Botany

Key Points

- Rare plants and fungi are not evenly distributed or predictable across the landscape, even where suitable habitat exists.
- There are 155 species of rare plants/fungi on BLM-administered lands within the planning area.
- Of the 155 occurrences, 90 plants/fungi have 20 or fewer occurrences.
- Approximately two-thirds of the 3,700 locations and 97 species occur in the Klamath Province.
- Six of the 13 federally listed species and the one federal candidate species occur on BLM-administered lands in the planning area.

The landscape and vegetation within the BLM planning area are extraordinarily diverse and include a unique combination of geology, climate, topography, and natural disturbances. The Northwest temperate conifer forest is the dominant floristic province within the planning area. Two other floristic provinces contribute substantial biodiversity: the California province in southern Oregon, and the Great Basin province in eastern Oregon. The broad floristic provinces are further subdivided into physiographic provinces based on geographic features and plant communities called plant series. Of high botanical interest are the plant communities of smaller geographic extent that increase biodiversity within the planning area; these include mixed hardwoods, oak woodlands, chaparral, grasslands, and the juniper and sage-brush steppe. Franklin and Dyrness (1988) describe plant communities and habitat in Oregon.

Distribution, Habitat and Biology

Unique landscape features of the physiographic provinces contribute to the presence and diversity of rare and locally endemic plant species and fungi. These plants and fungi are distributed throughout the planning area and found in nearly every habitat type. Southwest Oregon and northern California (the Klamath Province) have some of the highest rates of plant endemism and rarity in the United States (DellaSalla et al. 1999). Conversely, the eastern Cascades and the Great Basin provinces of the planning area have the fewest rare plant species.

More than 4,500 plant species are found in Oregon, and the majority of these occur within the planning area (ORNHIC 2007). Most of these plant species are common and of no conservation concern from the standpoint of rarity. However, 296 species are considered rare and are included on the list of Bureau special status species. These species are of conservation concern due to the small number of known occurrences, narrow distribution, loss of populations and habitat, and threats to their existence posed by human activity or other inherent biological factors.

Of the 296 species of Bureau special status species suspected or known to occur in Oregon, 155 species have documented occurrences on BLM-administered lands within the planning area (not including the West Eugene Wetlands or the Cascades-Siskiyou National Monument).

Rare/BLM special status species

The terms “rare” and “BLM special status species” are used interchangeably in the document.

Of those 155 species:

- 90 species have 20 or fewer occurrences.
- 42 species have 5 or fewer occurrences.
- 44 species occur only on BLM-administered lands.

Occurrence

The term "occurrence" is a single record from GeoBob or ORNHIC (mapping data standards for a location and extent of an individual or group of plants or fungi). All individuals within 300 feet of each other are a single record.

Rare plants and fungi are not evenly distributed or predictable across the landscape, even when good potential habitat exists. Some are associated with specific plant communities, habitat type, host species, substrate, or an ecological feature that defines their habitat. However, other rare species are associated with plant communities with less defined habitat characteristics. Kaye et al. (1997) describes types of rarity, patterns, distribution, and threats to rare plant species in Oregon.

The distribution of rare plants and fungi and their occurrences vary at the provincial scale within the planning area from nearly 100 species in the Klamath Province, to a few species in the Eastern Cascades Province. The Klamath Province, which has the highest total species richness of any province within the planning area, includes more than 250 plant species that are endemic to serpentine soils (Kruckeberg 1984). Ten percent of those species are considered rare. Crinite mariposa-lily (*Calochortus coxii*) and Howell's mariposa-lily (*Calochortus howellii*) are examples of rare, narrow endemics found only on soils influenced by a serpentine substrate. Approximately 97 rare plant species (not all of which are restricted to serpentine soils) and nearly two-thirds of the total known occurrences on BLM-administered lands are found in the Klamath Province.

