Minerals

Key Points

- Under all of the action alternatives, the acres of land recommended for withdrawal from locatable mineral entry would increase by 6-8 percent of the decision area. The BLM ranks 38-65 percent of these lands as high for mineral occurrence and development. Recommending the withdrawal of these 80,000-110,000 acres (depending on alternative) of high-ranked lands could have negative effects to the development of known and undiscovered mineral resources.
- Approximately 90 percent of the decision area remains open to locatable and salable mineral entry under all action alternatives.
- Unless closed by legislation, under all action alternatives, the decision area is open to leasable mineral development.

Background

The BLM administers the mineral estate on nearly 40 million acres of BLM, U.S. Forest Service, 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 68,600 acres of Federal minerals with private surface ownership. **Table 3-97** lists the acres by office.

Table 3-97. Acres of surface and mineral estate.

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**

* 2008 data from the Western Oregon Plan Revision EIS and district-specific information.

Physiography

The planning area contains five geologic physiographic regions.[63] They are the Coast Range, Willamette Valley, Cascade Mountains (High and Western), Klamath Mountains, and the Basin and Range (**Figure 3-123**). Each region's unique geology influences the mineral occurrences.

[63] These are different from the terrestrial physiographic regions described in FEMAT and illustrated in **Figure 3-2**.

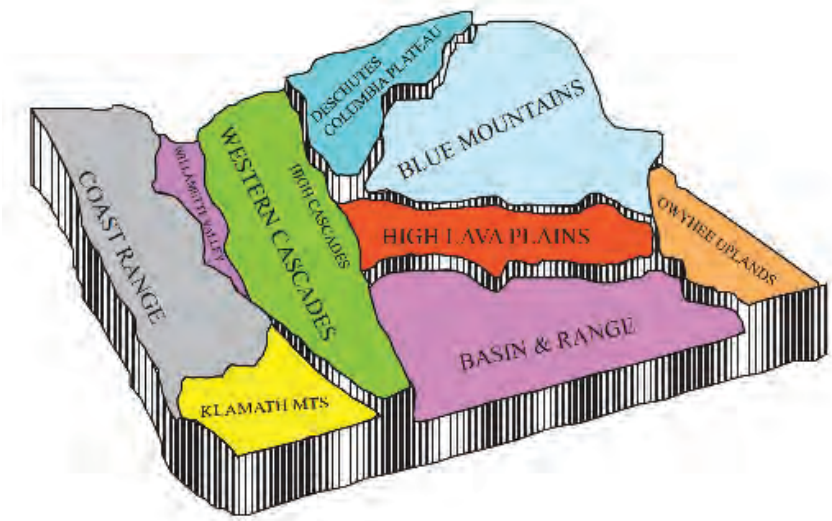

Figure 3-123. Physiographic Regions in the decision area (Orr and Orr 2012).

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 for aggregate 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. This MILO database shows 300 occurrences for other mineral commodities such as clay, limestone, pumice, and silica sand scattered thorough the planning area. There are 150 occurrences for coal with most sites in coastal areas concentrated in the Coos Bay area. In addition, there are 3,300 metal occurrences (gold, silver, copper, nickel, chromite, and other minerals) with nearly all being located in southwest Oregon.

Coast Range Mineral Resources

Coal seams occur throughout the Coast Range, with the majority in Coos County. On the Coos Bay District, there is a coalbed natural gas Area of Mutual Interest. The Coast Range has oil and gas potential and development; the State's first commercial gas field was located in 1979 near Mist in Columbia County; this field has 18 wells and has produced 65 billion cubic feet of gas. Other economically valuable minerals include beach placers containing gold and platinum from Cape Blanco to Cape Arago.

Willamette Valley Mineral Resources

Deeply-weathered basalts that have resulted in 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.

Cascade Mountains Mineral Resources

Gold and silver has 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, roughly 12-mile-wide, north-south belt marks a thermal boundary existing between the High Cascades and Western Cascades. Temperatures of the waters can range between 90-190 degrees Fahrenheit in certain areas. The thermal gradients of the region may represent a large potential source of renewable geothermal energy.

Klamath Mountains Mineral Resources

The Klamath province has substantial mineral resources due to its geologic diversity. Mineralization is primarily attributed to tectonic plate evolution and secondarily to later plutonic intrusion. This province has historically produced gold, silver, copper, nickel, chromite, and 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 province has come from placers deposits. Copper was historically mined from the Josephine ophiolite near Grants Pass, nickel from weathered ophiolites near Riddle, and chromite from ophiolites throughout the Klamath Mountains. Chromite rich beach sands derived from the Klamath Mountains occur on the southern Oregon coast.

Basin and Range Mineral Resources

There was historic uranium, mercury, and borax production in this province and diatomite occurs near the Sprague River. This region has a thin crust, numerous faults, and high heat flow, which creates an increased possibility for geothermal resources.

Issue 1

How would the alternatives affect salable mineral development or existing BLM rock quarries?

Summary of Analytical Methods

The BLM evaluated how the acreage proposed for closure to salable mineral materials under each alternative would affect the possible future development of this resource. Under each alternative, the BLM would close lands managed for their wilderness characteristics, eligible Wild and Scenic River segments, some Areas of Critical Environmental Concern (ACECs), and Recreation Management Areas (RMAs), to salable mineral development. The BLM evaluated data from LR2000,[64] data supplied by each office, and data from the Oregon Department of Geology and Mineral Industries to determine the location of mineral material sites (primarily rock quarries) in the decision area. It was determined that this data could not be utilized to predict the location for future mineral material sites. The BLM will not complete a formal mineral potential report for salable minerals for this RMP revision. Information regarding mineral potential reports, and when they are required, can be found in BLM Manual 3031.

The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which the BLM incorporates here by reference (USDI BLM 2014, p.104).

[64] This is a BLM database containing information about minerals.

Background

Salable minerals are mineral materials and include common variety quarry rock used in construction and road surfacing, and sand and gravel, clay, and volcanic pumice and cinders. The regulations found in 43 CFR 3600 guide the exploration, development, and disposal of mineral material resources and the protection of resources and the environment. The disposal of mineral materials includes sale at fair market value to the public and through free use permits to government entities or non-profit organizations. Disposal of mineral materials is discretionary on the part of BLM.

Within the decision area, the BLM's primary salable mineral material is quarry rock. The BLM, timber companies, and local governments crush the majority of this quarry rock to create aggregate for road surfacing. Other uses of quarry rock include rip-rap for fish enhancement projects, jetty and boat ramps, and reclamation projects. The BLM also disposes of sand and gravel, soil or fill, clay, volcanic pumice and cinders, and specialty stone through sales or free use permits.

Affected Environment

The use of mineral materials is dependent on the demand by the BLM, private companies, local governments, and the public. **Figures 3-124** and **3-125** display mineral material production by cubic yard and the number of sales across the decision area for the years 2007-2013 (LR2000).

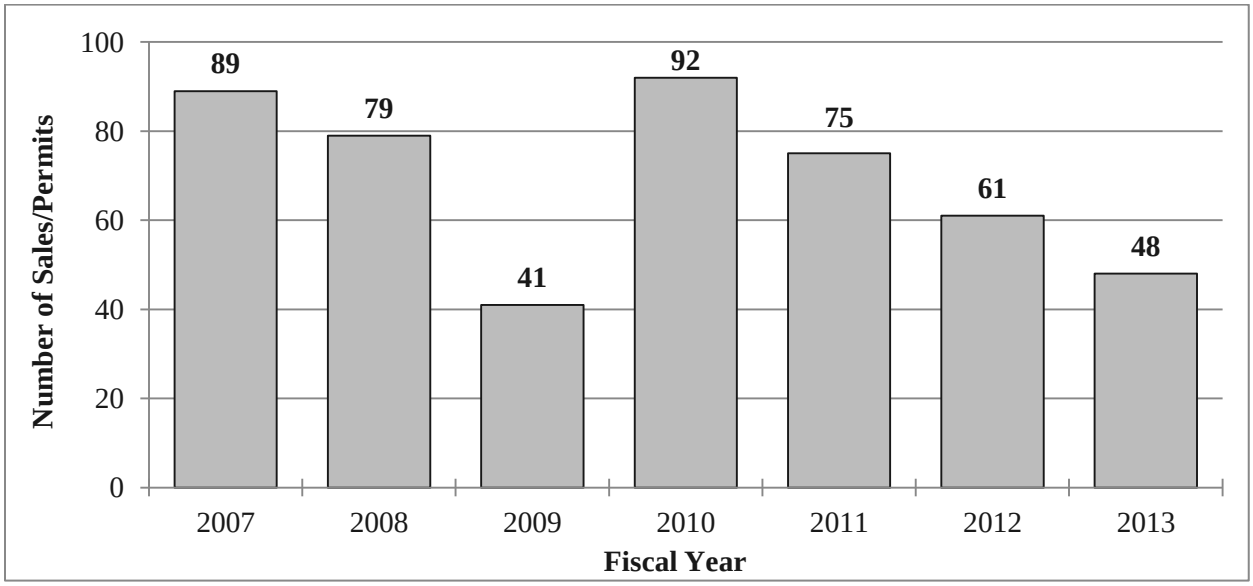

Figure 3-124. Number of sales or permits for mineral material by year in the decision area.

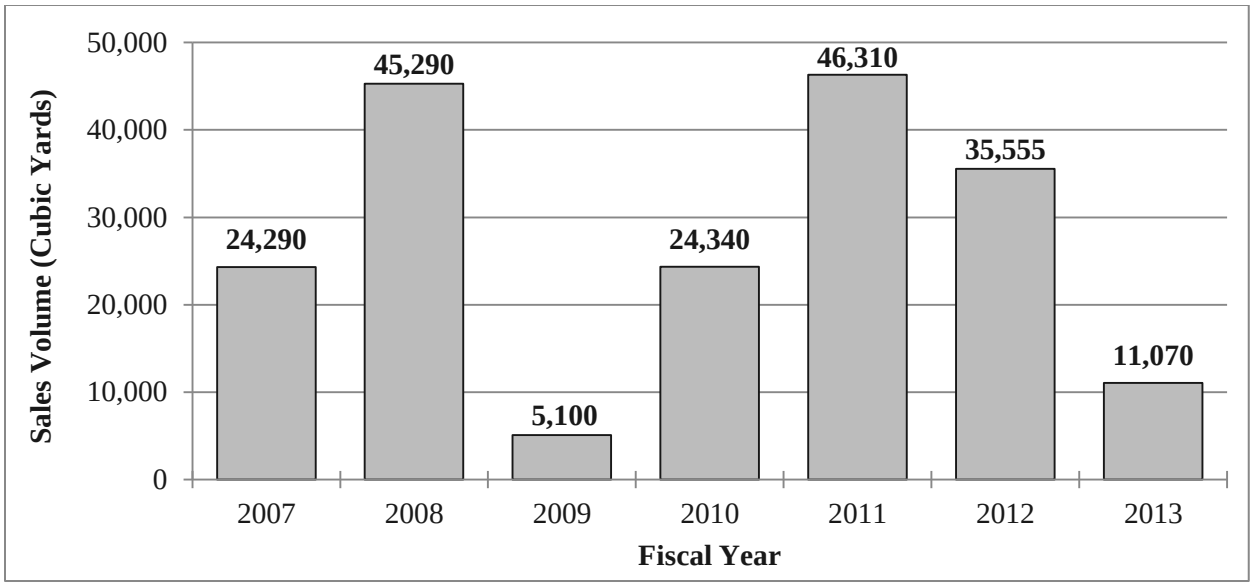

Figure 3-125. Cubic yards of mineral material produced by year in the decision area.

Mineral material sales data from 2007-2013 show that sales and permits (BLM use is tracked by permits) in the decision area are both numerous and of low volume, with nearly 500 disposals during this period averaging about 400 cubic yards each.

There are just over 600 developed quarry sites in the decision area. The majority of these quarries are used for in-place quarry rock, although a few sites are for pumice, sand, gravel, or dimension stone. Many of these sites were developed before the 1990s and have been in use for decades. The footprint, or area of disturbance, of quarry sites is variable and ranges from about 0.01-5 acres. A typical quarry is about 0.5 acre in size. The BLM estimates that that approximately 25-33 percent of these rock quarries are near depletion with just a few thousand cubic yards of rock remaining. At some sites, continued removal could require expansion of the existing footprint. The BLM does not have an 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 the required specifications. However, access, proximity to area of use, and environmental considerations are also important factors in determining where to develop a quarry. **Figure 3-126** shows the spatial distribution of quarry sites in the decision area.

