturbance surveys for and management of known sites of Bureau Sensitive and Survey and Manage species. The BLM would conduct pre-disturbance surveys for Bureau Sensitive species under the No Action alternative and Alternatives A, B, and C, and the Proposed RMP and would manage the species and their habitat so that BLM actions would not contribute to the need to list these species. Alternative D does not include any requirement for pre-disturbance surveys for Bureau Sensitive species, and the BLM would protect known Bureau Sensitive species sites in the Harvest Land Base on O&C lands only where protection would not conflict with sustained-yield timber production. The No Action alternative would also require pre-disturbance surveys for Survey and Manage species where appropriate and would manage known Survey and Manage sites through implementation of the Survey and Manage measures. None of the action alternatives or the Proposed RMP would require pre-disturbance surveys or site management for Survey and Manage species that are not included on the Bureau Sensitive species list.

Under Alternatives A and C, and the Proposed RMP, the BLM would take actions to contribute toward the recovery of ESA-listed and Special Status plants. This would involve active management to augment existing populations and create new populations within suitable habitat to meet recovery plan goals for ESA-listed species and to increase the overall resiliency of other Special Status Species to reduce the risk of extirpation. Under the action alternatives and the PRMP, the BLM would allocate all 3,125 acres of Cook's lomatium critical habitat in the action area to District-Designated Reserves and manage those reserves for the species and its critical habitat. Under the No Action alternative, Cook's lomatium critical habitat would occur within the Riparian Reserve and other allocations with no timber harvest. Since the BLM would manage Cook's lomatium critical habitat for the primary constituent elements under the alternatives and the Proposed RMP, there would be no management impacts to critical habitat.

Under the action alternatives and the Proposed RMP, within the dry forests outside of the Harvest Land Base, the BLM would apply management treatments to maintain or promote desired species composition within oak woodland, meadows, grasslands, and shrublands. In addition, within the Uneven-aged Timber Area, the BLM would retain oaks established prior to 1850. Under Alternative B, the BLM would manage mixed hardwood/conifer communities outside of the Harvest Land Base to maintain and enhance oak persistence and structure. Since oak species may be a minor component of mixed hardwood/conifer communities, they are likely to die off over time without management to prevent conifers from shading them out. Under Alternative B, the BLM would actively manage forest stands for the persistence of these species. Under the Proposed RMP across all land use allocations, the BLM would manage mixed hardwood/conifer communities to maintain and enhance oak consistent with other management direction for the land use allocation. The BLM would also retain oaks greater than 24" DBH, except for safety or operational reasons in the dry Late-Successional Reserve and the Uneven-aged Timber Area sub-allocation of the Harvest Land Base.

Timber Harvest and other Vegetation Management

The two ESA-listed species that occur within forest and woodland habitat, Kincaid's lupine and Gentner's fritillary, have known sites within the Harvest Land Base under the alternatives and the Proposed RMP. More sites of these species occur within the Harvest Land Base under all of the action alternatives and the Proposed RMP than under the No Action alternative. However, the BLM would conduct pre-disturbance surveys and apply the same conservation measures for these ESA-listed species under all alternatives and the Proposed RMP, regardless of land use allocation. Therefore, the species-specific protections for these species would avoid adverse effects from timber harvest.

Under the No Action alternative and Alternatives A, B, and C, and the Proposed RMP, timber harvest would not directly affect sites of Bureau Sensitive plants, including lichens and bryophytes, and their occupied habitat within the Harvest Land Base, because the BLM would conduct pre-disturbance surveys and apply conservation measures. These conservation measures would be sufficient to protect sites based on past implementation of these measures. The known Bureau Special Status and Bureau Strategic plant and fungi sites that would occur within the Harvest Land Base under each alternative and the Proposed RMP are listed in **Table 3-112**. The BLM and U.S. Forest Service have not reviewed the status of any species under the adaptive management process of the Survey and Manage measure since 2003. Some of the Survey and Manage species have had a very large increase in the number of known sites, as reflected in this table, and would likely be removed from Survey and Manage list under a current review.

Since fungi are difficult to detect even with multiple visits and the BLM cannot delineate their occupied habitat, it is possible that timber activities could affect some Bureau Sensitive fungi sites under all alternatives and the Proposed RMP. However, there is no basis for predicting a difference in effects between the No Action alternative and Alternatives A, B, and C, and the Proposed RMP. Under Alternative D, Bureau Sensitive plant and fungi known sites would receive protection within the Harvest Land Base on O&C lands only when protection measures do not conflict with sustained-yield timber production. In addition, since there is no provision for pre-disturbance surveys within the Harvest Land Base under Alternative D, potential habitat would be disturbed and previously unknown sites would be affected and potentially lost, contributing to the loss of genetic diversity. However, the majority of the decision area is allocated to reserves under Alternative D, which would limit this potential effect to the population as a whole.

Table 3-112. Bureau Special Status and Bureau Strategic plant and fungi sites within the Harvest Land Base

Alternative /Proposed RMP	Taxa Group	ESA Endangered	ESA Threatened	Bureau Sensitive	Bureau Strategic	Total Species
No Action	Bryophytes	-	-	10	22	32
	Lichens	-	-	110	300	410
	Vascular Plants	15	1	1,287	9	1,312
	Fungi	-	-	99	219	318
	No Action Totals	**15**	**1**	**1,506**	**550**	**2,072**
Alt. A	Bryophytes	-	-	8	6	14
	Lichens	-	-	95	80	175
	Vascular Plants	25	7	490	6	528
	Fungi	-	-	92	44	136
	Alt. A Totals	**25**	**7**	**687**	**136**	**853**
Alt. B	Bryophytes	-	-	4	16	20
	Lichens	-	-	75	184	259
	Vascular Plants	54	7	904	6	971
	Fungi	-	-	112	166	278
	Alt. B Totals	**54**	**7**	**1,095**	**372**	**1,528**
Alt. C	Bryophytes	-	-	8	20	28
	Lichens	-	-	115	201	316
	Vascular Plants	57	8	893	8	966
	Fungi	-	-	117	172	289
	Alt. C Totals	**57**	**8**	**1,133**	**401**	**1,599**
Alt. D	Bryophytes	-	-	10	25	35
	Lichens	-	-	122	224	346
	Vascular Plants	46	8	1,066	7	1,127
	Fungi	-	-	101	102	203
	Alt. D Totals	**46**	**8**	**1,299**	**358**	**1,711**
PRMP	Bryophytes	-	-	6	9	15
	Lichens	-	-	85	15	100
	Vascular Plants	50	12	824	18	904
	Fungi	-	-	98	219	317
	PRMP Totals	**50**	**12**	**1,013**	**261**	**1,336**

There are 2,719 known Bureau Sensitive, Bureau Strategic, and Survey and Manage fungi sites within the decision area. Under all alternatives and the Proposed RMP, the majority of known sites of rare fungi would be within reserve land use allocations.