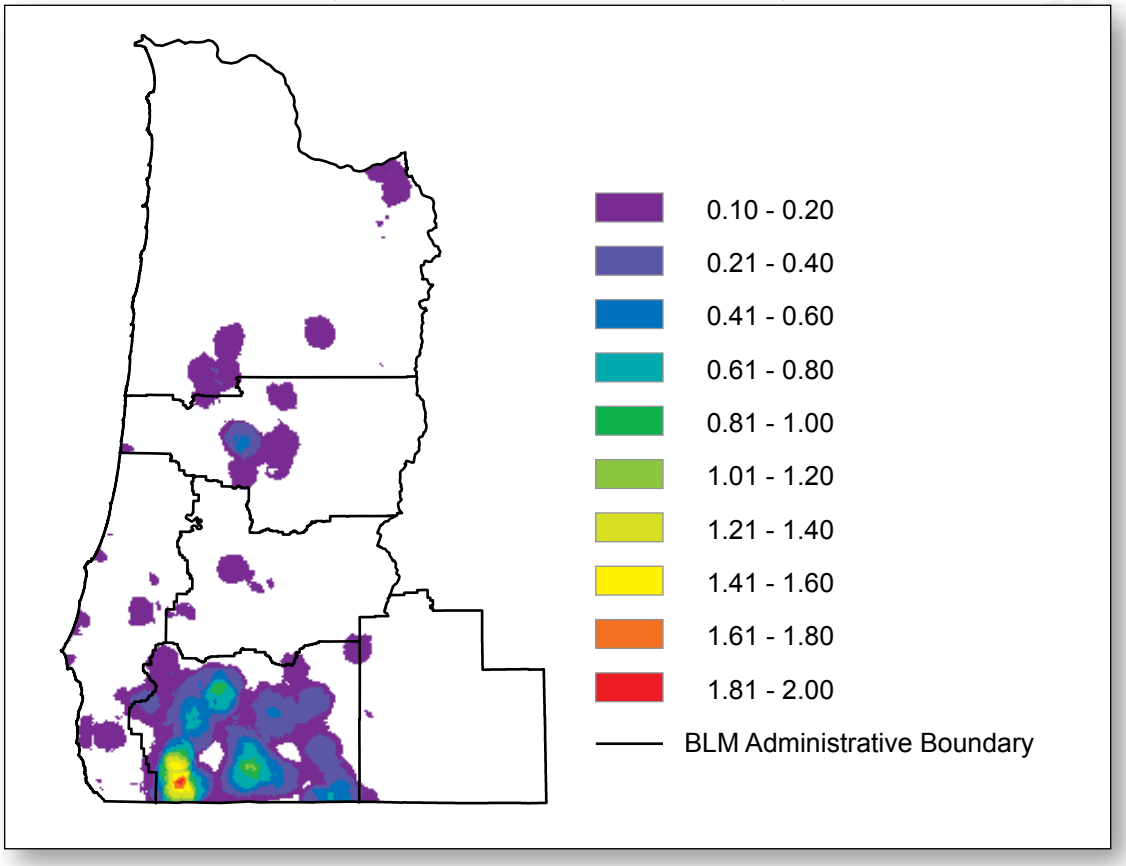
When the 296 rare plants and fungi suspected or documented to occur in Oregon are mapped by physiographic provinces on BLM-administered lands in western Oregon, their diversity and distribution patterns occur in the following manner, with some found in more than one province:

- 6 species within the Eastern Cascades Province
- 11 species within the Willamette Valley Province
- 50 species within the Coast Range Province
- 73 species within the West Cascades Province
- 97 species within the Klamath Province

Mapping of species occurrences provides distribution and density patterns. Areas of high and low densities of special status species occurrences can be displayed as hot spots (greater density) and cold spots (lesser density). Hot spots occur at fine spatial scales where there are such special habitat features as meadows, wetlands, rock outcrops, and at larger geographic scales such as the Klamath Province or the Eugene Wetlands area. Cold spots may result from fewer rare species, low occurrence levels, or lower survey intensity. The density figure below includes special status species occurrences on all lands within the planning area. See *Figure 3-48* (*Special status species occurrence density shown as hot spots and cold spots*).

Field surveys are the best method to confirm presence or absence of rare species and to increase knowledge of range, distribution, and habitat characteristics. Field searches for special status species (vascular plants, bryophytes and lichens) have occurred on approximately 510,000 acres in the past seven years on BLM-administered lands and resulted in the discovery of more than 1,300 new occurrences since 2003. For fungi, a coarse-filter approach was adopted that used a broad random sampling methodology and strategic searches (USDI BLM 2004c). More than 77% of all special status species occurrences in the past four years were reported from the Medford District, which includes the Klamath Province. At the opposite end of the range, approximately 1% of all occurrences were found in the Klamath Falls Resource Area in the Lakeview District.

Figure 3-48. Special Status Species Occurrence Density Shown As Hot Spots And Cold Spots (Density Per Square Kilometer)



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 unusual environments. The Oregon Coast includes a group of rare lichens (e.g., *Bryoria pseudocapillaris, Erioderma sorediatum,* and *Hypogymnia duplicata*) adapted to narrow ecological conditions found only along the Pacific coast. However, even in 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, the habitat associated with rare vascular plants is well understood. Bryophytes and lichen species are associated with a variety of habitats including conifer trees, rock, soils, and riparian habitat, 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 bryophytes species are less certain and more conceptual than those for vascular plants. Fungi have even less certain habitat characteristics than the lichen and bryophytes (USDA USFS and USDI BLM 2007). The understanding of the distribution and habitat requirements for many lichens, bryophytes and fungi is evolving. The habitat groups (discussed in the last section of this *Botany* section) organize Bureau special status species into broad habitat types based on current understanding. Additional species-specific habitat descriptions can be found in *Appendix F - Botany*.

Biological factors (e.g., reproductive strategies, inbreeding depression, pollinators and pollination, consumption by herbivores, weed invasion, habitat connectivity, disease, predation, habitat change, and global climate change) play important roles in determining the distribution and abundance of a species. 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 (e.g., Baker Cypress) appear to be remnant populations from historic plant communities that have shifted as a result of climate change. Other rare species in Oregon (e.g., numerous mariposa lilies and Mendocino gentian) are narrow endemics adapted over long periods of time 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 meta-populations (*Limnanthes* spp. and *Plagiobothrys* spp.), or may be the result of hybridization (e.g., Gentner's fritillary). Certain rare species of lichen 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 (e. g., Golden paintbrush, Bradshaw's desert parsley) are rare due to loss of habitat from an expanding human population and the introduction and spread of invasive plants (USDI USFWS 2000, USDI USFWS 1993).