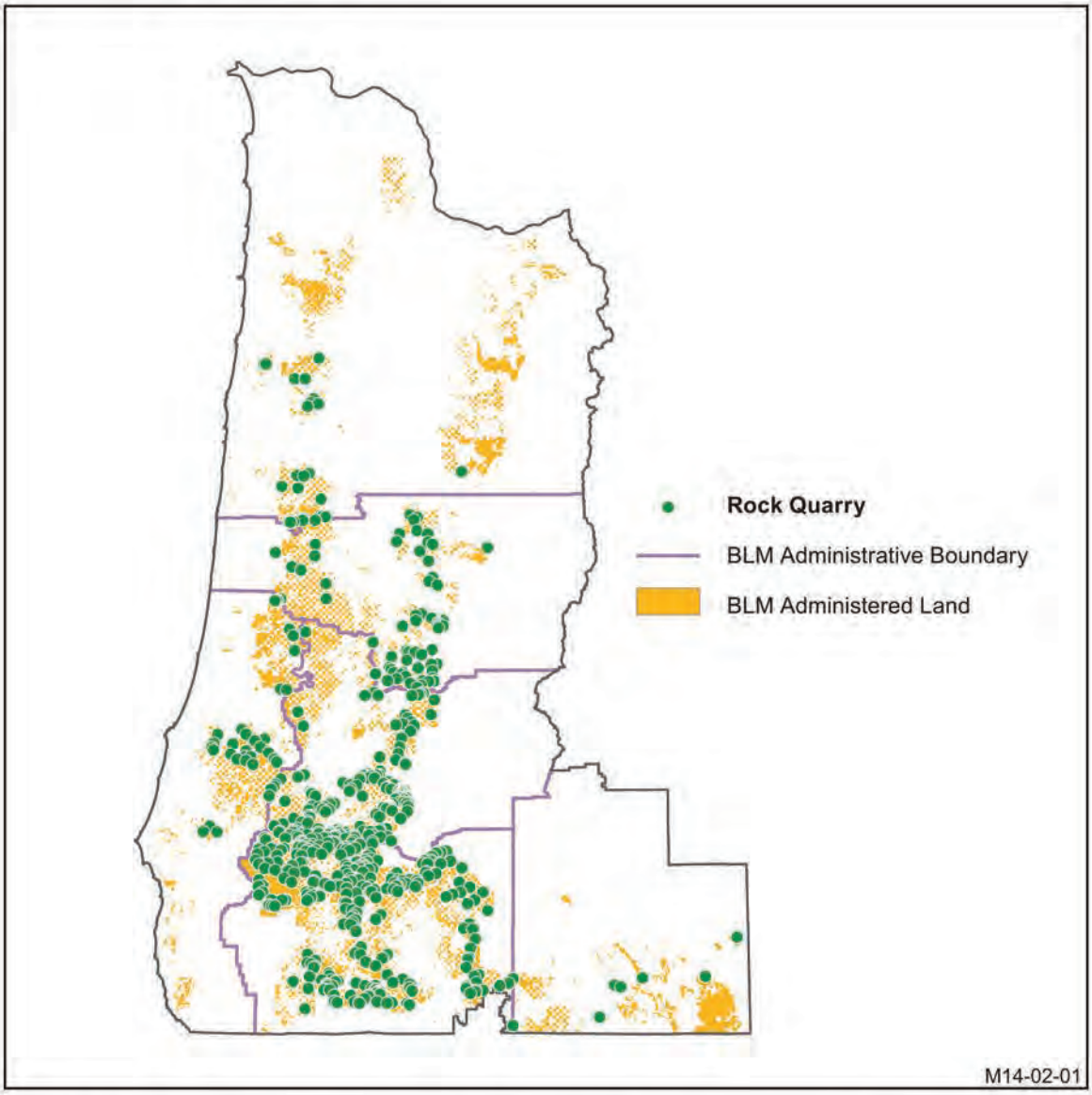

Figure 3-126. Developed quarry sites in the decision area from office inventories.

Table 3-98 shows the number of rock quarry sites per district or field office in the decision area as of 2014 based on office inventories.

Table 3-98. 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	18
Totals	**602**

The majority of these quarries are used for in-place quarry rock, although a few sites are for pumice, sand and gravel, or dimension stone. The BLM does not have a complete inventory of potential rock quarry sites in the decision area, but as **Figures 3-125** and **3-126** show, there is ongoing interest in BLM quarries, with 40 to 90 sales a year.

All of the salable activity described above takes place on BLM-administered lands that are open to salable mineral entry. **Table 3-99** provides a breakdown by office of the acres of BLM-administered lands that are currently closed to salable mineral development. Closed nondiscretionary lands, which total 31,530 acres, remain closed under all alternatives. As **Table 3-99** shows, the Salem District has the majority of lands closed to salable mineral entry.

Table 3-99. Acres of lands currently closed to salable mineral development (No Action alternative).

District/Field Office	Salable (Acres)*	Closed Nondiscretionary+ (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**

* 2008 data from The Western Oregon Plan Revision EIS.
\+ Legal mandates establish non-discretionary closures while a discretionary closure is the result of an agency management decision.

There are over 5,500 quarry sites for stone/aggregate and an estimated 300 sites for other types of saleable minerals other than quarry rock or aggregate in the planning area (DOGAMI MILO). They include commodities such as clay, limestone, pumice, silica, and others (**Table 3-100**).

Table 3-100. Estimated number of mineral material sites in the planning area.

Commodity	Number of Sites
Cement Materials	108
Clay	84
Other Minerals*	89
Pumice	4
Quarry Stone and Aggregate	5,500
Silica Sand	19

* Talc, soapstone, certain gemstone, refractory graphite, serpentine, quartz crystal, optical calcite

Trends in salable mineral material developments for rock quarries and development guidance can be found in **Appendix L**.

Environmental Effects

Figure 3-127 and **Table 3-101** show acres that the BLM would close to salable mineral development by alternative and land use category.

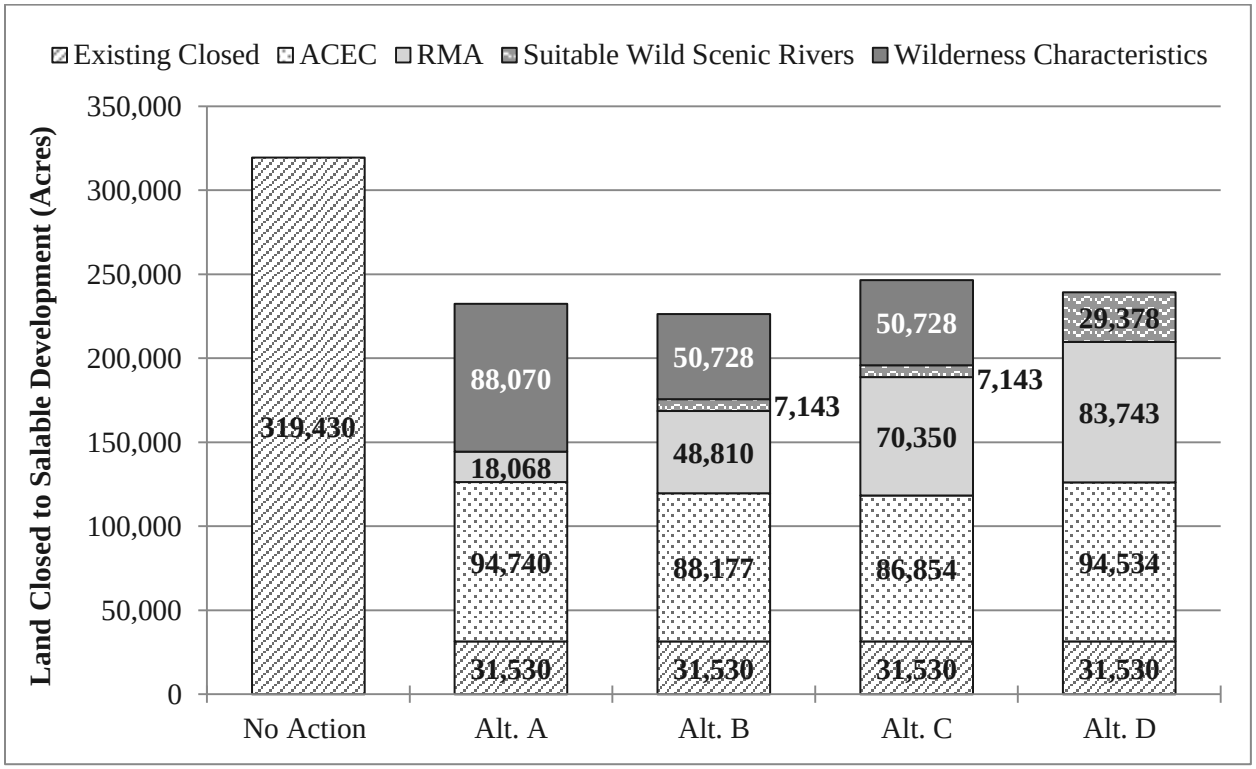

Figure 3-127. Acres closed to salable development by land category and alternative.

Table 3-101. Acres closed to salable mineral entry.

Land Category	No Action (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	Alt. D (Acres)
ACEC	-	94,740	88,177	86,854	94,534
RMA	-	18,068	48,810	70,350	83,743
Lands Managed for Wilderness Characteristics	-	88,029	50,728	50,706	0
Eligible Wild Scenic Rivers	-	0	7,143	7,143	29,378
Closed Nondiscretionary+	31,530	31,530	31,530	31,530	31,530
Closed Discretionary+ under the 1995 RMPs	287,900	0	0	0	0
Totals	**319,430**	**232,367**	**226,388**	**246,583**	**239,185**

+ Legal mandates establish non-discretionary closures while a discretionary closure is the result of an agency management decision.

All the action alternatives open more land to salable mineral entry than the No Action alternative (the allocations driving these closures are in **Table 3-101**). Under the No Action alternative, 13 percent of the

decision area is closed to salable mineral entry, the majority in the Salem District. Under the action alternatives, the BLM would reduce the total acres closed to saleable minerals to 9 to 10 percent of the decision area. Data is not readily available to spatially display the areas closed to salable mineral entry under the No Action alternative, therefore a comparison map is not included in this analysis. **Appendix L** lists each ACEC, RMA, lands managed for wilderness characteristics, and eligible WSRs closed to salable entry through this RMP revision. The overall percentage of closed acreage for each action alternative is similar, though the allocations driving the closures change across alternatives (**Table 3-102**). Compared to the No Action alternative, mineral materials would be slightly more available under the action alternatives, with Alternative B having the most acreage available.

Table 3-102. Percentage of lands closed to salable mineral entry in the decision area.

Land Category	No Action (Percent)	Alt. A (Percent)	Alt. B (Percent)	Alt. C (Percent)	Alt. D (Percent)
ACEC, RMA, Land managed for Wilderness Characteristics, Eligible WSRs	-	8%	8%	9%	9%
Nondiscretionary Closure	1%	1%	1%	1%	1%
Discretionary Closure under 1995 RMPs	12%	-	-	-	-
Totals	**13%**	**9%**	**9%**	**10%**	**10%**

Depending on the alternative, there are up to 19 developed rock quarries in allocations that the BLM would close to mineral development. **Table 3-103** shows the number or quarry sites that are located in each land use category by alternative.

Table 3-103. Number of rock quarries located in each land use category by alternative that would be closed to mineral development.

Land Category	No Action (Quarries)	Alt. A (Quarries)	Alt. B (Quarries)	Alt. C (Quarries)	Alt. D (Quarries)
ACEC	8	6	6	6	6
RMA	-	-	3	4	4
Lands Managed for Wilderness Characteristics	-	10	6	6	-
Eligible Wild and Scenic Rivers	-	-	-	-	9
Total Quarries	**8**	**16**	**15**	**16**	**19**

Closing existing rock quarries prevents future use by the BLM, local governments, and the public, which may necessitate the development of new quarries elsewhere to offset the loss. Closing 15 to 19 quarries, depending on the alternative, could require the development of new sites, which could increase the cost and environmental footprint of quarry development or necessitate a long haul of rock material. In addition to this, there would be an effective loss of resources available for future use for each quarry closed.

Appendix L contains the developed rock quarries by district and name within each ACEC, RMA, lands managed for wilderness characteristics and eligible WSRs closed to salable mineral development under the alternatives.

Issue 2

How would the alternatives affect the acres of land recommended for withdrawal from locatable mineral entry?

Summary of Analytical Methods

The BLM identified by alternative the acres of land recommended for withdrawal from locatable mineral entry. The BLM assumed that areas recommended for withdrawal from locatable mineral entry under each alternative to be withdrawn for the purposes of this analysis. The BLM then ranked each ACEC, RMA, lands managed for wilderness characteristics and eligible WSRs that is recommend for withdrawal as high, medium or low. The ranking is based on geology, mining claim density, historic mines, prospects, and occurrences. This ranking can be used to determine the potential impacts to mineral development for each recommended withdrawal. Withdrawing areas ranked as high would 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.

The BLM will not complete a formal mineral potential report for locatable minerals for this RMP Revision. Prior to actual withdrawal, the BLM must prepare a mineral potential report for each recommended withdrawal proposal.

The BLM estimated the historic mineral occurrence and/or development for each ACEC, RMA, lands managed for Wilderness Characteristics and eligible WSRs that the BLM would recommend for withdrawal from locatable mineral entry under each alternative. For this evaluation, the BLM relied on the Mineral Resource Map of Oregon (1984) for geology, mineral deposits, and mining history and on LR2000 for the number of claims per quarter section of closed and active mining claims. The rankings are from high to low.

High historic mineral occurrence or development areas are—

- Regions with historic major gold mining;
- Areas with laterites and beach placers that contain more than ten active or closed mining claims;
- Areas with favorable geology for mineral production and/or potential and containing more than ten active or closed mining claims; and
- Areas with more than thirty active or closed mining claims.

Medium historic mineral occurrence or development areas are—

- Areas with favorable geology for mineral production or potential;l
- Areas with laterites, beach placers, and no mining claims; and
- Areas with one to thirty active or closed mining claims.

Low historic mineral occurrence or development areas are areas with no mining claims and that do not fall into the High or Medium categories.

The Planning Criteria provides more detailed information on analytical assumptions, methods and techniques, and geographic and temporal scales, which the BLM incorporates here by reference (USDI BLM 2014, p.104).

Background

Locatable minerals include the metals gold, silver, copper, lead, zinc, nickel, and chromite and 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 at 43 CFR 3700 and 3800 establish procedures for locating mining claims, preventing unnecessary or undue degradation, compliance with Federal and State laws related to environmental protection, and performance standards. Surface Management Regulations from 43 CFR 3809 include that a Plan of Operations must be submitted for any operations causing surface disturbance greater that casual use in designated ACECs, areas in the National Wild and Scenic Rivers System, and areas designated as *closed* to OHV use (as defined in 43 CFR 8340.0-5). A Plan of Operations is subject to NEPA.

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. These requirements include that after the date on which the lands are withdrawn, the BLM will not approve a Plan of Operations or allow notice-level operations to proceed until the BLM has prepared a mineral examination report to determine mining claim validity. Cost recovery applies to this process. Congress can designate withdrawals, or the BLM can undertake a withdrawal process ending with a decision signed by the Secretary of Interior. This RMP revision does not withdraw lands from locatable mineral entry.