Under the No Action alternative, the BLM would continue to implement the Survey and Manage measures to conduct pre-disturbance surveys and protect known sites for the Survey and Manage species. Most Survey and Manage plant and fungi species would have sufficient habitat to maintain stable populations under the No Action alternative (USDA FS and USDI BLM 2000). In addition, Mature and Structurally-complex forest habitats for Survey and Manage plant and fungi species would increase under the No Action alternative in the decision area.

Under all action alternatives and the Proposed RMP, species that are Survey and Manage and not included on the Bureau Sensitive species list would receive no specific protections. The number of unprotected sites would vary: Alternative A would have the fewest sites within the Harvest Land Base, and Alternative C would have the most (**Table 3-113**). Unless these sites co-occur with Bureau Sensitive species, timber harvest would affect these sites.

Table 3-113. Survey and Manage plant and fungi species sites within the Harvest Land Base that are not also Bureau Sensitive/Bureau Strategic

Alternative/ Proposed RMP	Taxa Group	Survey and Manage Species That Are Not Also Sensitive or Strategic (Number of Sites)	Known BLM Sites Within HLB (Percent)
No Action	Bryophytes	3	3%
	Lichens	1,133	40%
	Vascular Plants	277	39%
	Fungi	2,006	47%
	No Action Totals	**3,419**	**43%**
Alt. A	Bryophytes	1	1%
	Lichens	401	14%
	Vascular Plants	60	9%
	Fungi	596	14%
	Alt. A Totals	**1,058**	**13%**
Alt. B	Bryophytes	3	3%
	Lichens	709	25%
	Vascular Plants	249	35%
	Fungi	1,079	25%
	Alt. B Totals	**2,040**	**26%**
Alt. C	Bryophytes	9	8%
	Lichens	1,026	37%
	Vascular Plants	220	31%
	Fungi	1,434	34%
	Alt. C Totals	**2,689**	**34%**
Alt. D	Bryophytes	6	5%
	Lichens	826	30%
	Vascular Plants	228	32%
	Fungi	929	22%
	Alt. D Totals	**1,989**	**25%**
PRMP	Bryophytes	3	3%
	Lichens	717	26%
	Vascular Plants	203	29%
	Fungi	1,228	29%
	PRMP Totals	**2,151**	**27%**

There is incomplete and unavailable information relevant to the effects of the action alternatives and the Proposed RMP on Survey and Manage species. With complete and species-specific survey information on the location of habitat and species sites for all Survey and Manage species, the BLM would be able to analyze the effects of all alternatives and the Proposed RMP on Survey and Manage species and compare those effects to the No Action alternative, which would continue to implement the Survey and Manage measure. However, the BLM lacks complete and species-specific survey information for most Survey and Manage species (USDA FS and USDI BLM 2004, pp. 108–109). It would be exorbitantly expensive and time-consuming to conduct random surveys across the decision area for all Survey and Manage species. Consistent with Council on Environmental NEPA regulations at 43 CFR 1502.22, this analysis summarizes the information that is currently available on the effects of the alternatives and the Proposed RMP on Survey and Manage species. The 2004 Final SEIS to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines (USDA FS and USDI BLM 2004, pp. 141–183) and the 2007 Final Supplement to the 2004 SEIS (USDA FS and USDI BLM 2007, pp. 162–244) analyzed the removal of Survey and Manage measures for known site management and pre-disturbance surveys. The species descriptions and discussions of known site management and pre-disturbance surveys from those analyses are incorporated here by reference. The U.S. District Court in *Conservation Northwest et al. v. Rey et al.* (Case No. C08-1067-JCC) found that the analysis of effects to species in the 2004 Final SEIS and the 2007 Final SEIS was insufficient to support the conclusion that the Survey and Manage measure was no longer necessary to meet the goals of the Northwest Forest Plan. The discussions of the 2004 SEIS and 2007 SEIS are incorporated by reference here only to the extent those portions of the analyses were not found invalid by the court. Nevertheless, the information in the 2004 SEIS and 2007 SEIS does present analysis based on the incomplete survey information available that concludes that most Survey and Manage species would have sufficient habitat to support stable populations under the No Action alternative without the Survey and Manage measure.

Even in the absence of the Survey and Manage measure, habitat and sites of species that fall within the reserve system would receive some protection. Not all sites within reserve land use allocations would necessarily be protected by buffers comparable to the No Action alternative. However, management actions in reserves could occur within these sites, but there would be a minimal effect to the species based on the type and intensity of allowable treatments. Under all action alternatives and the Proposed RMP, management direction in reserves would largely limit stand treatments to thinning to improve habitat conditions and fuels treatments to reduce the risk of uncharacteristic wildfire, and would generally preclude stand treatments that would remove or degrade Mature and Structurally-complex habitat (**Appendix B**). Compared to the No Action alternative, all action alternatives and the Proposed RMP allocate more acres to the Late-Successional Reserve, which the Northwest Forest Plan expected to contribute to meeting the needs of late-successional and old-growth related species (USDA Forest Service and USDI BLM 2000, pp. 201–202). To the extent that the No Action alternative without the Survey and Manage measure would provide sufficient habitat for Survey and Manage species, as analyzed in the 2004 SEIS, the action alternatives and the Proposed RMP would provide more habitat within the Late-Successional Reserve.

The Survey and Manage species are species associated with "late-successional and old-growth forests" (USDA FS and USDI BLM 2000, p. 8; USDA FS and USDI BLM 2004, p. 30). To the extent that older and more structurally-complex multi-layered conifer forests as defined in the action alternatives and the Proposed RMP encompass the 'late-successional and old-growth forests' that provide habitat for Survey and Manage species, all action alternatives and the Proposed RMP reserve such forests from timber harvest within the Late-Successional Reserve. Under all action alternatives and the Proposed RMP, there would be no timber harvest of older and more structurally-complex multi-layered conifer forests, although each alternative and the Proposed RMP use a different definition to identify older and more structurally-complex multi-layered conifer stands. Therefore, all of the action alternatives and the Proposed RMP, in contrast to the No Action alternative, would protect from timber harvest the forest conditions with which the Survey and Manage species are most closely associated.

In addition to reserving existing older and more structurally-complex multi-layered conifer forests, the acreage of Mature and Structurally-Complex forest (which is a broader category) in the decision area would increase under all alternatives and the Proposed RMP. Therefore, the amount of habitat for Survey and Manage plant and fungi species would increase under all alternatives and the Proposed RMP.

The current Survey and Manage list (USDI BLM 2014) includes 247 plant and fungi species. However, only 143 of these species have documented occurrences in the decision area. Many of the remaining 104 species are unlikely to occur on BLM-administered lands because suitable habitat is not present. **Table N-3** in **Appendix N** includes all 247 Survey and Manage plant and fungi species, whether they are documented on BLM-administered lands, and whether they are also on the Bureau Sensitive or Bureau Strategic lists.