Natural disturbances (wildfires, windstorms, and floods) change plant community and habitat conditions for rare plants and fungi. Many factors determine whether an occurrence will survive a disturbance. Among those factors are 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, Kincaid's lupine, and coral seeded allocarya (*Plagiobothrys* sps.) can respond positively to the increased light and moisture from 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 weedy annuals. Alternately, many rare lichen, bryophytes, and fungi, along with some vascular plants without fire-adaptive mechanisms, are consumed in a fire. These occurrences, 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 (Copeland, unpublished 2005).

Floods and debris flows alter riparian and aquatic plant communities and can also alter the rare plant populations that occur in disturbed areas. These types of events are very dynamic with some rare plant occurrences 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 resprouting and reseeding of riparian associated shrubs, perennial and annual grasses, and forbs. For example, many rare juncus and sedge species, along with coral-seeded allocarya (*Plagiobothrys* sps.*),* associated with streams and wetlands are adapted to periodic floods by prolific seed production.

Special Status Species

The BLM currently manages 296 rare plant species and fungi in western Oregon called special status species. Special status species include all federally listed, federally proposed, and federal candidate species, Oregon state listed, as well as Bureau sensitive and strategic species (USDI BLM 2007b). Some species are both state and federally listed species. The special status species list changes when species rankings change. The primary ranking considerations include federal and state status, the number of extant populations,

distribution, population size and dynamics, and threats. A species ranking inherently includes an ecological and viability assessment and provides the basis for inclusion on the BLM special status species list. The BLM strategic species receive no conservation protection measures and are not included in the analysis.

One of the conservation goals underlying the special status species program is the preservation of species and genetic diversity for human benefit. Rare species have high conservation value for scientific and biological interests, as well as agronomic utility. The hybrid meadowfoam "Floral" was developed by plant breeders at Oregon State University by crossing two meadowfoams: *Limnanthes floccose* ssp. Grandiflora (a federally listed narrow endemic found on mounded prairie in southern Oregon) with *Limnanthes alba*. Grass farmers in the Willamette Valley rotate "Floral" as a cover crop between grass seed crops to eliminate unwanted weeds and grasses and to harvest the seeds for processing into fine oil for the cosmetics and plastics industries, and as a specialty lubricant.

Of the 296 plant species and fungi in the planning area that are on the special status species list, only 155 (52%) have documented occurrences on BLM-administered lands. The remaining 141 (48%) are suspected or likely to occur on BLM-administered lands. Suspect plants or fungi are included on the special status species list because known sites occur nearby, their range coincides with the planning area, and suitable habitat exists on BLM-administered lands. Of the 189 vascular plants suspected to occur on BLM-administered lands within the planning area, there are 102 known occurrences, and only 6 of those are federally listed or candidate species. See *Table 3-19 (Number of documented and suspected plant and fungi special status species*) for known occurrences of bryophytes (i.e., mosses and liverworts), lichens, and fungi on BLM-administered lands in the planning area.

The 155 special status species have been detected at approximately 3,700 locations. They occupy about 4,250 acres of the approximately 2.6 million acres of BLM-administered lands within the planning area.

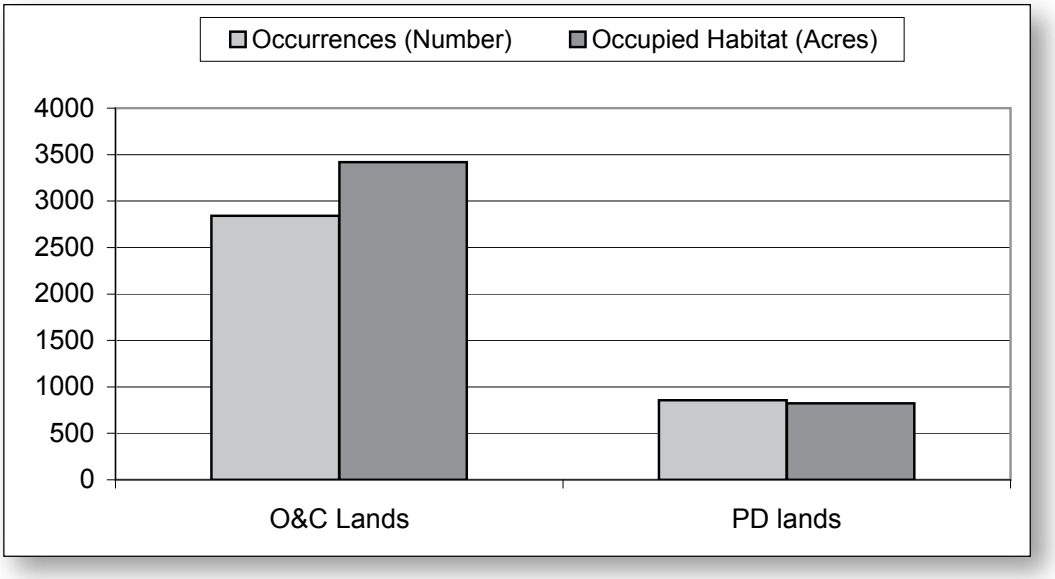
Approximately 74% of the occupied habitat (of 4,250 acres total) and 76% of the occurrences (of 3,700 occurrences total) have been found to occur on O&C lands. The other 26% of the occupied habitat and 24% of the occurrences occur on public domain lands. If the Eastern Cascades Province public domain lands (where 45% of all public domain lands are located and where very few occurrences and occupied habitat are found) were excluded, a higher proportion of occurrences and occupied habitat would occur on public domain lands compared to O&C lands. See *Figure 3-49 (Occurrences and occupied habitat of Bureau special status species on O&C and public domain lands within the planning area)*.