Affected Environment

The planning area contains over 3,300 occurrences of locatable mineral resources and has a long history of mineral development (DOGAMI MILO). Mining claim records show that about 39,500 claims have been located on public lands in the planning area since BLM recording requirements began with the passage of FLPMA. The 1,045 active mining claims in the decision area attest to the ongoing interest in locatable minerals.

Table 3-104 shows the number of active mining claims, Notices, and Pending or authorized Plan of Operation in the decision area by office. **Figure 3-128** shows the general locations of active mining claims in the decision area.

Table 3-104. 2013 Active mining claims, Notices, and pending or authorized Plans of Operation in the decision area.

District/Field Office	Active Mining Claims	Notices	Plans of Operation-Pending or Authorized
Coos Bay	38	1	-
Eugene	36	1	-
Klamath Falls	1	-	-
Medford	840	24	10
Roseburg	123	-	1
Salem	7	1	-
Totals	**1,045**	**27**	**11**

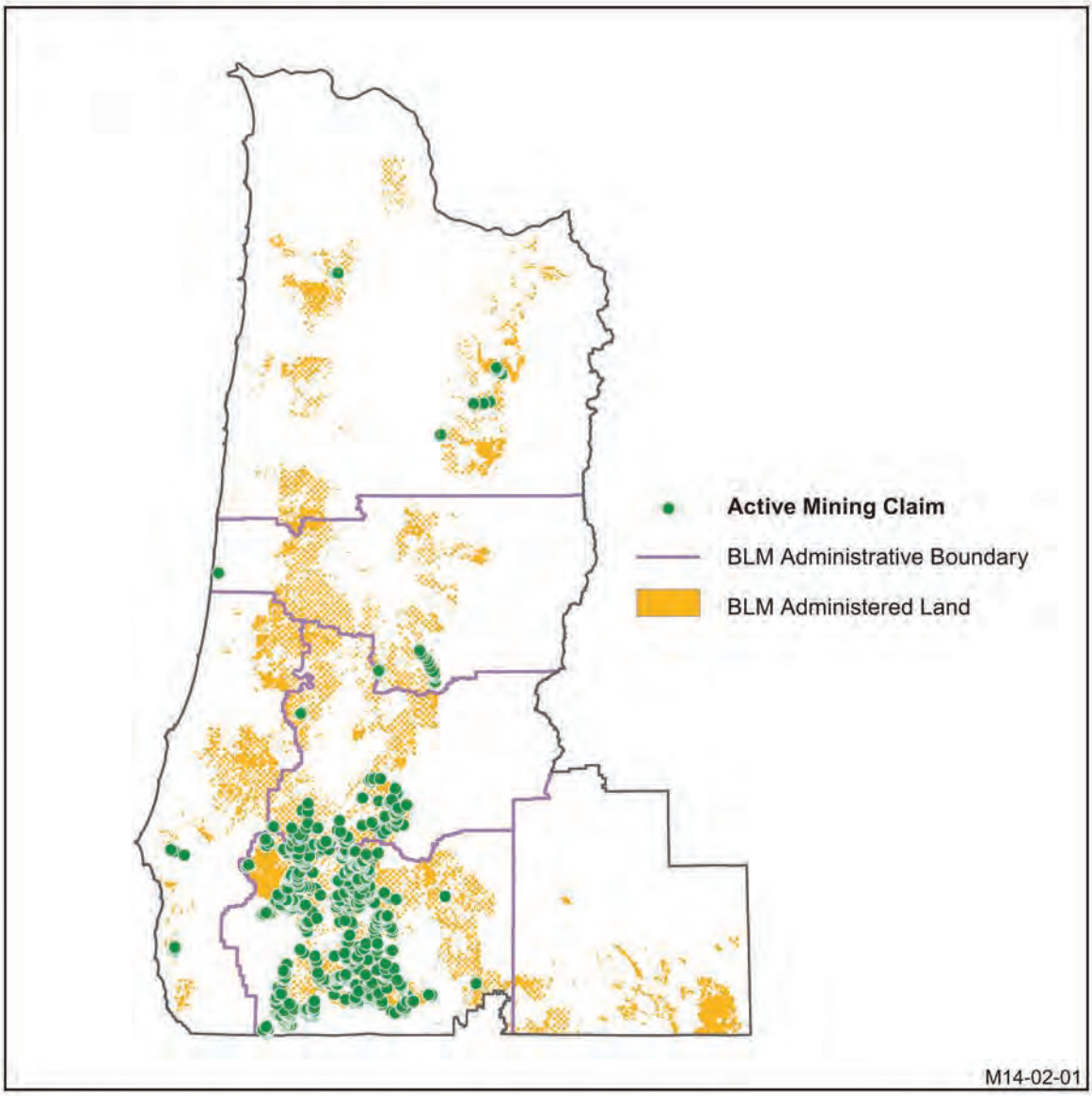

Figure 3-128. Active mining claims in the decision area in 2013.

Table 3-105 shows by office the acres of land currently withdrawn from locatable mineral entry, a total of 98,400 acres. The BLM would maintain these 98,400 previously-withdrawn acres under all alternatives.

Table 3-105. Acres of lands previously withdrawn from locatable minerals.

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
Totals	**98,400**

*2008 data from the Western Oregon Plan Revision EIS.

Trends in locatable mineral developments and regulations are described in **Appendix L**.

Environmental Effects

Figure 3-129 and **Table 3-106** show the acres that the BLM would recommend for withdrawal from locatable mineral entry by alternative for each ACEC, RMA, lands managed for wilderness characteristics, and eligible WSRs. The BLM did not rank existing withdrawals in this discussion, but included the existing acres.

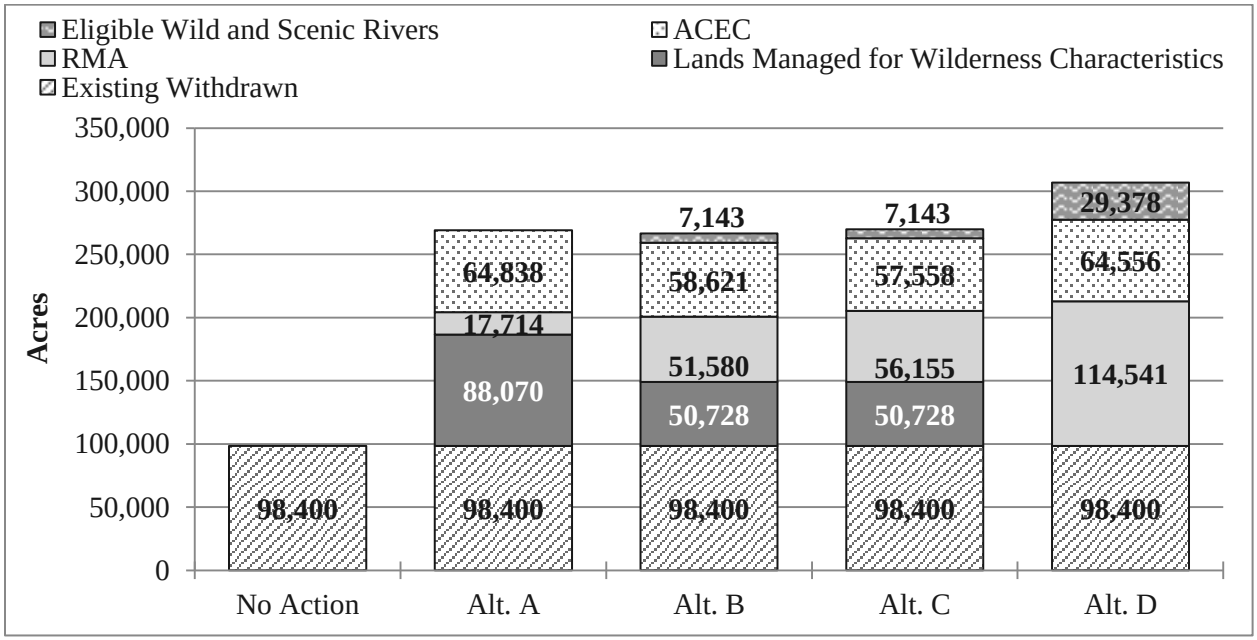

Figure 3-129. Acres that the BLM would recommend for withdrawal from locatable mineral entry by alternative and land category and previously withdrawn acres.

Table 3-106. Acres the BLM would recommend for withdrawal from locatable mineral entry by alternative and previously withdrawn acres.

Land Category	No Action (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	Alt. D (Acres)
ACEC		64,838	58,621	57,558	64,556
RMA	-	17,714	51,580	56,155	114,541
Lands managed for Wilderness Characteristics	-	88,070	50,728	50,728	-
Eligible Wild Scenic Rivers	-	-	7,143	7,143	29,378
Totals	**98,400**	**170,622**	**168,072**	**171,584**	**208,475**

Under all action alternatives, the BLM would recommend increasing the lands withdrawn from locatable mineral entry; this increase would range from 168,050 acres under Alternative B to 208,475 acres under Alternative D (**Table 3-106**). About 4 percent of the 2.5 million acre decision area is currently withdrawn from locatable mineral entry (**Table 3-107**). The BLM would retain the previously withdrawn acres under all alternatives. Alternatives A, B, and C would increase the percentage of lands withdrawn by 6 percent, and Alternative D would increase the percentage of lands withdrawn by 8 percent. Withdrawing an additional 6-8 percent of the decision area could affect the development of locatable mineral resources.

Table 3-107. Percentage of lands recommended for withdrawal to locatable mineral entry by alternative and land category including and percentage of previously withdrawn lands in the decision area.

Land Category	No Action (Percent)	Alt. A (Percent)	Alt. B (Percent)	Alt. C (Percent)	Alt. D (Percent)
ACEC, RMA, LWC, SWSR	-	6%	6%	6%	8%
Previously Withdrawn	4%	4%	4%	4%	4%
Totals	**4%**	**10%**	**10%**	**10%**	**12%**

To understand better 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, lands managed for wilderness characteristics, and eligible WSRs that the BLM would recommend for withdrawal under each alternative. **Figure 3-130** shows this ranking by alternative and the proportion of acres that fall into each mineral ranking category (High, Medium, Low). Existing withdrawals are not analyzed or ranked, but the acres are included in **Figure 3-130**.

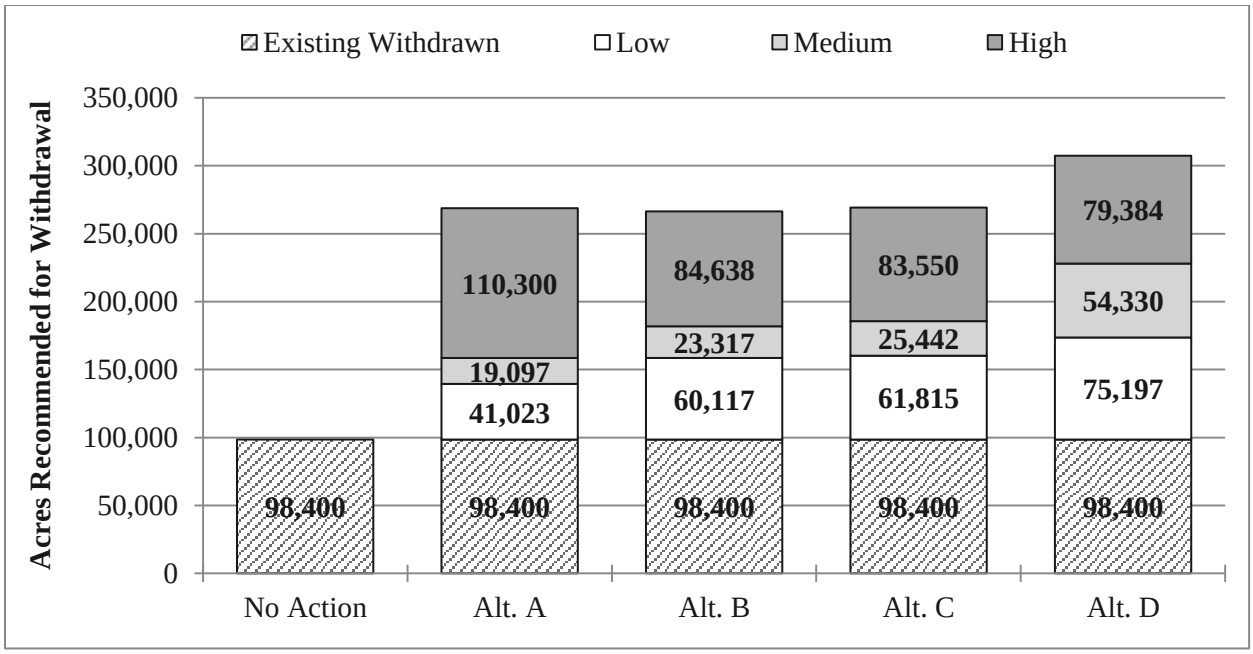

Figure 3-130. Acres that would be recommended for withdrawal with mineral ranking of estimated prospective mineral occurrence or development for each land category by alternative (includes previously withdrawn acres).

Figure 3-130 shows that the BLM ranks a substantial portion (38-65 percent) of the lands recommended for withdrawal as High for prospective mineral occurrence or development. Alternative A would recommend for withdrawal the greatest acreage of lands that ranked High (110,300) and Alternative D would recommend for withdrawal the least acreage of lands that ranked High (79,384). Removal of approximately 80,000-110,000 acres of these High ranked lands from locatable mineral exploration and development could have negative effect to development of known and undiscovered mineral resources.

Appendix L for the estimated ranking of each ACEC, RMA, lands managed for wilderness characteristics, and eligible WSRs recommended for withdrawal from locatable mineral entry.