In the 2007 SEIS, the BLM evaluated whether there would be sufficient habitat available for each Survey and Manage species to maintain the species if the Survey and Manage mitigation measure was removed from the existing Resource Management Plans (USDA Forest Service and USDI BLM, 2007). **Table N-3** in **Appendix N** indicates the plant and fungi species that the BLM determined in the 2007 analysis would have either insufficient habitat due to management or there was insufficient information to determine an outcome. These include 46 species – 28 fungi, 6 bryophytes, and 12 lichens. Only 35 of these species occur in the decision area, of which 5 are Bureau Sensitive and 30 are Bureau Strategic. For the 35 species that occur on the decision area, the BLM evaluated the percentage of known sites that would occur within a reserve allocation under each alternative and the Proposed RMP. Except for *Sowerbyella rhenana* in Alternative C and *Stenocybe clavata* in Alternative D, all of the 35 species would have an equal number or more known sites in a reserve allocation than under the No Action alternative (**Table 3-114**). As described above, habitat and sites of species that fall within the reserve system under the action alternatives and Proposed RMP would generally be protected. Overall, 45 percent of known sites of these 35 species would fall within reserve allocations under the No Action alternative, the fewest of any alternative and the Proposed RMP.[85] Under the Proposed RMP, 88 percent of known sites of these species would fall within reserve allocations, more than any alternative. One species, *Tholurna dissimilis*, is known from only two sites on BLM-administered lands, both of which would occur within the Harvest Land Base under all alternatives and the Proposed RMP. Given the difficulties of comparing directly the effects of the alternatives and the Proposed RMP to the outcomes described in the 2007 SEIS and the very few sites of *Tholurna dissimilis* in the decision area, it is not possible to make any conclusion about effect of allocating two known sites on BLM-administered lands to the Harvest Land Base. More generally, as with all Survey and Manage species, all action alternatives and the Proposed RMP, would protect from timber harvest the forest conditions with which the Survey and Manage species are most closely associated.

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[85] Under the No Action alternative, sites not in reserve allocations would be protected consistent with the Survey and Manage measure. To the extent that the percentage of sites in reserve allocations indicates the extent of habitat for these species in reserve allocations, the No Action alternative would provide less habitat within reserve allocations than the action alternatives or the Proposed RMP.

Table 3-114. Percent of known BLM sites within reserve allocations under the alternatives and the Proposed RMP for Survey and Manage species found to have uncertain outcomes in the 2004 FSEIS

Species	No Action (Percent)	Alt. A (Percent)	Alt. B (Percent)	Alt. C (Percent)	Alt. D (Percent)	PRMP (Percent)
Albatrellus ellisii	38%	100%	48%	50%	86%	49%
Calicium adaequatum	100%	100%	100%	100%	100%	100%
Calicium adspersum	100%	100%	100%	100%	100%	100%
Clavariadelphus ligula	16%	65%	38%	41%	48%	43%
Clavariadelphus sachalinensis	26%	94%	78%	88%	92%	82%
Collema nigrescens	75%	96%	86%	84%	82%	90%
Cudonia monticola	50%	77%	98%	98%	77%	98%
Gomphus kauffmanii	59%	100%	67%	63%	82%	80%
Gyromitra californica	18%	45%	27%	18%	36%	27%
Kurzia makinoana	100%	100%	100%	100%	100%	100%
Microcalicium arenarium	33%	67%	100%	100%	100%	100%
Nephroma occultum	37%	100%	98%	98%	98%	98%
Phaeocollybia californica	50%	82%	74%	66%	72%	77%
Phaeocollybia dissiliens	38%	81%	86%	48%	76%	90%
Phaeocollybia fallax	48%	79%	86%	70%	73%	86%
Phaeocollybia piceae	41%	79%	84%	65%	69%	89%
Phaeocollybia pseudofestiva	36%	89%	88%	66%	83%	91%
Phaeocollybia scatesiae	68%	81%	81%	65%	84%	83%
Phaeocollybia sipei	50%	82%	89%	52%	72%	91%
Phaeocollybia spadicea	50%	80%	81%	62%	67%	84%
Polyozellus multiplex	100%	100%	100%	100%	100%	100%
Pseudocyphellaria rainierensis	90%	100%	100%	98%	100%	100%
Ramaria amyloidea	100%	100%	100%	100%	100%	100%
Ramaria araiospora	42%	80%	76%	60%	83%	84%
Ramaria aurantiisiccescens	31%	74%	68%	57%	86%	84%
Ramaria cyaneigranosa	34%	72%	65%	55%	80%	80%
Ramaria largentii	50%	100%	100%	100%	100%	100%
Ramaria rubrievanescens	36%	78%	76%	71%	84%	87%
Ramaria stuntzii	40%	76%	71%	53%	75%	79%
Sarcodon fuscoindicus	33%	67%	43%	43%	71%	43%
Sowerbyella rhenana	48%	63%	48%	36%	58%	54%
Sparassis crispa	47%	84%	98%	84%	79%	99%
Stenocybe clavata	96%	97%	98%	98%	78%	98%
Tholurna dissimilis	-	-	-	-	-	-
Overall	**45%**	**82%**	**83%**	**69%**	**78%**	**88%**

In summary, all action alternatives and the Proposed RMP would remove the Survey and Manage measure that requires pre-disturbance surveys and protection of known sites. There is incomplete and unavailable information relevant to the effects of the action alternatives and the Proposed RMP on Survey and Manage species. The 2007 SEIS provides an incomplete analysis, in that survey and species data for Survey and Manage species was (and remains) incomplete, and in that the 2007 SEIS did not include information on species and sites that has since been identified over the past decade. Nevertheless, the analysis in the 2007 SEIS supports the conclusion that most Survey and Manage species would have sufficient habitat to support stable populations under the No Action alternative without the Survey and Manage measure.

It is not possible to compare directly the effects of the alternatives and the Proposed RMP to the outcomes described in the 2007 SEIS. The determinations about species outcomes in the 2007 SEIS were based on the evaluation of experts and were more qualitative than quantitative in nature. These qualitative expert opinions were based on assumptions of continuing application of the land use allocations of the Northwest Forest Plan, and are therefore only directly applicable to the No Action alternative. Finally, the conclusion in the 2007 SEIS of “insufficient habitat to support stable populations in a portion of the Northwest Forest Plan area” did not specify the areas of “insufficient habitat” beyond broad geographic areas. Thus, these general and qualitative conclusions are difficult to re-evaluate in light of these alternatives and the Proposed RMP, which would alter only management on BLM-administered lands in Oregon (USDA FS and USDI BLM 2007, pp. 118–119).