Table 3-19. Number Of Documented And Suspected Plant And Fungi Special Status Species Within The Planning Area

Occurrence of Special Status Plant and Fungi Species	Total Species	Vascular Plants[a]	Bryophytes[b]	Lichens	Fungi
Suspected	141	87	25	11	18
Documented	155	102	12	15	26
Total	**296**	**189**	**37**	**26**	**44**

[a] Includes the 14 species that are federally listed and candidate species
[b] Mosses and liverworts

Figure 3-49. Occurrences And Occupied Habitat Of Bureau Special Status Species On O&C And Public Domain Lands Within The Planning Area



Federally Threatened, Endangered, and Candidate Species

There are 13 species that are listed under the federal Endangered Species Act that occur within the planning area, along with one federal candidate species—for a total of 14 federally listed and candidate species. Only 6 of the 13 federally listed species, and the one federal candidate species, occur on BLM-administered lands. The other seven species are suspected, but are not documented on BLM-administered lands or do not occur on lands where management activities are proposed (West Eugene Wetlands). These federally listed species are included in the analysis because their range and suitable habitat overlap BLM-administered lands. See *Table 3-20 (Federally listed plant species and occurrences within the planning area)*. Also see *Appendix F - Botany* for a general description of the biology, ecology, range, and threats of each species.

One or more federally listed and candidate species occur on each BLM district within the planning area and all are vascular plants. See *Figure 3-50 (Federally listed plants in the planning area)*. The range, biology, and habitat of each species are unique. Most federally listed plant species are adapted to special habitats within narrow geographic ranges (e.g., Rough popcorn flower, Applegate's milk-vetch, Western lily, and Cook's lomatium), although some are wider ranging (e.g., Golden paintbrush, Water howellia). Most federally listed species are found in lower elevation valley areas that have been heavily modified by agriculture and urbanization. The total number of known federally listed plant occurrences is few on BLM-administered lands, but these occurrences are considered secure because of conservation protection measures provided under the Endangered Species Act. Individual occurrence sizes are generally small, and the area of occupied habitat is also small. See *Appendix F - Botany* for a list of federally listed species, the number of known sites, the area occupied in acres, and the general habitat descriptions.

Table 3-20. Federally Listed And Candidate Plant Species And Their Occurrences Within The Planning Area

Scientific Name	Common Name	Occurrences[a] on BLM	Total Occurrences[b]	BLM Districts
Federally Threatened Oregon (FTO)				
Castilleja levisecta	Golden paintbrush	0	7	Salem, Eugene
Howellia aquatilis	Water howellia	0	0	Salem, Eugene, Roseburg, Medford
Lupinus sulphureus ssp. *Kincaidii*	Kincaid's lupine[c]	11	70	Eugene, Roseburg
Sidalcea nelsoniana	Nelson's checker-mallow	1	99	Salem
Federally Endangered Oregon (FEO)				
Arabis mcdonaldiana	McDonald's rockcress	0	8	Medford, Coos Bay
Astragalus applegatei	Applegate's milk-vetch	0	14	Klamath Falls Resource Area
Erigeron decumbens var. *decumbens*	Willamette Valley daisy[d]	9	44	Eugene, Salem
Fritillaria gentneri	Gentner's fritillary	112	130	Medford
Lilium occidentale	Western lily	1	26	Coos Bay
Limnanthes floccosa ssp. *Grandiflora*	Large-flowered wooly meadow-foam	0	19	Medford
Lomatium bradshawii	Bradshaw's desert parsley[c]	7	49	Salem, Eugene
Lomatium cookie	Cook's lomatium	32	55	Medford
Plagiobothrys hirtus	Rough popcorn flower	2	17	Roseburg
Federal Candidate Oregon (FCO)				
Calochortus persistens	Siskiyou mariposa lily	2	3	Medford

[a] Source: Geographic Biotic Observation Database (GeoBob) (10/2007)
[b] Sources: Oregon Natural Heritage Information Center database (1/2008) and GeoBob (10/2007)
[c] Includes 6 occurrences in West Eugene Wetlands
[d] Includes 9 occurrences in West Eugene Wetlands