An additional effect that would occur in association with withdrawing additional lands from locatable mineral entry is the reduction of revenue collected from public lands through mining claim fees to the government. To illustrate how withdrawal might affect fees, LR2000 records show there have been about 3,500 mining claims located in the areas that the BLM would recommend for withdrawal from locatable mineral entry under the action alternatives. Using the current fee structure for mining claim location this 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 affect existing claims, the public cannot file new claims in lands that are withdrawn from locatable mineral entry, resulting in no new fees collected. However, holders of existing claims would still pay maintenance fees if applicable.

Issues considered but not analyzed in detail

How would the alternatives affect the acres of land with fluid leasable mineral restrictions: no surface occupancy, conditional surface use, and timing limitations?

The alternatives would impose proposed fluid mineral stipulations on each ACEC, RMA, lands managed for wilderness characteristics, and eligible WSRs. **Table 3-108** shows the acres for which the BLM would propose stipulations across the alternatives. As show the no action alternative contains the most acreage with stipulations and alternative A the least. The differences in the action alternatives are due to the differing arrangements in each alternative of ACECs, RMAs, lands managed for 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 Alternative acreages include all proposed stipulations which include specific stipulations, such as no surface occupancy or conditional surface uses based on resource protection needs.

Table 3-108. Acres that would have leasable stipulations across alternatives in ACECs, RMAs, lands managed for wilderness characteristics, and eligible WSRs

	No Action (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	Alt. D (Acres)
Leasable stipulations	692,100*	190,389	211,638	318,915	498,525

* This includes only acres that are no surface occupancy

Acreage not included in table above for the action alternatives are site-specific stipulations as needed to protect Federally-listed threatened and endangered species and their critical habitats

The BLM will not complete a formal mineral potential report for leasable minerals for this RMP revision. Information regarding mineral potential reports and when they are required can be found in BLM manual 3031.

Site-specific stipulations, such as no surface occupancy, conditional surface uses, or timing restrictions, can be imposed on each lease as needed to protect other resource values, as identified in this RMP. The BLM is identifying such stipulations for certain areas, but since they do not prevent the development of some leasable minerals and only somewhat hinder development, there will be no foreseeable effects of the alternatives regarding mineral leasing of oil, gas, or Coalbed Natural Gas resources. The stipulation of no surface occupancy could impact geothermal resources; this resource is a part of the sustainability energy section of this document.

Reasonably foreseeable mineral material developments and development guidance can be found in **Appendix L**.

References

DOGAMI, MLRR. Online Oil & Gas Well Log Viewer. http://www.oregongeology.org/mlrr/oilgas-logs.htm#./oilgas-logs.htm?&_suid=1401733817058038879085462602 15.

Ferns, M. L., and D. F. Huber. 1984. Mineral Resources Map of Oregon, DOGAMI Geological Map 36, , scale 1:500,000.

Oregon Department of Geology and Mineral Industries (DOGAMI). 1982. Geothermal Resources of Oregon, 1 sheet, scale 1:500,000.

Oregon Department of Geology and Mineral Industries (DOGAMI). 2010. Mineral Information Layer for Oregon (MILO, release 2), geospatial database.

USDI BLM. Well Information System. https://www.blm.gov/wispermits/wis/SP.

---. 2008. Record of Decision and Resource Management Plan Amendments for Geothermal Leasing in the Western United States. FES-08-44.

---. 2008. Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management Districts. Portland, OR. Vol. I-IV.

---. 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.

National Trails System

Key Points

- Regardless of the National Trail Corridor width, the BLM does not administer enough lands within the viewshed to protect the Pacific Crest National Scenic Trail resources and setting characteristics adequately.
- Alternative D provides the largest National Trail Corridor and protects the greatest number of acres within the viewshed. However, these acres only account for 9 percent of all viewable acres.

Issue 1

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 trail corridors by alternative 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 to determine the percent of BLM-administered land within the trail's viewshed.

For the purposes of this analysis, the BLM assumed that its 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. Within the corridors, the BLM would:

- Designate a Special Recreation Management Area
- Manage for Visual Resource Management Class II
- Designate as *closed* to off-highway vehicles
- Close to recreational target shooting
- Allow timber harvest activity only 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 development
- Apply stipulations for leasables including no surface occupancy, controlled surface use, and timing limitations

Pacific Crest National Scenic Trail Viewshed Analysis

The Pacific Crest National Scenic Trail (PCT) viewshed is defined as the area within 5 miles of any point of the portion of the PCT that runs through BLM-administered lands (**Figure 3-131**). This definition is based on the assumption that the average traveler along the PCT has the ability to see 5 miles from any point along the trail. It should be noted that this 5 miles is a fixed distance and so the viewshed actually includes areas that are not visible from the trail. Thus, in addition to determining the acres of BLM-administered lands within the 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 **Table 3-109**.

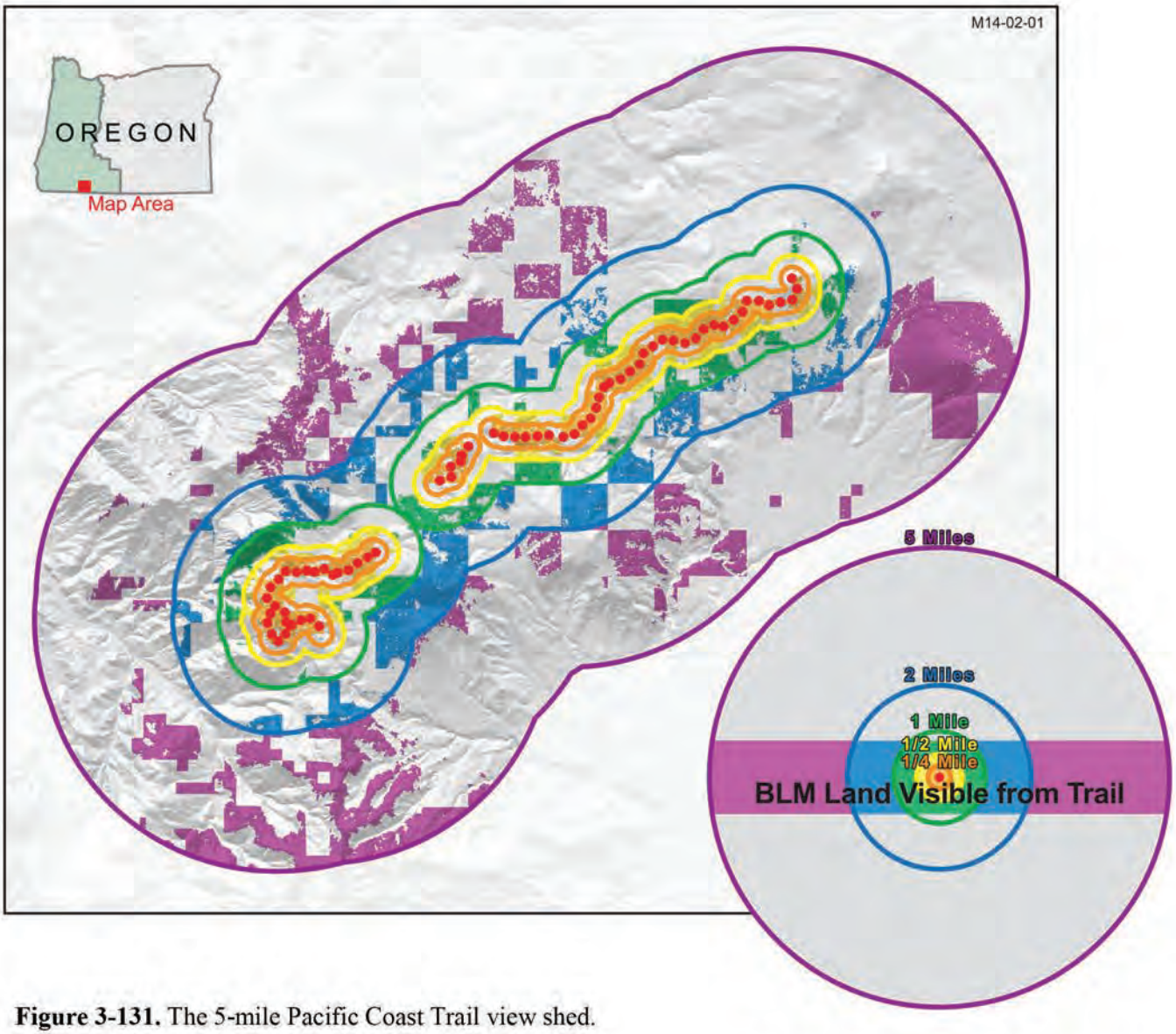

Figure 3-131. The 5-mile Pacific Coast Trail view shed.

Table 3-109. Pacific Crest Trail viewshed results for BLM administered lands within the 5-mile viewshed distance.

Description	Percentage
BLM-administered lands within the Pacific Crest Trail Viewshed	19.3%
BLM-administered lands within the Pacific Crest Trail Viewshed that are visible	28.1%
BLM-administered lands within the Pacific Crest Trail viewshed that are visible and within the planning area	23.2%

National Trails 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 these

three trail classification types, as well as of the allocation through which agencies manage them and the specific trails that pass through the BLM-administered lands within the planning area.

National Recreation Trail

The Secretary of the Interior can designate National Recreation Trails within parks, forests, recreation areas, or where lands administered by the Department of the Interior are involved. These would be subject to the consent of the Federal agency, State, political subdivision, or other appropriate administering agency having jurisdiction over the lands involved.

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.

National Historic Trail

Only Congress can establish National Historic Trails, which are extended trails which follow as closely as possible and practicable the original trails or routes of travel of national historic significance. Their purpose is to identify and protect historic routes and their historic remnants and artifacts for public use and enjoyment.

National Trail Management Corridor

A National Trail Management Corridor is a land use plan allocation which is based on Section 7(a)(2) of the National Trails System Act “rights-of-way.” The National Trail Management Corridor includes all public land area of sufficient width within which to encompass National Trail resources, qualities, values, and associated settings and the primary use or uses that are present or that the managing agency is to restore. For the purposes of this planning effort, National Trail Management Corridors include all BLM-administered lands containing resources, values, and associated settings that support the nature and purposes of a given National Trail.

Other Federal lands, State trust lands, private land, or other interests in lands, including split estate, that contain National Trail resources, qualities, values, and associate settings and the primary use or uses are included in the National Trail Management Corridor. 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 or other instrument with the BLM.

Pacific Crest National Scenic Trail

The Pacific Crest National Scenic Trail (PCT) 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; its corridor through the U.S. travels through the states of California, Oregon, and Washington. The PCT 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 PCT enters BLM-administered lands within the planning area from California along the crest of the Siskiyou Mountains east of Mt. Ashland and proceeds east towards Soda Mountain and then proceeds northeasterly along the western Cascades to the Rogue Siskiyou National Forest boundary. Hikers can access the PCT by numerous Federal, State, and county roads. Although the trail is easily accessible from numerous roads, the trail itself is closed to motorized and mechanized use.

Table 3-110. Pacific Crest National Scenic Trail mileage by ownership within the decision area.

Landowner	Approximate Mileage
BLM	17.0
Private Lands	3.6
Private Timber Companies	7.1
State of Oregon	0.9
Totals	**28.6**

The main use of the BLM-administered segment of the PCT is for day hikes, primarily by residents of the Rogue Valley. The main recreational activity within the PCT on BLM-administered lands is hiking, followed by equestrian use. In addition to these activities, sightseeing, wildlife observation, photography, camping, and hunting occur. In the winter months, cross-country skiing occurs along the trail. The BLM estimates that day use along the BLM-administered segment of the PCT is approximately 25,000 visitors annually.

The nature and purpose of the PCT 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 PCT is designed and managed to provide the most primitive recreational experience possible as identified through the BLM's Recreation Opportunity Spectrum. The trail includes a permanently protected corridor that provides for the nature and purpose of the trail, including side and connecting trails as well as PCT-dependent facilities such as campsites, water sources, and viewpoints. Public lands within the trail corridor, including lands acquired and managed for the PCT, 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 PCT experience is managed cooperatively and seamlessly across unit and agency boundaries and with significant involvement of citizen stewards.

California National Historic Trial-Applegate Trail Route

The National Park Service is preparing a feasibility study to evaluate 41 routes for possible addition to the California National Historic Trail. The feasibility study evaluates eligibility of the study routes for potential inclusion into the National Trails System. Congress authorized this study under the Omnibus Public Land Management Act of 2009. Approximately 10.9 miles of the evaluated Applegate trail route are located on BLM administered lands within the planning area. **Table 3-111** shows a mileage breakdown by ownership, within the planning area boundaries.

Table 3-111. California National Scenic Trail mileage breakdown by ownership within the planning area.

Landowner	Approximate Mileage
Bureau of Land Management	10.9
Private Lands	405.0
Private Timber Companies	5.6
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 2,000 miles in length spanning across the western half of North America. The first half of the California 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 route just north of the Oregon and California border.

The purposes of the California National Historic Trail are to enable all people to envision and experience the heritage and impacts 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, including those drawn as part of the California gold rush. 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 the approximately 30 miles of the Pacific Crest National Scenic Trail that passes through as a Special Recreation Management Area (SRMA) The current SRMA plan established a 100-foot wide (50 feet off center-line) trail 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 protective trail corridor for the portion of the PCT that passes through the Klamath Falls Field Office.