Furthermore, the threshold determination of whether there is sufficient habitat to support stable populations of the Survey and Manage species is not necessary to provide a “hard look” in this Proposed RMP/Final EIS at the environmental effects of the alternatives and the Proposed RMP. The determination related to stable populations is tied to the species viability goal of the Northwest Forest Plan, which is not part of the purpose for this RMP revision. The Survey and Manage measures were identified in the Final Supplemental EIS for the Northwest Forest Plan as a potential mitigation measure to increase the likelihood of achieving “viable populations, well-distributed across their current range, of species known (or reasonably expected) to be associated with old-growth forest conditions” (USDA FS and USDI BLM, 1994, p. 3&4-129) – a goal which was founded on a U.S. Forest Service planning regulation which, as explained above, did not and does not apply to the BLM. Finally, to the extent that the Survey and Manage measures were intended to prevent disruptions to sustained-yield timber production that would result from future listing of species under the ESA, the Survey and Manage measures are unnecessary under the action alternatives and the Proposed RMP (see the Relationship of the RMPs to Other Plans and Programs section of Chapter 1).

Although it is not possible to compare directly the effects of the alternatives and the Proposed RMP on Survey and Manage species to the outcomes described in the 2007 SEIS, it is possible to evaluate where known sites occur and how habitat would change over time under the alternatives and the Proposed RMP. For the 35 species that occur within the decision area and that the 2007 SEIS concluded would have either insufficient habitat due to management or there was insufficient information to determine an outcome, 88 percent of known sites would fall within the reserve land use allocations under the Proposed RMP, and all action alternatives would have a higher percentage of known sites in the reserve land use allocations than the No Action alternative. All action alternatives and the Proposed RMP allocate more acres to the Late-Successional Reserve than the No Action alternative, protect older and more structurally-complex multi-layered conifer forests, and result in an increase in Mature and Structurally-complex forest. As a result (as can best be determined given the incomplete information available to the BLM), all action alternatives and the Proposed RMP would protect most existing habitat for Survey and Manage species, would protect most known sites within the reserve allocations, and would result in an increase in the amount of habitat for Survey and Manage species.

A sub-group of more than 25 lichen, bryophyte, and fungi species (including Bureau Special Status Species and Survey and Manage species that are not Bureau Special Status Species) is associated with habitat conditions and biological legacies (e.g., green trees, coarse wood, and snags) of mature and structurally-complex forests. Important habitat components include coarse wood, snags, and specific host species. In general, the risk to these species would increase as the level of timber harvest activities would increase, biological legacies would be lost during harvest, and timber harvest would reduce interior habitat conditions in the Harvest Land Base over time.

The overall acreage of timber harvest during the first decade would be largest under Alternative C, with 178,429 acres of total timber harvest, and only slightly lower under Alternative B, with 173,633 acres of timber harvest (**Table 3-115**). Alternative D, the No Action alternative, and the Proposed RMP would have substantially lower acreage of total timber harvest, with 139,557 acres, 157,041 acres, and 155,635 acres, respectively. Alternative A would have the lowest acreage of total timber harvest, with 98,113 acres in the first decade. Included in the totals for Alternative A and the Proposed RMP are acres of thinning without timber removal, which would be much less likely to have adverse effects on rare plant and fungi habitat than other timber harvest methods, although it is not possible to quantify that difference in this analysis. Thinning without timber removal would include 12,957 acres under Alternative A and 2,215 acres under the Proposed RMP.

Table 3-115. Total acres of timber harvest in the first decade (2013–2023).

Harvest Type	No Action (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	Alt. D (Acres)	PRMP (Acres)
Clearcut	-	42,200	-	83,691	-	-
Salvage	2,539	884	2,642	3,587	1,640	2,258
Selection	-	26,757	68,580	45,403	103,059	58,641
Thinning	110,570	15,315	71,700	45,748	14,901	61,406
Thinning without Timber Removal	-	12,957	-	-	-	2,215
Variable Retention Harvest	43,932	-	30,711	-	19,957	31,115
Timber Harvest Totals	**157,041**	**98,113**	**173,633**	**178,429**	**139,557**	**155,635**

Under Alternatives A and C, forest management would include clearcuts (i.e., regeneration harvest with no retention) in the High Intensity Timber Area, and comprise 1.7 percent and 3.4 percent, respectively, of the decision area. Within the first decade, almost twice as many acres would be clearcut in Alternative C than in Alternative A (**Table 3-115**). Early successional Bureau Special Status species (e.g., wayside aster and tall bugbane) would benefit from the disturbance if they occur within colonization distance of the clearcut. However, the BLM would reforest these clearcuts after harvest, typically within five years of harvest, limiting the duration of any habitat benefit to early successional species on each harvest unit.

The impacts from salvage harvest would generally be the same as harvest of live trees. However, since the BLM would likely not be able to conduct pre-disturbance surveys for salvage harvest following disturbances such as wildfire, undiscovered sites would likely be affected, making the effects of salvage similar among all alternatives and the Proposed RMP. Salvage harvest could remove or damage live trees that are a refuge for rare plant and fungi species. Salvage harvest would primarily affect plant and fungi species in conifer and mixed evergreen forests, riparian and aquatic, serpentine areas, and oak and hardwood habitats. In all alternatives and the Proposed RMP, salvage would take place in the Harvest Land Base after a high- or moderate-severity wildfire event. In Alternatives A, B, and D, and the Proposed RMP, salvage would not take place in the Late-Successional Reserve, except for resource protection and safety objectives. Only in Alternative C would timber salvage occur in the Late-Successional Reserve for economic objectives. While it is not possible to predict the locations and amount of salvage harvest that would occur over the next 10 years, the BLM forecasts that salvage harvest would occur on a relatively small acreage under all alternatives and the Proposed RMP, approximately 1–2 percent of the total acres of timber harvest.

The No Action alternative and Alternative C would reduce habitat quality for rare plants and fungi because of fertilization. The No Action alternative would include almost twice the acreage of fertilization as Alternative C. The No Action alternative would reduce habitat quality for rare plants and fungi on 12,052 acres in the first decade, and Alternative C would reduce habitat quality on 6,854 acres. Most of the fertilization acres would occur within very young stands that are within Early Successional or Stand Establishment structural stages. However, the No Action alternative would include a small acreage of fertilization within Mature and Structurally-complex stands in the first decade, increasing the likelihood of reducing habitat quality for rare plants and fungi associated with that habitat. Alternatives A, B, and D would not include any fertilization and thus would not reduce habitat quality for rare plants and fungi. The Proposed RMP would allow for the manual application of fertilizers where necessary to enhance vigor and growth of desired vegetation within the Harvest Land Base; however, any fertilization would have to be compatible with management direction in the Proposed RMP to manage Bureau Special Status Species to maintain and enhance their persistence and to maintain natural species composition. As a result, it is unlikely that fertilization would reduce habitat quality for rare plants and fungi under the Proposed RMP, especially since manual application would limit the acreage involved.