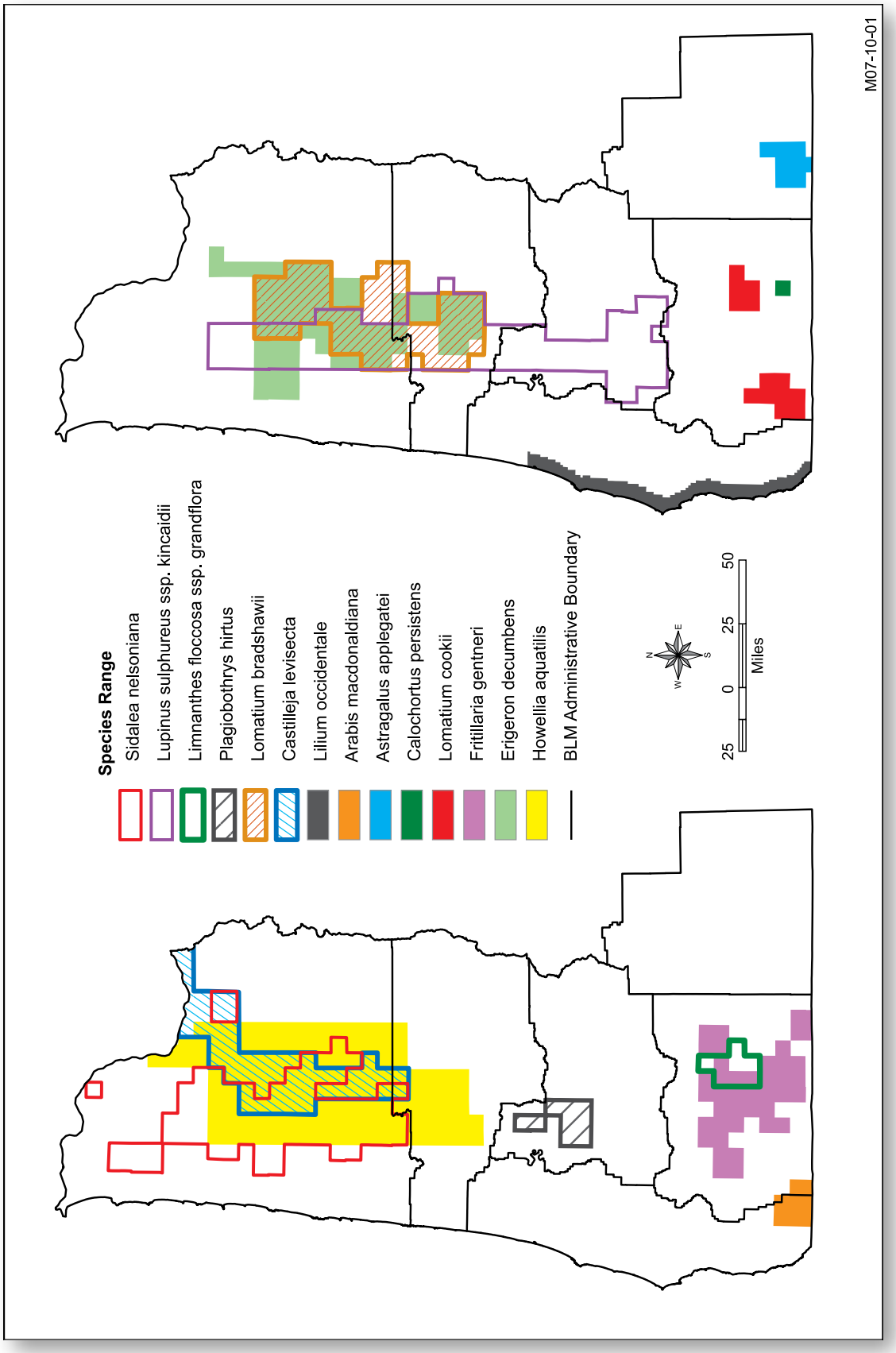


Figure 3-50. Federally Listed Plant Species

Oregon State Endangered, Threatened, and Candidate Species

Rare vascular plant species listed by the state of Oregon occur in every BLM district within the planning area. There are 32 plant species listed under the Oregon Endangered Species Act, along with 33 candidate species. The Oregon-listed species include 12 species that are also federally listed. In general, most of these species are narrow endemics that occur within restricted geographic areas or unique habitats, but have distinct range, biology, and habitat conditions. The occurrences of state-listed species are few and normally small in size. See *Appendix F - Botany*.

Bureau Sensitive Species

Bureau sensitive species comprise 282 of the 296 special status species and include vascular plants, bryophytes, lichens, and fungi. The group of 20 Oregon state-listed and 33 candidate species (not including federally listed species) is included under Bureau sensitive species. Bureau sensitive species are managed consistent with species conservation needs (biological and ecological requirements). Conservation measures to protect species occurrences and habitat from management activities include altering the type, timing, extent, and intensity of actions and other strategies designed to maintain populations of species. Conservation measures would include establishing new populations or augmenting existing populations and retaining biological forest legacies as host and substrate for lichens, bryophytes, and fungi in potential habitat. Bureau sensitive species would be managed so that management activities would not contribute to the need to list the species under the Endangered Species Act.

Conservation Plans

The following sections address the recovery plans, conservation agreements, and conservation strategies for rare plant species. A list of the conservation components that apply to land management activities, from each conservation plan, is provided in *Appendix F - Botany.*

Recovery Plans for Federally Listed Plant Species

Recovery plans identify the objectives, actions, and standards necessary to protect and recover federally listed species using the best available science. Recovery plans have been completed for 9 of the 13 species listed under the federal Endangered Species Act that occur in the planning area. See *Table 3-21 (Federally listed plant species with recovery plans)*. A draft recovery plan for Cook's lomatium (*Lomatium cookii*) and large-flowered wooly meadowfoam (*Limnanthes floccosa* ssp. *grandiflora)* was published in June 2006 and a final recovery plan is expected in 2008. A list of the primary conservation components that apply to land management activities, from each recovery plan, is provided in *Appendix F - Botany*.