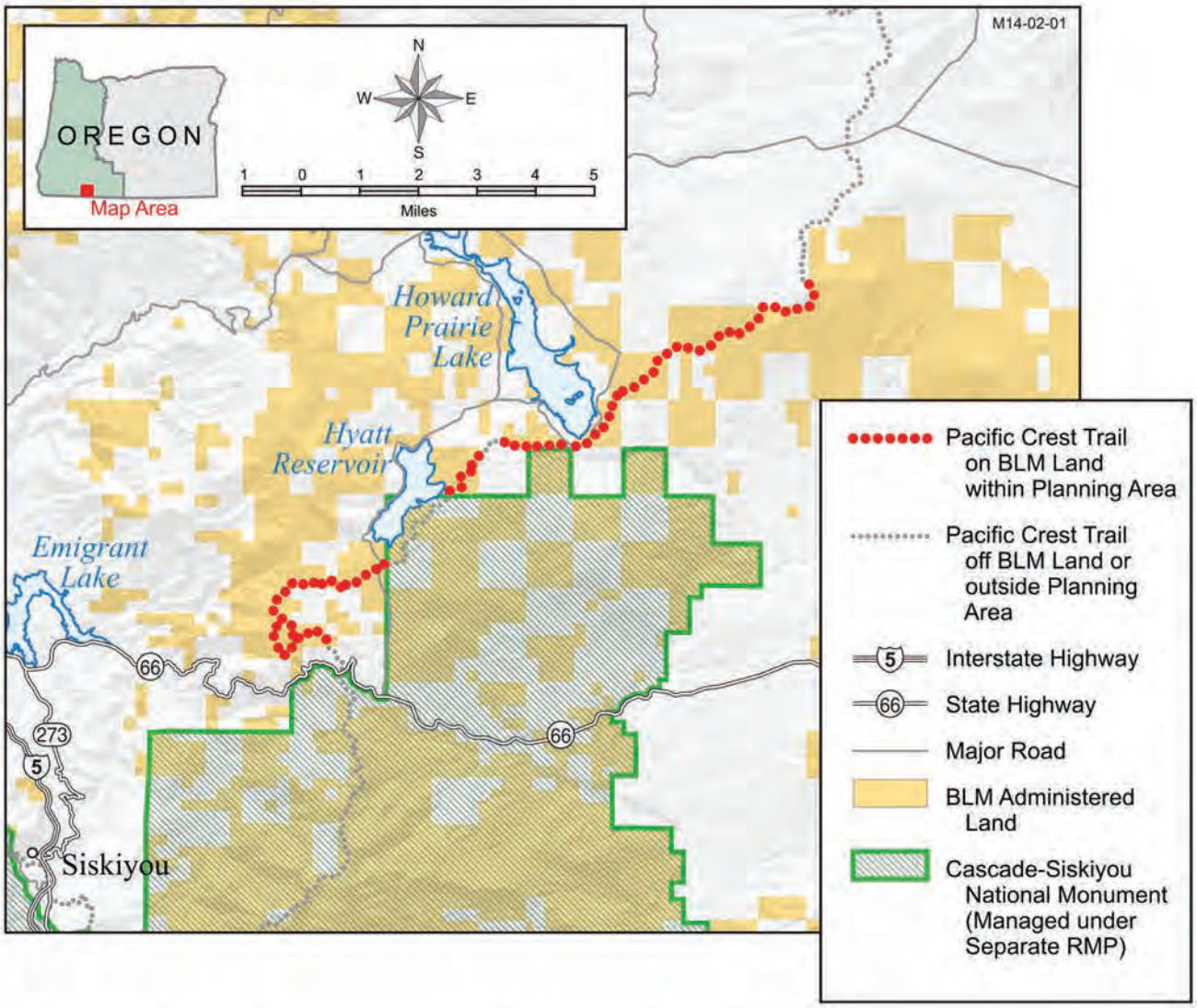

Figure 3-133. Pacific Crest National Scenic Trail corridor on BLM-administered lands within the planning area.

California National Historic Trail-Applegate Route

The BLM has not established a protective trail corridor for the portion of the California National Historic Trail that passes through BLM-administered lands within the planning area. **Figure 3-134** shows an illustration of the California National Historic Trail Corridor that travels through BLM-administered lands within the planning area.

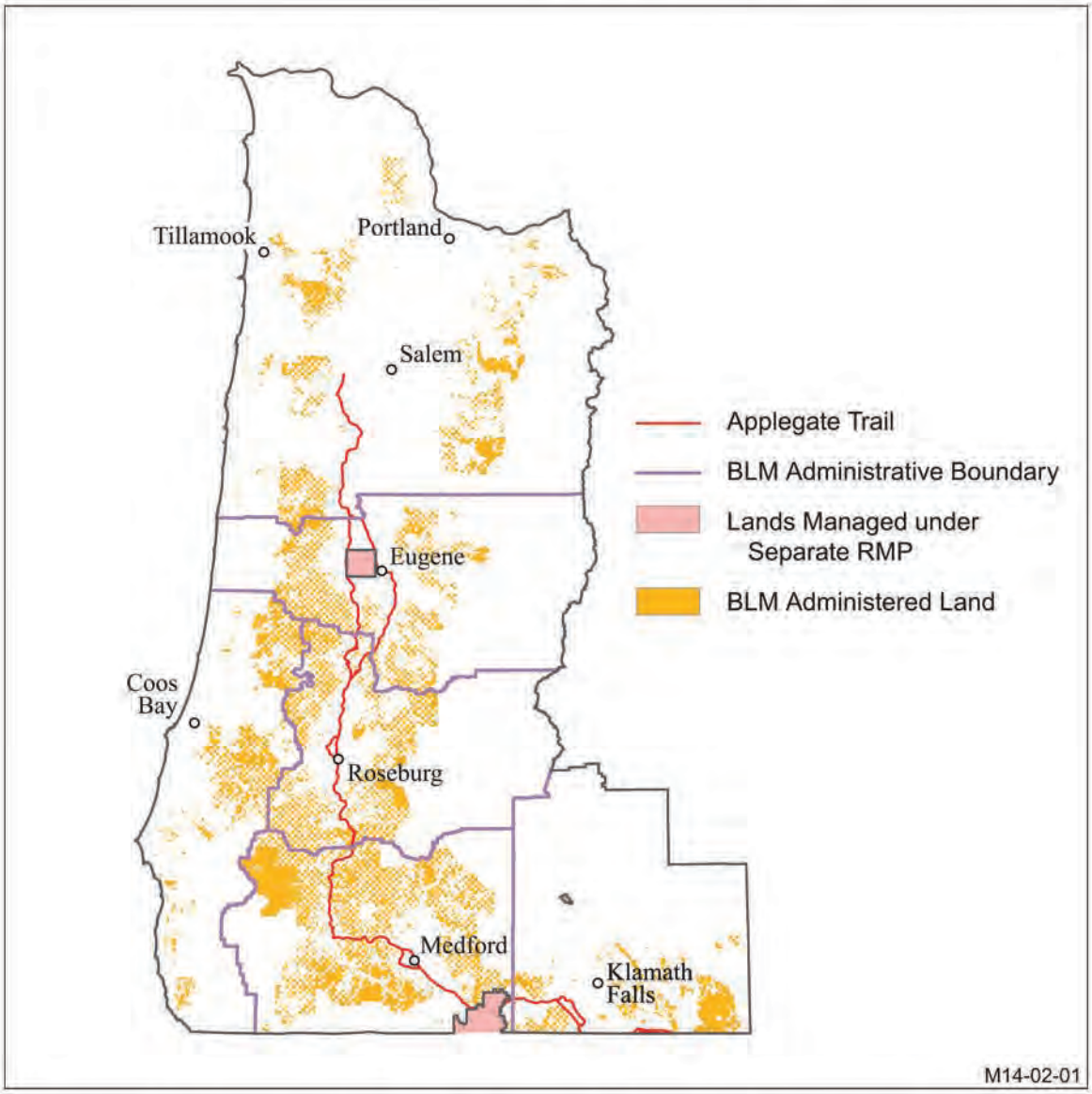

Figure 3-134. California National Historic Trail Corridor on BLM-administered lands in the planning area.

Environmental Effects

The variation in effects between alternatives is driven by the application of widths of trail corridors. As described above, the management within the corridors would be constant and protective across alternatives.

California National Historic Trail-Applegate Route

The No Action alternative does not provide protections because protective corridors do not currently exist for the Applegate route of the California National Historic Trail. The No Action alternative would result in impacts to the Applegate Route of the California National Historic Trail resources, values, recreation

setting, and primary uses because protective management direction does not exist and would not be applied to areas of the trail that pass through BLM-administered lands within the planning area.

In all alternatives, the BLM would apply a 100-foot wide trail corridor (50-feet off centerline) along all portions of the California National Historic trail that cross BLM-administered lands within the planning area. This would result in adequate protection of National Trail resources, values, setting characteristics and primary uses for which the California National Historic trail is currently being studied.

Pacific Crest National Scenic Trail

The BLM would establish a National Trail Corridor on the 17 miles of the Pacific Crest National Scenic Trail (PCT) that crosses BLM-administered lands within the planning area. This corridor width would vary across alternatives. In this analysis, the BLM considers the effects of these widths on PCT resources, values, recreation setting, and primary uses.

Table 3-112 shows the percentage of visible acres present in the PCT corridor by alternative. This table also shows the total acres of BLM-administered lands visible from the BLM portion of the PCT within the planning area by alternative.

Table 3-112. Percent of total and visible acres of BLM-administered lands within Pacific Crest Trail corridor by alternative.

Areas	No Action	Alt. A	Alt. B	Alt. C	Alt. D
Trail corridor width	100 feet	500 feet	0.25 mile	1 mile	2 miles
BLM lands within the corridor (Acres)	411	526	737	1,355	2,453
BLM lands within the corridor (% of all lands)	97.1%	81.2%	56.1%	30.4%	30.9%
BLM lands within the 5-mile viewshed and within the corridor (% of all lands)	0.4%	0.9%	0.7%	3.6%	8.0%
BLM lands visible within 5 miles of the corridor (% of all visible lands)	1.5%	1.9%	1.3%	4.9%	8.8%

Regardless of the National Trail Corridor width, the BLM does not administer enough lands within the viewshed to protect PCT resources and setting characteristics adequately. Under the most protective Alternative (Alternative D), the BLM would administer only 8.8 percent of the total visible acres within the viewshed. Management activities that result in visual impacts could take place on the 90 percent of the viewshed that the BLM does not administer resulting in impacts to the setting characteristics that are beyond the BLM's control.

No Action Alternative

Under the No Action alternative, the BLM would continue to provide a 100-foot trail management corridor off centerline (50 feet on each side) on the Pacific Crest Trail (PCT). This would result in the protection of 411 acres of BLM administered lands along the 17-mile segment of the PCT included in this analysis. Compared to the acres of visible lands from the PCT (6,464 acres), the No Action alternative would preserve 7 percent of the visible BLM-administered lands from the PCT 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 PCT's resources when compared with all action alternatives.

Alternative A

Under Alternative A, the BLM would establish a 500-foot trail management corridor off the centerline (250 feet on each side) on the PCT. This would result in the protection of 526 acres of visible BLM-administered lands along the 17-mile segment of the PCT included in this analysis. Alternative A would protect 8 percent of the 6,464 acres of BLM-administered lands that are visible from the PCT using the protective management direction described in the methods section.

Alternative A provides greater protection to the PCT's resources when compared with the No Action alternative and less protection when compared to Alternatives B, C, and D.

Alternative B

In Alternative B, the BLM would establish a 1/4 -mile trail management corridor off the centerline on the PCT. This would result in the protection of 737 acres of BLM-administered lands along the 17-mile segment of the PCT included in this analysis. Alternative B would protect 11 percent of the 6,464 acres of BLM-administered lands that are visible from the PCT using the protective management direction described in the methods section.

Alternative B provides greater protection than the No Action alternative and Alternative A, and less than Alternatives C and D.

Alternative C

In Alternative C, the BLM would establish a 1-mile trail management corridor off the centerline (1/2 mile on each side) on the PCT. This would result in the protection of 1,355 acres of visible BLM-administered lands along the 17-mile segment of the PCT included in this analysis. Alternative C would protect 21 percent of the 6,464 acres of BLM-administered lands that are visible from the PCT using the protective management direction described in the methods section.

Alternative C provides greater protection than the No Action alternative and Alternatives A and B and less than Alternative D.

Alternative D

In Alternative D, the BLM would establish a 2-mile trail management corridor off the centerline (1 mile on each side) on the Pacific Crest Trail (PCT). This would result in the protection of 2,453 acres of BLM-administered lands along the 17-mile segment of the PCT included in this analysis. Alternative D would protect 38 percent of the 6,464 acres of BLM-administered lands that are visible from the PCT using the protective management direction described in the methods section.

Alternative D provides the greatest level of protection to the PCT's resources compared to the other alternatives. Alternative D provides five times the level of protection as the No Action alternative.

Rare Plants and Fungi

Key Points

- Only two Federally-listed plant species potentially occur within the Harvest Land Base under all alternatives: Kincaid's lupine and Gentner's fritillary. Under all alternatives, the BLM would conduct pre-disturbance surveys and apply conservation measures for these two species.
- The six Federally-listed plant species and one Federal candidate plant species within the decision area are shade-intolerant.
- The BLM would manage Bureau Sensitive plant and fungi species under the BLM's Special Status Species program under all alternatives. 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 would include the Survey & Manage standards and guidelines. Under all action alternatives, species that are currently Survey & Manage and not included on the Bureau Sensitive species list would receive no specific protections.
- All action alternatives 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 forest.

Background

There are 269 special status plant and fungi species within the planning area: 179 vascular plants, 41 bryophytes (mosses and liverworts), 22 lichens, and 27 fungi. Included on the Special Status Species list are Federally-listed, proposed, and candidate species, and Bureau Sensitive species. 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 State Directors also can designate species known or suspected to occur on BLM-administered land that botanists know little about as Bureau Strategic, a tracking or "watch list" category that is not part of the Special Status Species program.

Of the 269 plant and fungi Special Status Species within the planning area, there are 178 documented species on BLM-administered land. The remaining 91 speciesare suspected or likely to occur on BLM-administered lands. These suspected species are included on the Special Status Species list because known sites occur nearby, their range coincides with the planning area, or suitable habitat exists on BLM-administered land.