Under all alternatives and the Proposed RMP, a majority of the BLM-administered lands would be allocated to reserves, where Mature and Structurally-complex stands would be retained and additional habitat would develop. All action alternatives and the Proposed RMP allocate more acres to Late-Successional Reserve than the No Action alternative, which would benefit rare plants and fungi associated with Mature and Structurally-complex stands. The acreage of Structurally-complex stands would increase under all alternatives and the Proposed RMP, as would the acreage of stands older than 120 years. Within the Harvest Land Base, the abundance of Structurally-complex stands would increase substantially under the No Action alternative, Alternatives B and D, and the Proposed RMP, with the largest proportional increase in Alternative D. Additionally, a substantial amount of forest stands with biological legacies would remain on BLM-administered lands in the Harvest Land Base, except for the High Intensity Timber Areas under Alternatives A and C. The abundance of Structurally-complex stands would not increase within the Harvest Land Base under Alternatives A and C.

The acreage of potential fungi habitat (i.e., Mature Multi-layered Canopy and Structurally-complex stands) within the Harvest Land Base would vary (**Table 3-116**). Alternative A would have the fewest potential fungi habitat acres within the Harvest Land Base because most of this habitat would be allocated to reserves. The Proposed RMP would have the second lowest acreage of potential fungi habitat within the Harvest Land Base. The No Action alternative would have the largest acreage of potential fungi habitat within the Harvest Land Base; however, most of this habitat would be subject to the Survey and Manage equivalent-effort survey requirement, and the BLM would protect new sites. All of the Sensitive and Strategic fungi sites within the Harvest Land Base are also Survey and Manage species. Of the action alternatives and the Proposed RMP, Alternative C would have the largest number of potential fungi habitat acres within the Harvest Land Base, followed by Alternatives D and B. The BLM would conduct pre-disturbance surveys under Alternatives A, B, and C, and the Proposed RMP for Special Status Species, and the BLM would provide conservation measures for new sites found. As noted above, the effectiveness of fungi surveys is limited, because fungi are difficult to detect even with multiple visits. The BLM would not conduct surveys under Alternative D, and undetected sites would be affected by timber harvest.

Table 3-116. Bureau Special Status fungi potential habitat within the Harvest Land Base

Alternative/ Proposed RMP	Fungi Habitat within the Harvest Land Base (Acres)
No Action	255,125
Alt. A	40,140
Alt. B	145,081
Alt. C	156,219
Alt. D	150,103
PRMP	91,428

Designation of Reserve Allocations

As noted earlier, all of the action alternatives and the Proposed RMP would designate more acres of land to reserve allocations (e.g., Late-Successional Reserve and Riparian Reserve). For comparison, **Table 3-117** lists the number of known Bureau Special Status vascular plant sites within the Late-Successional Reserve and Riparian Reserve. The fewest number of sites in reserves would be in the No Action alternative, and the largest number would be in Alternative A. The Proposed RMP and Alternatives C and D would have similar numbers of sites in reserves.

Where Gentner's fritillary and Kincaid's lupine occur within forested communities, they are generally on the edge or in openings. Alternative A would include the largest number of sites for Gentner's fritillary and Alternatives B, C, and D, and the Proposed RMP for the largest number of sites for Kincaid's lupine.

Table 3-117. Bureau Special Status vascular plant sites within reserve allocations

Alternative/ Proposed RMP	Bureau Special Status Vascular Plants (Known Sites in Reserves)	Gentner's Fritillary (Known Sites in Reserves)	Kincaid's Lupine (Known Sites in Reserves)
No Action	1,679	40	7
Alt. A	2,758	95	8
Alt. B	1960	41	10
Alt. C	2,138	50	10
Alt. D	2,108	65	10
PRMP	2,128	46	10

While the overall management objectives for reserves are consistent across action alternatives and the Proposed RMP, the management direction varies. The No Action alternative would allow for management activities within reserves to promote recovery of ESA-listed species. The Proposed RMP would conduct integrated vegetation management to restore and maintain habitat for Bureau Special Status Species. The action alternatives would not conduct integrated vegetation management to restore and maintain habitat for Bureau Special Status Species within reserve allocations. Plant species that require open growing conditions would likely decline in the reserve allocations under the action alternatives. Under the No Action alternative, the BLM would only manage habitat for ESA-listed species within reserves, and Bureau Sensitive plant species would decline in the reserve allocations. The

Proposed RMP would maintain and enhance habitat for Bureau Special Status plant species within reserve allocations.

Livestock Grazing

Under the No Action alternative, livestock grazing would be available on 495,190 acres in the Coos Bay District, the Klamath Falls Field Office, and the Medford District. However, 140,380 acres are currently vacant and have not been subject to livestock grazing for several years. The vacant allotments would remain available for livestock grazing under the No Action alternative, and livestock grazing could occur in these areas in the future.

Alternatives A, B, and C, and the Proposed RMP would close the vacant allotments to livestock grazing, but keep all active allotments open to livestock grazing. Since these vacant allotments are not currently grazed, there would be no immediate difference in effects from the No Action alternative. However, closing the vacant allotments would preclude potential future livestock grazing impacts to rare plants and fungi.

Under the No Action alternative, Alternatives A, B, and C, and the Proposed RMP, livestock grazing would continue in active allotments. There are 571 Bureau Special Status plant and fungi sites within active livestock grazing allotments, including Gentner's fritillary, 35 Bureau Sensitive vascular plants, 2 Bureau Sensitive bryophytes, and 3 Bureau Sensitive fungi. The large majority of these sites (98 percent) are vascular plants. As described in the Background section, livestock grazing can have both positive and negative effects to vascular plants. As described in the Livestock Grazing section of this chapter, the BLM conducts periodic rangeland health assessments. The BLM has found that 12 allotments in the decision area are not meeting rangeland health standards due to livestock grazing. Of the 12 allotments, there are 5 that contain Bureau Sensitive vascular plant sites, as shown in **Table 3-118**.

Table 3-118. Bureau Sensitive plants within allotments not meeting rangeland health standards due to livestock grazing

District/ Field Office	Allotment	Sensitive Plants within Allotment
Klamath Falls	Dixie	*Limnanthes floccosa* ssp. *bellingeriana*
Medford	Brownsboro Park	*Plagiobothrys greenei*, *Plagiobothrys austiniae*, *Ranunculus austrooreganus*
	Canal	*Ranunculus austrooreganus*
	Conde Creek	*Scirpus pendulus*, *Nemocladus capillaris*, *Hackelia bella*
	Cove Creek	*Limnanthes floccosa* ssp. *bellingeriana*, *Poa rhizomata*

BLM botanists have observed livestock directly uprooting and trampling individuals of *Limnanthes floccosa* ssp. *Bellingeriana* and wallowing in their vernal pool habitat (J. Blanchard, 2015, personal communication). Conversely, botanists have noted an increase in invasive competitive plants, such as yellow starthistle and North Africa grass, in habitat for *Limnanthes floccosa* ssp. *bellingeriana* in response to the removal of livestock. Due to a wildfire in 2014, the Dixie allotment is unavailable to livestock grazing for one to two years. There are fences within the allotment to protect meadows and springs from livestock grazing. Under the No Action alternative, Alternatives A, B, and C, and the Proposed RMP, the BLM would adjust the grazing season of use to minimize direct impacts to the species from livestock.