Conservation Agreements

Conservation agreements outline mutual conservation goals for species between the BLM and other federal agencies, state agencies, and private landowners. They provide general guidance for management of species that is necessary to reduce, eliminate, or mitigate threats or risks. There are four single species conservation agreements and one multiple species interagency conservation agreement between the BLM and other agencies (usually involving the U.S. Fish and Wildlife Service) within the planning area. The multiple species conservation agreement provides management direction for five rare species occurring on habitat surrounding *Darlingtonia* wetlands and fens on serpentine areas See *Table 3-22 (Plant species with conservation agreements)*.

Two of the conservation agreements are for the federally listed species *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's lupine) and *Lomatium cookii* (Cook's lomatium). The agreement for Kincaid's lupine is between

the Roseburg BLM District and the U.S. Fish and Wildlife Service and includes populations in Douglas County, Oregon. The agreement's objectives are to: (1) maintain stable populations of the species in Douglas County by protecting and restoring habitats, (2) reduce threats to the species on lands managed by the BLM and USFS, (3) promote larger functioning metapopulations, with increased population size and genetic diversity, and (4) meet recovery criteria in the Recovery Outline for the species (USDI USFWS 2006a). The agreement for Cook's lomatium is between the Medford BLM District and the U.S. Fish and Wildlife Service and includes those populations in the Illinois Valley, Oregon. The agreement's objectives are to: (1) protect

Table 3-21. Federally Listed Plant Species With Recovery Plans

Status[a]	Scientific Name	Common Name	Listing Date	Recovery Plan Date
FEO	*Arabis macdonaldiana*	MacDonald's rockcress	1978	1990
FEO	*Astragalus applegatei*	Applegate's milk-vetch	1993	1998
FTO	*Castilleja levisecta*	Golden paintbrush	1997	2000
FEO	*Erigeron decumbens* var. *decumbens*	Willamette Valley daisy	2000	
FEO	*Fritillaria gentneri*	Gentner's fritillary	1999	2003
FTO	*Howellia aquatilis*	Water howellia	1994	Draft 1996
FEO	*Lilium occidentale*	Western lily	1994	1998
FEO	*Limnanthes floccosa* ssp. *Grandiflora*	Large-flowered wooly meadowfoam	2002	Draft 2006
FEO	*Lomatium bradshawii*	Bradshaw's desert parsley	1988	1993
FEO	*Lomatium cookii*	Cook's lomatium	2002	Draft 2006
FTO	*Lupinus sulphureus* ssp. *Kincaidii*	Kincaid's lupine	2000	
FEO	*Plagiobothrys hirtus*	Rough popcorn flower	2000	2003
FTO	*Sidalcea nelsoniana*	Nelson's checker-mallow	1993	1998

[a] FEO - federally endangered Oregon FTO - federally threatened Oregon

Table 3-22. Plant Species With Conservation Agreements

Single-species agreements			
Status[a]	**Scientific Name**	**Common Name**	**BLM District**
SE	*Calochortus coxii*	Crinite mariposa lily	Roseburg
SE	*Calochortus umpquensis*	Umpqua mariposa lily	Roseburg, Medford
ST	*Eucephalus vialis*	Wayside aster	Eugene, Roseburg, Medford
FEO	*Lomatium cookii*	Cook's lomatium	Medford
FTO	*Lupinus sulphureus* sp. *Kincaidii*	Kincaid's lupine	Roseburg
Multi-species agreement for the serpentine Darlingtonia wetlands and fens of southwestern Oregon and northwestern California, for the following five species:			
Status	**Scientific Name**	**Common Name**	**BLM District**
OR-Sen	*Epilobium oreganum*	Oregon willow-herb	Medford
OR-Sen	*Gentiana setigera*	Mendocino gentian	Medford
ST	*Hastingsia bracteosa* var. *bracteosa*	Large-flowered rush lily	Medford
ST	*Hastingsia atropurpurea* var.*atropurpurea*	Purple-flowered rush lily	Medford
OR-Sen	*Viola primulifolia* ssp. *occidentalis*	Western bog violet	Medford

[a]FTO (federally threatened - Oregon) FEO (federally endangered - Oregon) ST (state threatened) SE (state endangered) OR-Sen (BLM sensitive)

significant biological and ecological values of populations and habitats, (2) protect populations from human activity, recreation and mining, (3) manage populations and habitat to enhance populations, and (4) survey additional suitable habitat (see *Appendix F – Botany)*.

Conservation Strategies

Conservation strategies are more detailed than conservation agreements. Besides containing the information that is included in a conservation assessment (a species biology, ecology, range, occurrence size and population demographics, threats, and habitat management), conservation strategies address how to manage and conserve the species, identify essential populations and habitat, and ensure population viability and persistence. Conservation strategies have been written for five species within the planning area. See *Table 3-23 (Plant species with conservation strategies)*.