Separate from the 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 & Manage measures (USDA FS and USDI BLM 1994). Some, but not all, of the Survey & Manage species qualify for inclusion on the Bureau Sensitive species list. Of the 241 Survey & Manage species within the planning area, 47 are also on the Bureau Sensitive list and an additional 65 are on the Bureau Strategic list.

Distribution, Habitat, and Biology

The planning area is vegetatively diverse due to the physical geography of the area and it falls within five of the Level III ecoregions[65] mapped by the Environmental Protection Agency: Willamette Valley, Coast Range, Cascades, Klamath Mountains, and Eastern Cascades Slopes and Foothills (Omernik and Griffith 2012).

Within the State of 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 (e.g., crinite mariposa lily (*Calochortus coxii*)) are strictly associated with serpentine soils that occur in the planning area within the Klamath Mountains ecoregion (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 construction of roads).

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 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 M**). The figure in **Appendix M** 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 Special Status Species sites based upon current data. Both **Table 3-113** and **3-114** indicate that the greatest abundance and density of Special Status plant species within the planning area is within the Medford District. This is because the Medford District lies primarily within the Klamath Province that 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 3-113. Plant and fungi sites by status and taxonomic group.

District/ Field Office	Bureau Sensitive (# of Sites)				Bureau Strategic (# of Sites)				Totals
	Bryophytes	Lichens	Vascular Plants	Fungi	Bryophytes	Lichens	Vascular Plants	Fungi	
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**

[65] 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 3-10** or **Figure 3-123**.

Table 3-114. Special Status, Strategic, and Survey & Manage sites documented between January 2009 and July 2013.

District/Field Office	Special Status (# of Sites)	Strategic (# of Sites)	Survey & Manage (# 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. From January 2009 to July 2013, the BLM surveyed approximately 121,297 acres within the decision area and found a total of 226 new Special Status Species sites, 88 new Strategic Species sites, and 180 new Survey & Manage species sites. On average, this works out to be one new Special Status, Strategic, or Survey & Manage site for every 246 acres surveyed. However, BLM found the majority of the new sites within the Medford District with 92 percent of the Special Status sites, 84 percent of the Strategic sites, and 52 percent of the Survey & Manage sites. The detection rate for the Medford District was one new site for every 128 acres surveyed, while the detection rate for the Eugene District was much less with one new site found for every 1,248 acres surveyed. During this period, surveyors did not document any new sites within the Klamath Falls Field Office.

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 produce sporocarps everywhere that they may occur, and the sporocarps are usually present for a short time. Most of the Special Status and Survey & 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). Visual observation cannot determine the size of a genetic individual or a population of a fungal species. The plant community composition gives an indication of the fungal community under the surface. The plant community influences the development of mycorrhizal populations (i.e., when the aboveground vegetation changes, the fungal community changes with it).

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 **Table 3-114** 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, noxious weed treatments).

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, including aquatic, riparian, rock, and terrestrial. Generally, botanists understand the habitats associated with rare vascular plants. Bryophytes and lichens are associated with a variety of habitats including conifer trees, rock, soils, and riparian areas, although primarily in conifer and hardwood communities. Many of these species are closely associated with a particular substrate, habitat condition, and environment. Fungi occur in a number of forms. Most are mycorrhizal and usually associated with host species in conifer and hardwood forest communities. The habitat characteristics for many rare lichen and bryophyte species are less certain and more conceptual than those for vascular plants. Fungi have even less certain habitat characteristics than the lichens and bryophytes. The habitat groups discussed later in this section organize BLM Special Status Species into broad habitat types based on current understanding.

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. When the vascular plant community changes, the mycorrhizal fungi also change. 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 fungal species richness, (i.e., the larger the clearcut, the greater the impact to the mycorrhizal fungal 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 (Kranabetter and Kroeger 2001, Luoma and Eberhart 2005, Miller *et al*. 1998, Wiensczyk *et al*. 2002).

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 and cause 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. These include 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 (e.g., Bradshaw's desert-parsley) are adapted to frequent, low-intensity fires and respond positively in most cases (Kaye *et al.* 2001). Species such as Gentner's fritillaria 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 wildfire. 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 juncus and sedge species associated with streams and wetlands are adapted to periodic floods by prolific seed production.

Federally-Listed Species

There are twelve Federally-listed and one candidate plant species that occur or have occurred historically within the planning area. The BLM has documented seven of these species within the decision area: Gentner's fritillary, western lily, Cook's lomatium, rough popcorn flower, Kincaid's lupine, Nelson's checker-mallow, and Siskiyou mariposa lily. The U.S. Fish and Wildlife Service has designated critical habitat for four of the Federally-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 Federally-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, thus making positive identification of newly discovered sites difficult. 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 one new Gentner's fritillary site for every 4,400 acres surveyed in suitable habitat. Most sites are very small – 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 on BLM-administered lands within the decision area. There are an additional 36 sites within the Cascade Siskiyou National Monument, which is outside of the decision area. Gentner's fritillary occurs within nine livestock grazing allotments. The Medford District has surveyed all suitable habitats within grazing allotments, and populations generally occur on steeper slopes outside of riparian areas where cattle use is light. Botanists monitor the effects of grazing on Gentner's fritillary and there is little evidence of direct grazing or trampling by cattle (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 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 has yet to flower as of 2014 (Guerrant 2006, as cited in USDI FWS 2009). 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 BLM populations are in and adjacent to the French Flat Area of Critical Environmental Concern. Rural development, illegal refuse dumping, and recreational use threaten Cook's lomatium habitat in the Illinois Valley. Illegal uses such as OHV trespass and refuse dumping occasionally damage sites on BLM, although the use of barricades and law enforcement efforts have successfully reduced effects in recent years (R. Showalter, BLM, personal communication, 2014). BLM does not authorize livestock grazing of any habitats containing Cook's lomatium, eliminating effects from livestock grazing.

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 within the Roseburg District. There are no naturally occurring populations of rough popcorn flower on BLM-administered land. 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 planning 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 10 Kincaid's lupine sites known to occur in the decision area. In addition, there are five sites on BLM-administered land within the West Eugene Wetlands, which is outside of the planning area. Within the decision area, there is designated critical habitat on BLM lands only within the West Eugene Wetlands. 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. 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 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 planning 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 land, 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 is another 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 BLM site consists of one to five 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 on BLM-administered lands: 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 land in the planning area, and the species is unlikely to occur on BLM-administered land within the Klamath Falls Field Office (R. Currin, USFWS, 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 land 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

The BLM designed the Special Status Species program to conserve rare species and their habitats, promote their conservation, and reduce the likelihood and need for species to be listed under the Endangered Species Act. BLM Manual 6840 (Special Status Species Management; USDI BLM 2008) provides policy guidance and includes specific implementation actions such as surveying BLM-administered land for Special Status Species, monitoring Special Status Species populations and habitats, and developing conservation strategies to meet these program objectives. 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" (USDI BLM 2008). The Special Status Species policy directs each BLM State Director to establish Special Status Species lists. 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 two 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 Special Status Species. The Affected Environment section below summarizes results of these surveys.

Survey & Manage

The Northwest Forest Plan and the 1995 RMPs include the Survey & 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 & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines and the 2004 Final Supplemental EIS to Remove of Modify the Survey & Manage Mitigation Measure Standards and Guidelines discussed the origin and implementation of the Survey & 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 & 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 & 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 & Manage measures.

There are six categories of Survey & Manage species that are found in the planning area (**Table 3-115)**. The categories consider species relative rarity, their level of association with late-successional/old-growth forests, and if pre-disturbance surveys are practical **(Table 3-116)**. Strategic surveys are landscape-scale surveys designed to collect information about a species, including its presence and habitat, and are required for all Survey & Manage species. For Category A and C species, pre-disturbance surveys are required. The Survey & 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 & 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, 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 & 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 and USDI 2011).

Table 3-115. Number of Survey & Manage species by taxonomic group and category found within the planning area (2003 list).

Taxa Group	Survey & Manage Categories						Totals
	A	C	B	D	E	F	
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**

Table 3-116. Survey & 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

Oak Woodland

Oak woodlands represent a special habitat within the decision area. While oak species in Oregon are not special status, their habitat is rare and vulnerable to destruction from development, conversion to conifer forest, and high-intensity fire. 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 ranges (*Quercus kelloggii*) 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 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, natural fire and frequent, low intensity burning by Native

Americans limited the extent of coniferous forests and sustained fire-tolerant oak savannah and woodlands (Devine and Harrington 2006, Gould *et al.* 2011, Klamath Bird Observatory and Lomakatsi Restoration Project 2014, Tveten and Fonda 1999). Lack of fire in oak communities has resulted in the invasion 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 (Fire and Fuels). 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 significant during the first five years after release.

Issue 1

How would management activities (such as timber harvest, livestock grazing, and mineral development) affect Special Status plant and fungi species, current Survey & Manage species, and special habitats?

Summary of Analytical Methods

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 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. These compounding uncertainties complicate the analysis of effects on rare plant and fungi species at this scale of planning.

The BLM used species occurrence data where it was available to evaluate the effects of management activities. Botanists have surveyed only a portion of BLM-administered lands within 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.

Because there is generally little existing information available 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. As discussed in the background section, fungi are especially difficult to detect even with repeat visits. The BLM assumed that the surveys for rare fungi will be opportunistic in nature. Targeted, repeat surveys for fungi would only occur under the No Action alternative where equivalent-effort fungi surveys are required.

Under Alternative D within the Harvest Land Base, the BLM would rely on existing information and habitat evaluations to assess the site-specific effects of timber management activities on Bureau Sensitive species.

Timber Harvest and other Vegetation Management

In this analysis, 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 at this scale of analysis with the data available.

Timber harvest methods (clearcuts, regeneration harvest with retention, uneven-aged management, 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, the BLM in this analysis evaluated the relative magnitude of 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 relative difference in management activity levels among alternatives. The BLM evaluated the overall acreage of all timber harvest methods by alternative. The BLM assumed that clearcut harvest would have a greater magnitude of effect 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.

The BLM assumed in this analysis that mature, multi-layered canopy and structurally-complex forest provides habitat for rare fungi. The BLM specifically evaluated effects on rare fungi based on the acreage of mature, multi-layered canopy and structurally-complex forest within the Harvest Land Base under each alternative.

The BLM evaluated how the Harvest Land Base overlaps with rare plant and fungi habitat and known sites under each alternative. The BLM assumed that timber activities would not affect Survey & Manage plant and fungi sites directly in the No Action alternative because of pre-disturbance surveys and site protection. The BLM assumed that sensitive plant and fungi sites would not be directly affected by timber activities under any alternative except Alternative D, because of pre-disturbance surveys for plant species and site protection for all sensitive species. Under Alternative D, some sites within the Harvest Land Base would be directly affected by timber harvest, because the BLM would protect known sites on O&C lands only 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. For the purposes of this analysis, the BLM assumed that sites within the Harvest Land Base of Survey & Manage species that are not Bureau Sensitive would eventually be lost because of timber harvest under the action alternatives. The BLM assumed that changes to their habitat from timber harvest under all alternatives could indirectly affect rare plant and fungi species, such as through the introduction or spread of invasive species.

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 over 50 years.

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 (Berch *et al*. 2006, Ryden *et al*. 1997).

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 (Fire and Fuels and Forest Management). These treatments would affect 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 species depends. However, prescribed burning rarely would consume soil duff, large logs, or snags. An indirect effect of prescribed burning is the potential increase in non-native species due to 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, Giles-Johnson *et al.* 2010, USDI FWS 2006 and 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.

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 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). 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 cattle do not stray far from water. Heavy trampling disturbance occurs around holding pens, water sources, salt blocks, and trails between favored 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 grazing in each alternative. Additionally, the BLM considered the presence of Federally-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. 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. 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 resulting in increased soil erosion adjacent to the road, fragments habitat, creates a conduit for the introduction of noxious and non-native invasive plants, and increases the potential for off-highway 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 Soil Resources).

Off-highway Vehicle Use

In this analysis, the BLM assumed that areas allocated as open for off-highway vehicle (OHV) use would experience habitat removal and disturbance for rare plants and fungi. Where cross-country travel occurs, 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 allow for the introduction and dispersal of noxious and non-native weed species.

In this analysis, the BLM assumed that OHV users would operate vehicles consistent with BLM decisions about OHV use. Although the BLM has some site-specific and anecdotal information about illegal OHV use, the BLM does not have a basis for predicting the location or effects of any widespread or systematic illegal OHV use. In addition, much of the decision area has physical limitations to potential illegal OHV use, including dense vegetation, steep slopes, and locked gates. In most of the interior/south, the ability to track numerous different routes across the open spaces can lead to degradation and erosion in a greater proportion than most of the coastal/north. However, the BLM lacks a basis for characterizing current illegal OHV use or forecasting such potential illegal OHV use in the future under any of the alternatives at this scale of analysis.

Areas designated as *closed* would not experience habitat disturbance for rare plants and fungi, because the BLM would not permit OHV use. Areas designated as *limited* would not experience measurable additional habitat disturbance for rare plants and fungi, because the BLM would limit off-highway 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 planning, the BLM cannot identify which routes any alternative would design. Therefore, the BLM cannot quantify more site-specific effects in this analysis, and implementation level decisions would address these effects.

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. 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 assumed in this analysis that the mileage of new road construction would be indicative of the amount of quarry activities, including the expansion of existing sites and the development of some number of new sites. In addition, the BLM also considered the effects of quarry activities on rare plants and fungi based on the acreage closed to salable mineral development under each alternative.

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 development 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. 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 development. 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 allow for consideration of Federally-listed or proposed species, but not for other BLM Special Status Species; therefore, some Special Status Species sites would likely be extirpated and occupied habitat would be destroyed as a result of equipment operations and ground disturbance.