As is true for most allotments, the livestock grazing effects on plants are highly variable across the Brownsboro Park allotment. Botanists have periodically monitored the allotment and found that, while the grasslands are dominated by nonnative grasses, particularly medusahead and yellow starthistle, the three Bureau Sensitive plant species within the allotment have not been directly impacted by livestock (M. Wineteer, 2015, personal communication). Botanists have not observed any livestock grazing impacts on the Bureau Sensitive plant species within the Canal, Conde Creek, or Cove Creek allotments (B. Wender, 2015, personal communication).

Currently, 62 sites of Gentner's fritillary, ranging in size from 1 plant to approximately 30 plants, occur in 8 active allotments. Another 55 Gentner's fritillary sites occur within 8 vacant allotments. Despite the presence of this species within active allotments in the No Action alternative, Alternatives A, B, and C, and the Proposed RMP, there would be no direct negative impacts to this species from livestock grazing because there has been no evidence that livestock eat Gentner's fritillary or cause measurable trampling impacts (M. Wineteer, BLM, personal communication, 2014). Livestock tend to concentrate in areas with water, while Gentner's fritillary generally occurs on steeper slopes outside of riparian areas.

There is little research on the effects of livestock grazing on fungi in the planning area. It is likely that livestock may trample and even consume sporophytes, but these impacts would generally be minor and would not affect the long-term viability of fungi since most of the hyphal mat is underground. Livestock may trample bryophytes that grow on the soil surface. One of the Bureau Sensitive bryophytes that occurs within an active grazing allotment, *Meesia uliginosa*, grows on the soil surface in wetland habitat. The BLM has not observed any livestock grazing impacts to this species.

Alternative D would close all current active and vacant allotments. Elimination of livestock grazing under Alternative D would have both positive and negative effects for the known Bureau Special Status plant and fungi species that occur within active allotments. Elimination of livestock grazing would reduce direct consumption of these species and trampling, but would also result in increased competition for resources from non-native plant species, including noxious weeds, and have an increased accumulation of fuels, increasing the risk of wildfire. The specific effects of the elimination of livestock grazing under Alternative D on each of the Special Status plant and fungi species would depend on species-specific and site-specific factors. For example, almost 99 percent of the currently active allotments with Gentner's fritillary locations are in the Improve management category, meaning that the current resource condition does not meet Rangeland Standards and Guidelines. While livestock do not directly affect Gentner's fritillary, removing livestock might improve adjacent habitat for the species and allow for potential expansion. Nevertheless, given the absence of evidence that livestock grazing is affecting Gentner's fritillary, there are no reasonably foreseeable differences in effects on Gentner's fritillary of eliminating livestock grazing under Alternative D.

ACEC Designation

Under the No Action alternative, the BLM would maintain the designation of 50,073 acres of ACECs. In addition, under the No Action alternative, the BLM would continue to provide interim management to protect relevant and important values on 54,310 acres of potential ACECs. As a result, the No Action alternative would effectively manage 104,383 acres to maintain relevant and important values and thereby protect rare plant and fungi species. Alternatives A and D would designate the most acres of ACECs, 94,545 and 94,376 acres, respectively. The Proposed RMP would designate 93,515 acres. Alternatives B and C would designate the fewest acres: 88,448 and 87,044 acres, respectively (see the ACEC section in this chapter).

Within the 104,383 acres of existing designated and potential ACECs, there are approximately 650 known sites of Bureau Special Status plants and fungi within these areas and 284 sites of Survey and Manage species. However, not all acres of ACECs contain Bureau Special Status plants and fungi or botanical Survey and Manage species. Additionally, management direction for land use allocations other than the Harvest Land Base would effectively protect these existing sites whether or not the ACEC designation were applied under any alternative or the Proposed RMP. As such, potential loss of sites for Bureau Special Status plants and fungi or botanical Survey and Manage species would only occur where an ACEC designation was not applied due to conflicts with sustained-yield timber harvest on O&C lands. The action alternatives would present potential loss of sites ranging from none under Alternative D, one under Alternative A, six under Alternative B, and nine under Alternative C. Under the Proposed RMP, no sites occur within ACECs that are not designated due to conflict with sustained-yield timber production, and no sites would potentially be lost from any ACECs not being designated.

As a result, Alternative D and the Proposed RMP would have similar effects and provide the most benefit to rare plant and fungi species through ACEC designation. Alternative A would designate more acres as ACECs than the Proposed RMP, but one site would be at risk for potential s and benefits to rare plant and fungi species would be somewhat less than Alternative D and the Proposed RMP. Alternatives B and C would have similar effects in the amount of acres not designated as ACECs and provide the least benefit to rare plant and fungi species through ACEC designation, with Alternative B providing slightly more protection than Alternative C. Even though the No Action alternative would designate the fewest acres of ACECs, it would provide the greatest benefit to rare plant and fungi species because of the protection provided by interim management of potential ACECs.

Road Construction

As described earlier, road construction directly removes vegetation, fragments habitat, increases water runoff and erosion immediately adjacent to the road, provides a conduit for noxious and invasive plants to spread, and provides increased access by humans and wildlife that may further affect habitat for rare plants and fungi. New road construction would generally avoid directly affecting rare plant and fungi sites, because the BLM would conduct surveys prior to construction and would avoid or minimize any site found if alternate routes are available. However, road construction could directly affect some sites and indirectly affect sites in proximity to roads by increased access and spread of noxious and invasive vegetation. Although it is not possible at this scale of analysis with the data available to determine whether the estimated new road construction under each alternative and the Proposed RMP would occur within potential or occupied habitat for rare plants and fungi, the acreage of estimated habitat removed or disturbed by road construction provides a relative evaluation of the effects of road construction on rare plants and fungi. Alternative C would result in the largest mileage of new road construction in the first decade (**Table 3-119**). This mileage of new road construction would result in the removal or disturbance of 3,819 acres of habitat. Alternative D would result in the least mileage of new road construction in the first decade and 1,318 acres of habitat removed or disturbed. The Proposed RMP would potentially remove or disturb more habitat acres than Alternatives D and A, but less than the No Action alternative and Alternatives B and C.

Table 3-119. Road construction miles for the first 10 years of implementation

Alternative/ Proposed RMP	Total New Road Construction (Miles)	Habitat Removed or Disturbed (Acres)
No Action	637	3,481
Alt. A	299	1,642
Alt. B	531	2,897
Alt. C	699	3,819
Alt. D	240	1,318
PRMP	437	2,391

Public Motorized Access Designations

Under the No Action alternative, approximately 85,000 acres (3.3 percent) of the decision area would remain designated as *closed* for public motorized access, and approximately 330,400 acres (12.8 percent) would remain designated as *open* for public motorized access. On the remaining 83.9 percent, public motorized vehicle use would continue to be *limited* to existing or designated roads and trails. On some portion of the 330,400 acres designated as *open* for public motorized access, habitat removal and disturbance has been occurring and would continue to occur. It is not possible for the BLM to determine at this scale of analysis with the data available how much of the 330,400 acres designated as *open* for public motorized access are actually experiencing habitat removal or disturbance or would in the future. However, within areas designated as *open* for public motorized access, such effects could occur throughout the open area without future analysis or decision-making by the BLM.