Affected Environment

There are 213 known sites of Federally-listed plants on BLM-administered lands within the planning area (**Table 3-117**). Most occupied sites of the Federally-listed species are very small: approximately 74 percent of all sites occupy 1/10th of an 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.

Table 3-117. Federally-listed plants within the BLM-administered lands in the planning 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 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 planning 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
Candidate				
Siskiyou mariposa lily	*Calochortus persistens*	1	Medford	Species mostly known from northern California
	Total	**213**		

There are 4,564 known sites of Bureau Sensitive and Strategic plant and fungi species on BLM-administered lands in the planning area (**Table 3-113**). Sites range in size from just one or a few individuals that occupy much less than 1/10th 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 one acre.

The BLM has conducted Survey & 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. These surveys found 619 sites during this period, an average of one new site for every 9.8 acres surveyed within potential habitat. The Salem District conducted equivalent-effort fungi surveys on two acres and did not find any fungi.

There are currently 862,408 acres of mature, multi-layered canopy or structurally-complex forest, which provides potential habitat for rare plants and fungi that are associated with late-successional and old growth habitat.

Oak woodland and savanna are limited within the planning area. Within the decision area, Oregon white oak woodland and savannah occur primarily in the Roseburg and Medford Districts and the Klamath Falls Field Office; however, oaks occur in all of the officeswithin the decision area.

Environmental Effects

Under all alternatives, the BLM would—

- Manage Federally-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 Federally-listed and candidate plant and fungi species on BLM-administered land with suitable habitat;
- Maintain or restore natural processes, native species composition, and vegetation structure in natural communities outside of the Harvest Land Base through prescribed fire, 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.

The alternatives vary in the approach to pre-disturbance surveys for and management of known sites of Bureau Sensitive and Survey & 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 would conserve known sites 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 & Manage species where appropriate and would manage known Survey & Manage sites through implementation of the Survey & Manage standards and guidelines. None of the action alternatives would require pre-disturbance surveys or site management for Survey & Manage species that are not included on the Bureau Sensitive species list.

Under Alternatives A and C, the BLM would take actions to contribute toward the recovery of Federally-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 Federally-listed species and to increase the overall resiliency of other Special Status Species to reduce the risk of extirpation.

Under Alternative B, the BLM would manage mixed hardwood and 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 and conifer communities, they are likely 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.

The two Federally-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. More sites of these species occur within the Harvest Land Base under all of the action alternatives than under the No Action alternative. However, the BLM would conduct pre-disturbance survey and apply the same conservation measures for these Federally-listed species under all alternatives, regardless of land use

allocation. Therefore, the species-specific protections for these species would avoid adverse effects from timber harvest similarly under all alternatives.

In the No Action alternative and Alternatives A, B, and C, 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 currently known Special Status and Strategic plant and fungi sites that would occur within the Harvest Land Base under each alternative are listed in **Table 3-118**. 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. However, there is no basis for predicting a difference in effects between the No Action alternative and Alternatives A, B, and C. 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. Also, 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 3-118. Special Status and Strategic plant and fungi sites within the Harvest Land Base.

Alternative	Taxa Group	Federal Endangered	Federal Threatened	Sensitive	Strategic	Totals
No Action	Bryophytes	-	-	10	22	32
	Lichens	-	-	110	300	410
	Vascular	15	1	1,287	9	1,312
	Fungi	-	-	99	219	318
	Totals No Action	**15**	**1**	**1,506**	**550**	**2,072**
Alt. A	Bryophytes	-	-	8	6	14
	Lichens	-	-	95	80	175
	Vascular	25	7	490	6	528
	Fungi	-	-	92	44	136
	Totals Alt. A	**25**	**7**	**687**	**136**	**853**
Alt. B	Bryophytes	-	-	4	16	20
	Lichens	-	-	75	184	259
	Vascular	54	7	904	6	971
	Fungi	-	-	112	166	278
	Totals Alt. B	**54**	**7**	**1,095**	**372**	**1,528**
Alt. C	Bryophytes	-	-	8	20	28
	Lichens	-	-	115	201	316
	Vascular	57	8	893	8	966
	Fungi	-	-	117	172	289
	Totals Alt. C	**57**	**8**	**1,133**	**401**	**1,599**
Alt. D	Bryophytes	-	-	10	25	35
	Lichens	-	-	122	224	346
	Vascular	46	8	1,066	7	1,127
	Fungi	-	-	101	102	203
	Totals Alt. D	**46**	**8**	**1,299**	**358**	**1,711**

There are 2,719 currently known Sensitive, Strategic, and Survey & Manage fungi sites within the decision area. Under all alternatives, the majority of known sites of rare fungi would be within Reserve land use allocations. **Table 3-119** shows the number of known fungi sites within the Harvest Land Base under each alternative

Table 3-119. Number of Special Status and Survey & Manage fungi sites within Harvest Land Base by alternative.

Alternative	Sensitive (# of Sites)	Strategic (# of Sites)	Current Survey & Manage Species (# of Sites) (Percent of Known Sites in Decision Area)*	All Species (# of Sites) (Percent of Known Sites in Decision Area)
No Action	99	219	1,045 (38%)	1,363 (50%)
Alt. A	92	44	482 (18%)	618 (23%)
Alt. B	112	166	721 (27%)	999 (37%)
Alt. C	117	172	900 (33%)	1,189 (44%)
Alt. D	101	102	765 (28%)	968 (36%)

* Sites of Survey & Manage species that are not also Sensitive or Strategic

Under the No Action alternative, the BLM would continue to implement Survey & Manage measures to conduct pre-disturbance surveys and protect known sites for the Survey & Manage species. Most Survey & 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 & Manage plant and fungi species would increase under the No Action alternative in the decision area.

Under all action alternatives, species that are currently Survey & Manage and not included on the Bureau Sensitive species list would receive no specific protections under the action alternatives. The number of unprotected sites would vary by alternative: Alternative A would have the fewest sites within the Harvest Land Base, and Alternative C would have the largest (**Table 3-120**). Unless these sites co-occur with Sensitive species, timber harvest would affect these sites.

Table 3-120. Current Survey & Manage species sites within the Harvest Land Base.

Alternative	Taxa Group	Current Survey & Manage Species that are not also Sensitive or Strategic (# of Sites)
No Action	Bryophytes	379
	Lichens	428
	Vascular Plants	278
	Fungi	1,045
	No Action Totals	**2,130**
Alt. A	Bryophytes	97
	Lichens	172
	Vascular Plants	58
	Fungi	482
	Alt. A Totals	**809**
Alt. B	Bryophytes	205
	Lichens	341
	Vascular Plants	222
	Fungi	721
	Alt. B Totals	**1,489**
Alt. C	Bryophytes	221
	Lichens	435
	Vascular Plants	193
	Fungi	900
	Alt. C Totals	**1,749**
Alt. D	Bryophytes	235
	Lichens	378
	Vascular Plants	202
	Fungi	765
	Alt. D Totals	**1,580**

There is incomplete and unavailable information relevant to the effects of the action alternatives on Survey & Manage species. With complete and species-specific survey information on the location of habitat and species sites for all Survey &Manage species, the BLM would be able to analyze the effects of all alternatives on Survey & Manage species and compare the effects under each action alternative to the No Action alternative, which would continue to implement the Survey & Manage measure. However, the BLM lacks complete and species-specific survey information for most Survey &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 & 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 on Survey & Manage species. The 2004 Final SEIS to Remove or Modify the Survey & 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 & Manage measures for known site management and pre-disturbance surveys, and that analysis is incorporated here by reference. However, 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 EIS was insufficient to support the conclusion that the Survey & Manage measure was no longer necessary to meet the goals of the Northwest Forest Plan. 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 & Manage species would have sufficient habitat to support stable populations under the No Action alternative without the Survey & Manage measure.

Even in the absence of the Survey & Manage measure, habitat and sites of species that fall within the reserve system would receive protection. Compared to the No Action alternative, all action alternatives allocate more acres to the Late-Successional Reserve, which the Northwest Forest Plan expected to meet 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 & Manage measure would provide sufficient habitat for Survey & Manage species, as analyzed in the 2004 SEIS, the action alternatives would provide additional habitat within the Late-Successional Reserve.

The Survey & Manage species are species associated with "late-successional and old-growth forests" (USDA FS and USDI BLM 2000, p. 8). To the extent that older and more structurally-complex multi-layered conifer forests as defined in the action alternatives encompass the "late-successional and old-growth forests" that provide habitat for Survey & Manage species, all action alternatives reserve such forests from timber harvest within the Late-Successional Reserve. Under all action alternatives, there would be no timber harvest of older and more structurally-complex multi-layered conifer forests, although each alternative uses a different definition to identify older and more structurally-complex multi-layered conifer forests. Therefore, all of the action alternatives, in contrast to the No Action alternative, would protect from timber harvest the forest conditions with which the Survey &Manage species are 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 than older and more structurally-complex multi-layered conifer forests) in the decision area would increase under all alternatives. Therefore, the amount of habitat for Survey & Manage plant and fungi species would increase under all alternatives.

In summary, all action alternatives would remove the Survey & 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 on Survey & Manage species. The 2004 Final SEIS provides an incomplete analysis, but supports the conclusion that most Survey & Manage species would have sufficient habitat to support stable populations under the No Action alternative without the Survey & Manage measure. All action alternatives allocate more acres to the Late-Successional Reserve than the No Action alternative, protect older and more structurally-complex multi-layered conifer forests, and would result in an increase in mature and structurally-complex forest. As a result, and in light of the incomplete information available to the BLM, all action alternatives would protect most existing habitat for Survey & Manage species and would result in an increase in the amount of habitat for Survey & Manage species.

A sub-group of more than 25 lichen, bryophyte, and fungi species (including Special Status Species and current Survey & Manage species that are not Special Status Species) is associated with habitat conditions and forest biological legacy (green trees, coarse wood, and snags) of mature and structurally-complex forests. Important habitat components include coarse wood, snags, and specific host species. 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 greatest under Alternative C, with 176,696 acres of total timber harvest, and only slightly lower under Alternative B, with 162,764 acres of timber harvest (**Table 3-121**). Alternative D and the No Action alternative would have substantially lower acreage of total timber harvest, with 139,151 acres and 111,260 acres, respectively. Alternative A would have the lowest acreage of total timber harvest, with 91,782 acres in the first decade. Included in that total

for Alternative A is 13,425 acres of restoration thinning without timber extraction, 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.

Table 3-121. Total acres of timber harvest in the first decade (2013-2023) by alternative.

Harvest Type	No Action (Acres)	Alt. A (Acres)	Alt. B (Acres)	Alt. C (Acres)	Alt. D (Acres)
Clearcuts	-	47,644	-	93,935	-
Salvage	3,493	1,086	2,954	4,160	1,973
Selection	-	26,179	67,516	44,464	104,569
Thinning	107,767	3,448	54,362	34,137	7,030
Thinning without Timber Extraction	-	13,425	-	-	-
Two-Age	-	-	37,932	-	25,579
Total Timber Harvest	**107,767**	**91,782**	**37,932**	**176,696**	**25,579**

Under Alternatives A and C, forest management would include clearcuts (i.e., regeneration harvest with no retention) in the High Intensity Timber Area, which comprises 12 percent and 22 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, 93,935 acres and 47,644 acres, respectively (**Table 3-121**). Early-successional 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 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 lost, making the effects of salvage similar among all alternatives. 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, salvage would take place in the Harvest Land Base after a high or moderate severity fire event. In all alternatives except for Alternative C, 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 Reserves 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, approximately 1 to 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 forests in the first decade, increasing the likelihood of reducing habitat quality for rare plants and fungi associated with mature and structurally-complex forest. Alternatives A, B, and D would not include any fertilization and thus would not reduce habitat quality for rare plants and fungi because of fertilization.

Under all alternatives, a majority of the BLM-administered lands would be allocated to reserves, where mature and structurally-complex forest habitat would be retained and additional habitat would develop. All action alternatives 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 forest. The acreage of structurally-complex forest would increase under all alternatives, as would the acreage of stands older than 120 years. Within the Harvest Land Base, the abundance of structurally-complex forest would increase substantially under the No Action alternative and Alternatives B and D, 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 forest 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 by alternative (**Table 3-122**). 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 No Action alternative would have the greatest acreage of potential fungi habitat within the Harvest Land Base; however, most of this habitat would be subject to the Survey & 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 current Survey & Manage species. Of the action alternatives, Alternative C would have the largest number of potential fungi habitat acres within the Harvest Land Base, followed by Alternatives B and D. The BLM would conduct pre-disturbance surveys under Alternatives A, B, and C for Special Status Species, and the BLM would provide conservation measures for new sites found. The BLM would not survey under Alternative D, and undetected sites would be affected by timber harvest.

Table 3-122. Special Status fungi potential habitat within the Harvest Land Base by alternative.

Alternative	Fungi Habitat Acres within the Harvest Land Base
No Action	207,586
Alt. A	48,601
Alt. B	133,763
Alt. C	172,015
Alt. D	125,001

Although vegetative communities where oak species currently predominate are generally outside of the Harvest Land Base in all alternatives, oak species do occur within the Harvest Land Base. Oaks represent an immeasurable small percentage of the basal area of the forests 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 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) across all alternatives would decrease by 3 to 4 percent in 50 years. It is likely that the vegetation modeling overestimates any a decline in hardwood abundance in general and oaks in specific, 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, oaks 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. Within the Harvest Land Base, the different harvest methods would have varying effects on oak species. Alternatives A and C would both include clear cuts with no retention, 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 alternatives would mitigate effects of timber harvest on oaks. Management direction common to all alternatives 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, the BLM would apply vegetation management to increase species diversity and allow for hardwood persistence.

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 Districts. However, 140,380 acres of this total are currently vacant, and these areas have not been subject to grazing for several years. The vacant allotments would remain available for grazing under the No Action alternative, and grazing could occur in these areas in the future.

Alternatives A, B, and C would close the vacant allotments to grazing, but keep all active allotments open to grazing. Since livestock do not currently graze these areas, there would be no immediate difference in effects from the No Action alternative. However, closing the vacant allotments would preclude potential future grazing impacts to Special Status plants and fungi.

Under all alternatives other than Alternative D, grazing would continue in active grazing allotments. There are 571 Special Status plant and fungi species sites that occur within active grazing allotments; 98 percent are vascular plants and include Gentner's fritillary. 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 and Alternatives A, B, and C, there would be no direct negative impacts to this species from grazing under those alternatives: there has been no evidence that cattle eat Gentner's fritillary or cause measurable trampling impacts (M. Wineteer, BLM, personal communication, 2014). Cattle tend to concentrate in areas with water, while Gentner's fritillary generally occurs on steeper slopes outside of riparian areas.

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 special status plant and fungi species that occur within active grazing allotments. Elimination of grazing would reduce direct consumption of these species and trampling. However, elimination of grazing would also result in increased competition and accumulation of fuels, increasing the risk of wildfire. The specific effects of the elimination of 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 cattle do not directly affect Gentner's fritillary, removing cattle may improve adjacent habitat for the species and allow for expansion.

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. There are approximately 650 known sites of special status plants and fungi within these areas, and 284 sites of current survey and manage species, in addition to representative examples of many types of diverse vegetation. Alternatives A and D would designate more acres of ACECs than other alternatives: 105,990 and 105,784 acres, respectively. Alternatives B and C would designate fewer acres: 99,427 and 98,104 acres, respectively (see the ACEC section in this chapter for more detailed information on ACEC designation).

As a result, Alternatives A and D would have similar effects and provide the most benefit to rare plant and fungi species through ACEC designation. Even though the No Action alternative would designate the fewest acres of ACECs, it would provide only slightly less benefit to rare plant and fungi species because of the protection provided by interim management of potential ACECs. Alternatives B and C would have similar effects and provide the least benefit to rare plant and fungi species through ACEC designation.

Road Construction

The No Action alternative would result in the greatest mileage of new road construction in the first decade (**Table 3-123**). This mileage of new road construction would result in the removal or disturbance of 5,167 acres of habitat. Alternative D would result in the least mileage of new road construction in the first decade and 1,288 acres of habitat removed or disturbed. Although it is not possible at this scale of analysis with the data available to determine whether these acres represent potential or occupied habitat for rare plants and fungi, the acreage affected by road construction provides a relative evaluation of the effects of road construction on rare plants and fungi.

Table 3-123. Road construction miles for the first 10 years of implementation.

Alternative	Total New Road Construction (Miles)	Habitat Removed or Disturbed (Acres)
No Action	947.3	5,167
Alt. A	310.2	1,692
Alt. B	687.2	3,748
Alt. C	800.6	4,367
Alt. D	254.5	1,388

Off-highway Vehicle Use

Under the No Action alternative, approximately 85,000 acres (3.3 percent) of the decision area would remain *closed* to OHV use, and approximately 330,400 acres (12.8 percent) would remain *open* to OHV use. On the remaining 83.9 percent, OHV use would continue to be *limited to existing or designated roads and trails*. On some portion of the 330,400 acres *open* to OHV use, habitat removal and disturbance has been occurring and will continue to occur in the future. 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 *open* to OHV use is actually experiencing habitat removal or disturbance or will in the future. However, within areas *open* to OHV use, such effects could occur throughout the open area without future analysis or decision-making by the BLM.

Under all action alternatives, no areas would be open to OHV use. The BLM would designate the entirety of the decision area as either *closed* to OHV use or *limited to existing roads and trails*. As such, there would be no additional habitat removal or disturbance from OHV use measurable at this scale of analysis with the data available under any of the action alternatives.

Mineral Development

The No Action alternative would maintain the closure of the largest acreage to salable mineral development, at 319,430 acres closed. The action alternatives would close from 226,367 acres under Alternative A to 246,584 acres under Alternative C. 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 development under the alternatives.

Under the No Action alternative, 98,400 acres would continue to be withdrawn from locatable mineral entry. All of the action alternatives would recommend for withdrawal more than double the acreage of the existing withdrawals, totaling from 266,473 acres under Alternative B to 307,308 acres under Alternative D. As described in the Minerals section in this chapter, much of this acreage would have low prospective mineral occurrence or development. 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.

There are currently approximately 1,045 mining claims of active record in the decision area, the majority of which occur within the Medford District, which has a disproportionate percentage of rare plant and fungi sites. Mining claims, notices, and plans currently exist on areas where there are known rare plant sites such as French Flat (Medford District) and Hunter Creek Bog (Coos Bay District), which are also Areas of Critical Environmental Concern.

Issues considered but not analyzed in detail

How would recreation management affect special status plant and fungi species, current Survey & 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 as a result of trampling, collection of firewood, introduction and spread of noxious and non-native species, and soil disturbance. Recreation sites would not differ among the alternatives. Changes to recreation sites in the decision area under any of the alternatives, such are 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.

While recreation use outside of recreation sites 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.

How would invasive plant introduction and spread affect special status plant and fungi species, current Survey & 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. 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, current Survey & Manage species, and special habitats?

Wildfire response activities, such as bulldozing for fire line access and construction, safety zone construction, and staging centers, can cause direct effects to rare plant and fungi sites and 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. However, the full range of wildfire response tactics would be available under all alternatives, and maintenance of fire suppression-related infrastructure would not change among alternatives (the Fire and Fuels section contains more information). Because these factors would not differ among the alternatives, there is no reasonable basis on which to identify a difference among the alternatives in the effects of wildfire response on rare plants and fungi.

References

Amsberry, K., and R. Meinke. 2007. Continuing investigations of hybridization and fertility of *Fritillaria gentneri* through cytological evaluations and pollen viability analysis. Prepared for U.S. Fish and Wildlife Service, Region 1.

Berch, S. M., R. P. Brockley, J. P. Battigelli, S. Hagerman, and B. Holl. 2006. Impacts of repeated fertilization on components of the soil biota under a young lodgepole pine stand in the interior of British Columbia. Canadian Journal of Forest Research **36**(6): 1415-1426.

Dahlberg, A., and J. Stenlid. 1995. Spatiotemporal patterns in ectomycorrhizal populations. Canadian Journal of Botany **73** (Supplement): S1222-S1230

Devine, W. D. and C. A. Harrington. 2006. Changes in Oregon white oak (*Quercus garryana* Dougl. ex Hook.) following release from overtopping conifers. Trees **20**(6): 747-756.

Devine, W. D. and C. A. Harrington. 2007. Release of Oregon white oak from overtopping Douglas-fir: effects on soil water and microclimate. Northwest Science **81**(2): 112-124. http://www.bioone.org/doi/full/10.3955/0029-344X-81.2.112.

Devine, W. D., C. A. Harrington, and D. H. Peter. 2007. Oak woodland restoration: understory response to removal of encroaching conifers. Ecological Restoration **25**(4): 247-255.

Durall, D. M., M. D. Jones, E. F. Wright, P. Kroeger, and K. D. Coates. 1999. Species richness of ectomycorrhizal fungi in cutblocks of different sizes in the Interior Cedar-Hemlock forests of northwestern British Columbia: sporocarps and ectomycorrhizae. Canadian Journal of Forest Research **29**(9): 1322-1332.

Giles-Johnson, D. E. L., A. S. Thorpe, R. E. Newton, and T. N. Kaye. 2010. *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's lupine) and *Icaricia icarioides fenderi* (Fender's blue butterfly) in the West Eugene Wetlands: Population monitoring, reintroduction success, and an evaluation of experimental treatments. 2010 Report. Prepared by Institute for Applied Ecology for Eugene District BLM. 26 pp.

Gould, P. J., C. A. Harrington, and W. D. Devine. 2011. Growth of Oregon white oak (*Quercus garryana*). Northwest Science **85**(2): 159-171. http://www.bioone.org/doi/full/10.3955/046.085.0207.

Hagerman, S. M., M. D. Jones, G. E. Bradfield, M. Gillespie, and D. M. Durall. 1999. Effects of clear-cut logging on the diversity and persistence of ectomycorrhizae at a subalpine forest. Canadian Journal of Forest Research **29**(1): 124-134.

Kaye, T. N., K. L. Pendergrass, K. Finley, J. B. Kauffman. 2001. The effect of fire on the population viability of an endangered prairie plant. Ecological Applications **11**(5): 1366–1380.

Klamath Bird Observatory and Lomakatsi Restoration Project. 2014. Restoring oak habitats in southern Oregon and northern Californica: a guide for private landowners. Rep. No. KBO-2014-0005. Klamath Bird Observatory, Ashland, OR.

Kranabetter, J. M., and P. Kroeger. 2001. Ectomycorrhizal mushroom response to partial cutting in a western hemlock-western redcedar forest. Canadian Journal of Forest Research **31**(6): 978-987.

Luoma, D. L. and J. Eberhart. 2005. Results from green-tree retention experiments: ectomycorrhizal fungi. In: Peterson, C .E., and D. A. Maguire (eds.). Balancing ecosystem values: innovative experiments for sustainable forestry. Proceedings of a conference. Gen. Tech. Rep. PNW-GTR-635. USDA FS, Pacific Northwest Research Station, Portland, OR. pp. 257-264. http://bashanis.org/luoma/luomagreentree.pdf.

Miller, S. L., T. M. McClean, N. L. Stanton, and S. E. Williams, 1998. Mycorrhization, physiognomy, and first-year survivability of conifer seedlings following natural fire in Grand Teton National Park. Canadian Journal of Forest Research **28**(1): 115-122.

Molina, R. 2008. Protecting rare, little known, old-growth forest-associated fungi in the Pacific Northwest USA: a case study in fungal conservation. Mycological research **112**(6): 613-638.

Omernik, J., and G. Griffith. 2012. Ecoregions of the United States-Level III (EPA). Retrieved from http://www.eoearth.org/view/article/152242.

Oregon Biodiversity Information Center (ORBIC). Institute for Natural Resources (INR), Portland State University, Portland, OR. http://orbic.pdx.edu/index.html.

Oregon Flora Project. 2013. Dept. Botany & Plant Pathology, Oregon State University, Corvallis, OR. http://www.oregonflora.org/index.php.

Rilla, E., and L. Bush. 2009. The changing role of agriculture in Point Reyes National Seashore. Division of Agriculture and Natural Resources, University of California Cooperative Extension, Novato. Marin Technical Reports. http://cemarin.ucanr.edu/publications/Reports/.

Rydin, H., M. Diekmann, and T. Hallingback. 1997. Biological characteristics, habitat associations, and distribution of macrofungi in Sweden. Conservation Biology **11**(3): 628-640.

Tveten, R. K. and R. W. Fonda. 1999. Fire effects on prairies and oak woodlands on Fort Lewis, Washington. Northwest Science **73**(3): 145-158. http://research.wsulibs.wsu.edu/xmlui/bitstream/handle/2376/1150/v73%20p145%20Tveten%20and%20Fonda.PDF?sequence=1.

USDA FS and USDI BLM. 1994. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (Northwest Forest Plan). Portland, Oregon. 2 vols.

USDA FS and USDI BLM. 2000. A FS and USDI BLM. 2001. Record of decision and standards and guidelines for amendments to the Survey & Manage, protection buffer, and other mitigation measures standards and guidelines. Portland, OR.

USDA FS and USDI BLM. 2011. Survey & Manage category B fungi equivalent-effort survey protocol, version 1.0. Portland, OR. U.S. Department of Inerior, Bureau of Land Management, Oregon/Washington and U.S. Department of Agriculture, Forest Service, Region 6. 20 pp.

USDI BLM, USDI FWS, and USDA FS. 2006. Programmatic Conservation Agreement for Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*) in Douglas County. BLM Roseburg District Office.

USDI BLM, USDI FWS, and USDA FS. 2008. Management Plan for Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*) in Douglas County, Oregon. BLM Roseburg District Office.

USDI FWS, USDA FS, and USDI BLM. 2013. Conservation Agreement between the U.S. Fish and Wildlife Service and the U.S. Forest Service and the U.S. Bureau of Land Management for *Calochortus persistens* (Siskiyou mariposa lily).

USDI FWS. 1994. The plant, water howellia (*Howellia aquatilis*), determined to be a threatened species. Federal Register 59:35860-36864. https://ecos.fws.gov/docs/frdocs/1994/94-17134.pdf.

USDI FWS. 2003. Recovery plan for *Fritillaria gentneri* (Gentner's fritillary). U.S. Fish and Wildlife Service, Portland, Oregon. viii+89 pp.

USDI FWS. 2009. *Lilium occidentale* (Western lily) 5-year review: summary and evaluation. USDI FWS, Arcata Field Office.

USDI FWS. 2010. Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington. Portland, OR. 241 pp.

USDI FWS. 2012. Nelson's checker-mallow (*Sidalcea nelsoniana*) 5-year review: summary and evaluation. U.S. Fish and Wildlife Service, Portland, OR.

USDI FWS. 2012b. Recovery Plan for Rogue and Illinois Valley Vernal Pool and Wet Meadow Ecosystems. Region 1, Portland, OR. xvii + 240 pp. https://www.fws.gov/oregonfwo/FieldOffices/Roseburg/Documents/RogueIllinoisValleyFinal.RP3.19.13.pdf.

Wiensczyk, A. M., S. Gamlet, D. M. Durall, M. D. Jones, and S.W. Simard. 2002. Ectomycorrhizae and forestry in British Columbia: a summary of current research and conservation strategies. B.C. Journal of Ecosystems and Management **2**(1): 1-20.

United States Department of the Interior
Bureau of Land Management - Oregon & Washington
1220 SW 3rd Avenue
Portland, OR 97204

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

FIRST CLASS MAIL
POSTAGE AND FEES PAID
Bureau of Land Management
Permit No. G-76

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

BLM/OR/WA/GI-15/023+1792