Under all action alternatives and the Proposed RMP, no areas would be designated as *open* for public motorized access. The BLM would designate the entirety of the decision area as either *closed* or *limited* for public motorized access. As such, there would be no additional habitat removal or disturbance from public motorized vehicle use measurable at this scale of analysis with the data available under any of the action alternatives or the Proposed RMP.

Mineral Development

The No Action alternative would maintain the closure of the largest acreage to salable mineral material disposal, at 319,430 acres closed. The action alternatives and the Proposed RMP would close from 232,408 acres under Alternative A to 249,241 acres under the Proposed RMP. Although there is no basis for evaluating whether closed areas would have been developed if not closed and whether such areas would have included rare plants and fungi, these acreages provide an approximate evaluation of the level of protection for rare plants from the effects of salable mineral material disposal under the alternatives and the Proposed RMP.

Under the No Action alternative, 98,400 acres would remain withdrawn from locatable mineral entry. All of the action alternatives and the Proposed RMP would recommend for withdrawal more than double the acreage of the existing withdrawals, totaling 266,472 acres under Alternative B, 306,878 acres under Alternative D, and 307,312 acres under the Proposed RMP. Although there is no basis for evaluating whether these areas recommended for withdrawal would have been developed if not withdrawn and whether such areas would have included rare plants and fungi, these acreages provide an approximate evaluation of the level of protection for rare plants from the effects of locatable mineral development under the alternatives and the Proposed RMP.

There are 1,292 active mining claims in the decision area, the majority of which occur within the Medford District, which has a disproportionate percentage of rare plant and fungi sites. There is one pending Plan of Operation in the French Flat ACEC in the Medford District that would provide protection for Cook's lomatium. The BLM does not have information on whether there are mining claims on areas that include Bureau Sensitive plant sites.

Summary

The No Action alternative would allocate the smallest Late-Successional Reserve, not reserve all Structurally-complex forest, result in the second-largest acreage of timber harvest, result in the second-largest mileage of new road construction, and designate areas as *open* for public motorized access. However, the No Action alternative would require surveys and protection of sites of Survey and Manage species. In total, the No Action alternative would provide specific species protections and would result in an increase in habitat for most rare plant and fungi species, but would provide less benefit overall than most of the action alternatives and the Proposed RMP.

Alternative A would allocate the largest Late-Successional Reserve and would result in the fewest overall acres of habitat disturbance. However, timber harvest in the moist forest would include clear-cutting, which would not provide habitat benefits for rare plant and fungi species associated with Mature and Structurally-complex stands.

Alternative B would allocate the second-largest Late-Successional Reserve and would result in the third-largest amount of habitat disturbance.

Alternative C would result in the most acres of habitat disturbance, and timber harvest in the moist forest would include clear-cutting, which would not provide habitat benefits for rare plant and fungi species associated with Mature and Structurally-complex stands. Alternative C would result in the least increase in Mature and Structurally-complex stands over time.

Alternative D would result in the second-fewest overall acres of habitat disturbance and would result in the largest increase in Mature and Structurally-complex stands over time. However, Alternative D would provide less site protection for rare plants and fungi in the Harvest Land Base than the other alternatives and the Proposed RMP.

The Proposed RMP would result in the third-fewest overall acres of habitat disturbance. The Proposed RMP would provide specifically for the maintenance and enhancement of Bureau Special Status plant species habitat within reserve allocations.

It is not possible to compare directly the cumulative effects of different actions on rare plants and fungi under the alternatives and the Proposed RMP. However, the No Action alternative and Alternative C would generally provide less benefit to rare plants and fungi. Alternatives A, B, and D, and the Proposed RMP would generally provide more benefit to rare plants and fungi.

Issue 2

How would timber harvest and other vegetation management affect oak communities?

Summary of Analytical Methods

The BLM calculated the acres of oak-dominant communities within the planning and decision areas using Gradient Nearest Neighbor (GNN) data (2012). The BLM defined oak-dominant communities as forest types where an oak species is the primary or secondary species. For example, the forest type could consist of Oregon white oak, or of ponderosa pine and California black oak.

The BLM evaluated the effect of timber harvest on oak woodlands based on the percent change in oak basal area in the Harvest Land Base and the entire decision area among the alternatives and the Proposed RMP over 50 years.

Background

Oak communities, including oak woodlands and oak savanna, represent a special habitat within the decision area. While oak species in Oregon are not Bureau Special Status species, their habitat is rare and vulnerable to destruction from development, conversion to conifer forest, and high-intensity wildfire. Oregon white oak (*Quercus garryana*) occurs from Vancouver Island through western Washington, Oregon, and northwest California and in the Sierra Nevada foothills. California black oak (*Quercus kelloggii*) ranges from southern Oregon and throughout California and occurs within the Eugene, Medford, and Roseburg Districts, and the Klamath Falls Field Office. Both Oregon white oak and California black oak may occur within forested stands as a minor component and are often examples of the legacy vegetative community. Oregon white oak is intolerant to shade and relies on the most recent two years of ring growth for water transport. Therefore, it is vulnerable to competition (Gould *et al.* 2011). Prior to European settlement, wildfire and frequent, low-intensity burning by Native Americans limited the extent of coniferous forests and sustained fire-tolerant oak savannah and woodlands (Tveten and Fonda 1999, Devine and Harrington 2006, Gould *et al.* 2011, Klamath Bird Observatory and Lomakatsi Restoration Project 2014). Lack of fire in oak communities has resulted in the encroachment of conifers that rapidly overtop, shade, and crowd out the oaks. In addition, lack of frequent fire has often resulted in the accumulation of heavy fuels, making the reintroduction of fire difficult (see the Fire and Fuels section in this chapter). Releasing Oregon white oaks from overtopping Douglas-fir increases the available soil water content, extending the growing season for the oaks and understory vegetation (Devine and Harrington 2007). Even oaks suppressed for many years respond favorably after release with increased stem diameter growth and the growth of epicormic branches (Devine and Harrington 2006). These changes are most substantial during the first five years after release.

Affected Environment

Oak woodlands and savannas are limited within the planning area. Within the decision area, Oregon white oak woodlands and savannas occur primarily in the Roseburg and Medford Districts and the Klamath Falls Field Office; however, oaks occur in all districts within the decision area. **Table 3-120** lists the acres of oak-dominant communities in the planning area and the decision area within each district.

Table 3-120. Acres of oak-dominant plant communities within the planning and decision areas

District/ Field Office	Oak – All Ownerships (Acres)	Oak – BLM-administered lands (Acres)	Oak Acres on BLM (Percent of Total)
Coos Bay	33,475	1,062	3.17%
Eugene	35,256	1,045	2.96%
Klamath Falls	11,147	3,654	32.78%
Medford	447,900	117,405	26.21%
Roseburg	135,804	12,490	9.20%
Salem	107,882	550	0.51%
Totals	**771,464**	**136,207**	**17.66%**

Environmental Consequences

Under the action alternatives and the Proposed RMP, within the dry forests outside of the Harvest Land Base, the BLM would apply management treatments to maintain or promote desired species composition within oak woodlands, meadows, grasslands, and shrublands. In addition, within the Uneven-aged Timber Area sub-allocation, the BLM would retain oaks established prior to 1850. Under Alternative B, the BLM would manage mixed hardwood/conifer communities outside of the Harvest Land Base to maintain and enhance oak persistence and structure. Since oak species may be a minor component of mixed hardwood/conifer communities, they are likely to die off over time without management to prevent conifers from shading them out. Under Alternative B, the BLM would actively manage forest stands for the persistence of these species. Under the Proposed RMP across all land use allocations, the BLM would manage mixed hardwood/conifer communities to maintain and enhance oak consistent with other management direction for the land use allocation. The BLM would also retain oaks greater than 24” DBH, except for safety or operational reasons in the dry Late-Successional Reserve and the Uneven-aged Timber Area sub-allocation.

Although vegetative communities where oak species currently predominate are generally outside of the Harvest Land Base in all alternatives and the Proposed RMP, oak species do occur within the Harvest Land Base. Oaks represent an immeasurable small percentage of the basal area of the stands in the Harvest Land Base in the moist forests of Salem and Eugene. However, oaks represent more than 60 percent of the basal area of some individual dry forest stands in the Klamath Falls Field Office and the Medford and Roseburg Districts. In general, all alternatives and the Proposed RMP would result in a decrease of oak basal area of 1 percent or less across the decision area over 50 years. Canopy cover of all hardwoods (e.g., oaks, madrone, maple, and chinquapin) would decrease by 3–4 percent in 50 years. It is likely that the vegetation modeling overestimates any decline in hardwood abundance in general and specifically oaks, because the tree growth model is designed primarily for fast-growing conifer species such as Douglas-fir, and the model did not account for all management directions that would help to maintain oaks within stands.

In general, oak communities would eventually decline in abundance within the Late-Successional Reserve and the Riparian Reserve as stands would continue to grow, and conifers would overtop and shade out oaks under the No Action alternative and Alternatives A, B, C, and D. Oak communities would fare best within the Late-Successional Reserve under the Proposed RMP as the BLM would utilize integrated vegetation management to increase or maintain vegetative species diversity and to create and maintain areas of hardwood dominance. Within the Harvest Land Base, the different harvest methods would have varying effects on oak species. Alternatives A and C would both include clearcuts, and all oaks present within the stand would be removed. Forest stands with an oak component require natural or management disturbance to prevent oaks from dying out of the stand. Intermediate harvest methods, such as regeneration harvest with retention and uneven-aged management would provide more opportunities for maintaining oaks within stands.

The management direction for the action alternatives and the Proposed RMP would mitigate effects of timber harvest on oaks. Management direction common to all alternatives and the Proposed RMP designed to meet objectives for fire and fuels would maintain and promote oaks on lands outside of the Harvest Land Base. Within the Harvest Land Base, the BLM would favor patches dominated by hardwood trees and areas containing unique habitats or high diversity for retention, except in the High Intensity Timber Area under Alternatives A and C. In the dry Late-Successional Reserve under all action alternatives and the Proposed RMP, the BLM would apply vegetation management to increase species diversity and allow for hardwood persistence. Under the Proposed RMP, oaks would be maintained within forest and woodland communities across all land use allocations. The quality and quantity of existing oak habitat would improve under the Proposed RMP. The No Action alternative and the action alternatives would likely result in the decline of oaks within forest communities, as conifer species would eventually overtop and suppress oaks.

Issues Considered but not Analyzed in Detail

How would recreation management affect Special Status plant and fungi species, Survey and Manage species, and special habitats?

The BLM assumed that human use concentrated at recreation sites, such as campgrounds and trails, would adversely affect rare plants and fungi because of trampling, firewood collection, introduction and spread of noxious and non-native species, and soil disturbance. Recreation sites would not differ among the alternatives or the Proposed RMP. Changes to recreation sites in the decision area, such as the development of new sites or elimination of existing sites, would be speculative. As such, there is no basis for describing a difference in effect on rare plant and fungi species from recreation sites among the alternatives and the Proposed RMP.

While dispersed recreation could potentially affect rare plants and fungi, such recreation use would be less concentrated than at recreation sites, and effects would be speculative. It is not possible at this scale of analysis with the data available to describe any foreseeable effects on rare plants and fungi of the recreation allocations at the RMP level, such as Special Recreation Management Areas and Extensive Recreation Management Areas or issuance of special use permits.

How would invasive plant introduction and spread affect Bureau Special Status plant and fungi species, Survey and Manage species, and special habitats?

Invasive plants alter the existing native plant community and reduce rare vascular plant growth and vigor, flowering, and fruiting. There is very little information about the adverse effects of invasive plant species to fungi, terrestrial lichens, and bryophytes. Invasive species effects to rare plant and fungi sites would vary depending on many factors, but primarily the invasive species and its biology, site characteristics, and the affected rare plant species and its biology. There is not a reliable way to predict actual location of invasive species introductions relative to sites of rare species because of activities. Actions to control invasive plant species that eradicate or reduce competition would benefit rare plant sites. Generally, larger rare plant and fungi sites would be more resilient to invasive species invasion and persist longer than small sites that are less robust. The Invasive Species section of this chapter analyzed the risk of invasive plant introduction and spread associated with management actions under each alternative and the Proposed RMP. It is not possible to describe that risk of invasive plant introduction and spread in terms of effects on rare plant and fungi species given the incomplete information on rare plant and fungi distribution, the uncertainty associated with forecasting future invasive plant introduction and spread, and the highly species-specific and site-specific interactions between rare plants and fungi and invasive plants.

How would wildfire response affect Special Status plant and fungi species, Survey and Manage species, and special habitats?

Wildfire response activities, such as bulldozing for the construction of fire lines, safety zones, and staging areas, can cause direct effects to rare plant and fungi sites from habitat disturbance. Wildfire response efforts that prevent or reduce habitat loss from uncharacteristic wildfire can preserve rare plant and fungi sites that would otherwise be lost. Because of uncertainties with regard to wildfire response activities on BLM-administered lands, such as location and extent, specific environmental effects of these actions to rare plant and fungi sites from habitat disturbance would be speculative. The full range of wildfire response tactics would be available under all alternatives and the Proposed RMP, and maintenance of fire suppression-related infrastructure would not change among alternatives or the Proposed RMP (see the Fire and Fuels section in this chapter). Because these factors would not differ among the alternatives or the Proposed RMP, there is no reasonable basis on which to identify a difference in the effects of wildfire response on rare plants and fungi.

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