See *Appendix F - Botany* for a complete list of conservation strategies and conservation agreements, which includes species, key conservation components that apply to land management actions, participating agencies, and field units.

Habitat Groups for Rare Plants and Fungi

Given the large number of special status plants and fungi and also their unique range, biology, and ecology, a macro-habitat organizational approach was developed to place species with similar ecological characteristics into habitat groups. This approach is a modified multiple species classification system described by Raphael and Molina (2007), but varies in that some species within a habitat group respond differently than others to habitat change. See *Figure 3-51 (Number of special status plant and fungi species by habitat group)*.

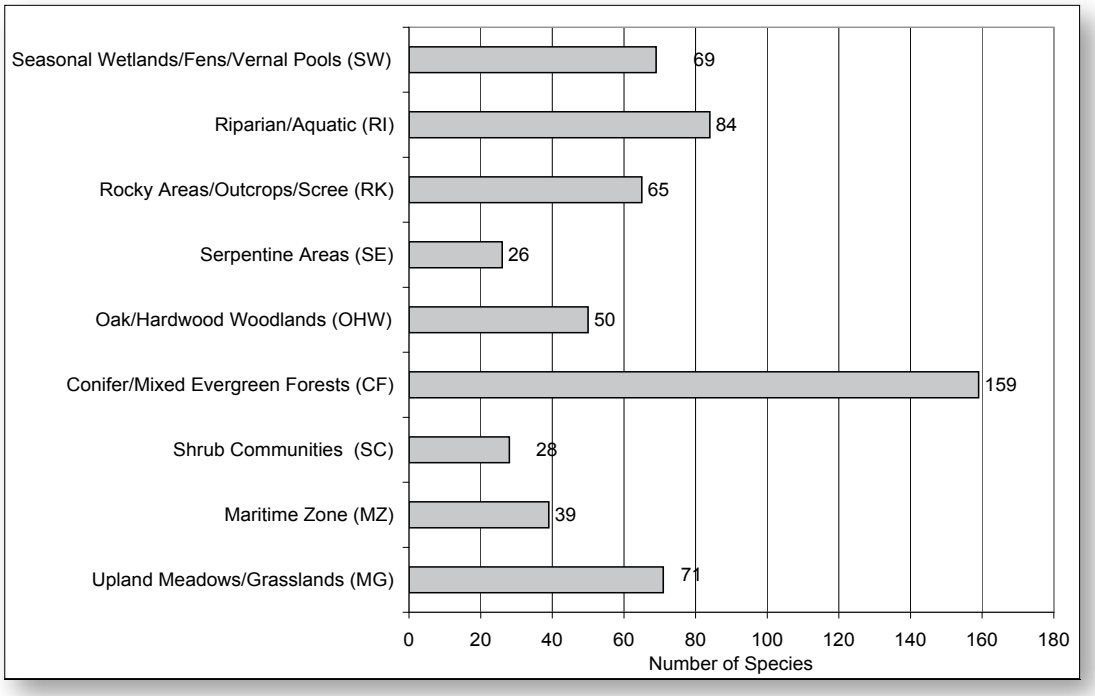
The 296 special status species plants and fungi within the planning area are from approximately 14 life forms (e.g., tree, forb, grass, lichen, and fungi) that are found in numerous habitat-specific substrates, plant communities, and environments. Nine habitat groups were formed based on aggregating similar habitat types that exist throughout the planning area (see list below). For the analysis of the effects of the alternatives, each of the 296 species was placed into one or more groups based on the broadest known range of habitats and conditions associated with the species. Habitat information and habitat groups for each species is in *Appendix F - Botany*.

Table 3-23. Plant Species With Conservation Strategies

Status[a]	Scientific Name	Common Name	BLM District
OR-Sen	*Eucephalus gormanii (Aster gormanii)*	Gorman's aster	Salem
OR-Sen	*Cimicifuga elata*	Tall bugbane	Medford, Roseburg, Salem, and Eugene
ST	*Frasera umpquaensis*	Umpqua gentian	Medford and Roseburg
ST	*Phacelia argentea*	Silvery phacelia	Coos Bay
OR-Sen	*Rorippa columbiae*	Columbia cress	Klamath Falls Resource Area in the Lakeview District

[a] OR-Sen (BLM sensitive) ST (state threatened)

Figure 3-51. Number Of Special Status Plant And Fungi Species By Habitat Group



Habitat groups used in this analysis include:

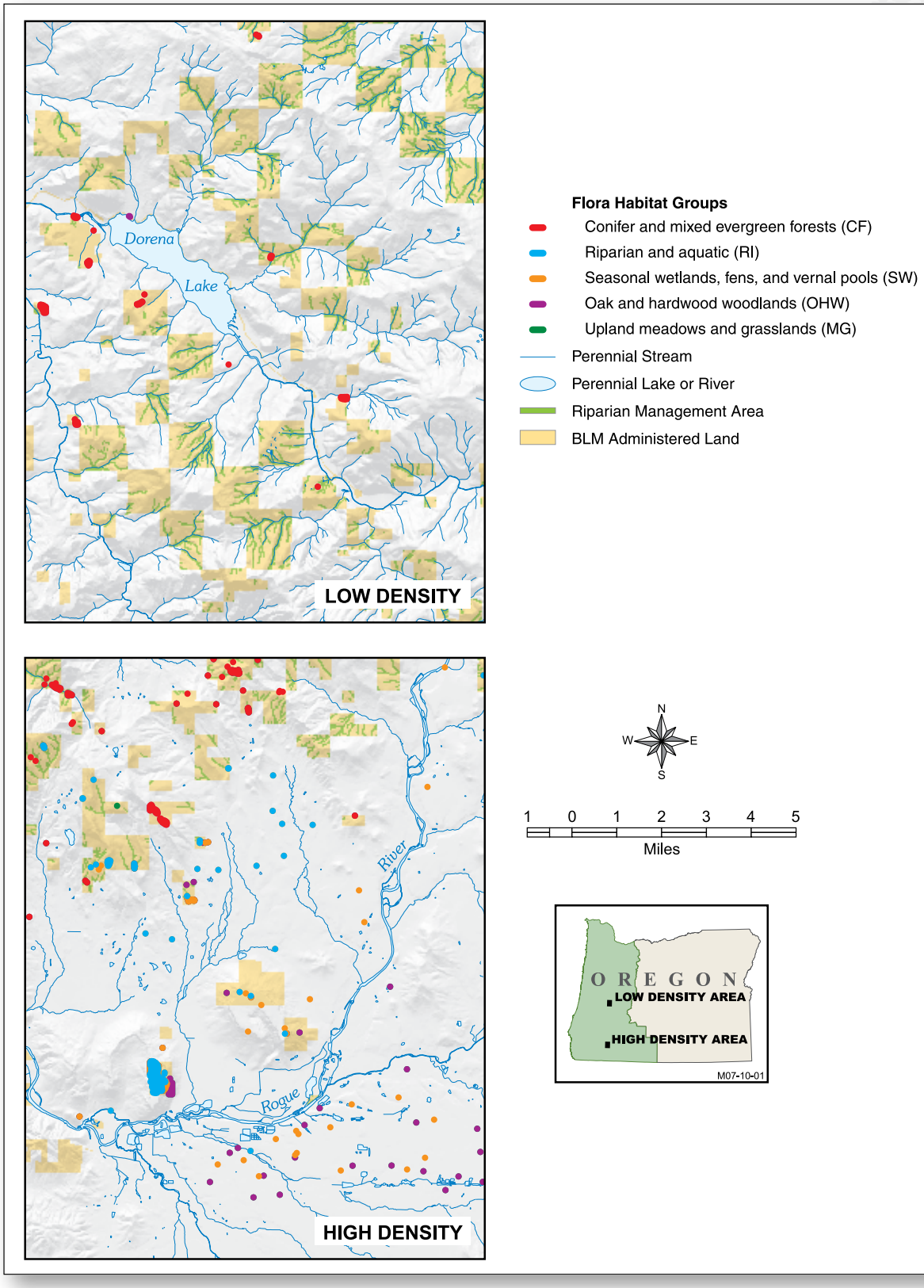
- conifer and mixed evergreen forests (CF)
- maritime zone (MZ)
- oak and hardwood woodlands (OHW)
- riparian and aquatic (RI)
- rocky areas, outcrops, and scree (RK)
- seasonal wetlands, fens, and vernal pools (SW)
- serpentine areas (SE)
- shrub communities (SC)
- upland meadows and grasslands (MG)

The above habitat groups relate to biotic and abiotic conditions as follows:

- Four habitat groups (CF, MG, OHW, and SC) are associated with broad vegetative community types.
- Two habitat groups (RI and SW) are associated with hydrologic and aquatic dependencies.
- Two habitat groups (RK and SE) are associated with parent material substrates (one specifically to serpentine areas).
- One habitat group (MZ) is associated with Oregon coastal conditions (wind, temperature, humidity, and precipitation) within approximately 10 miles of the coast.

In addition to the biotic and abiotic conditions that shape the composition of species by habitat groups, occurrence densities and habitat group diversity (i.e., species diversity) varies by ecoregion and BLM District, from relatively low to high occurrence density and habitat group diversity. See *Figure 3-52 (Southwest Oregon - Example areas of high and low occurrence density, and of high and low habitat group diversity)*

Figure 3-52. Southwest Oregon - Example Areas Of High And Low Occurrence Density, And Of High And Low Habitat Group Diversity



Invasive Plants

Key Points

- Invasive plant infestations are numerous and many are well distributed on BLM-administered lands within the planning area.
- Invasive plant species are introduced and spread through various mechanisms, including land management activities.

Invasive plants are non-native plant species whose introduction causes economic or environmental harm, or harm to human health. Noxious weeds are a subset of invasive plant species. Noxious weeds are plant species that are designated by federal or state law and generally possess one or more of the following characteristics:

- aggressive and difficult to manage
- parasitic
- carrier (or host) of serious insects or disease
- non-native, new, or not common to the United States

More than 130 invasive plant species have been documented within the planning area. Of these, 61 are also listed as noxious weeds in Oregon. See *Table 3-24 (Number of invasive plant and noxious weed species on BLM-administered lands within the planning area)*. Several of the other identified invasive plants are also listed as noxious weeds in other states.

An accurate accounting of the total acreage and distribution of invasive plant infestations and treatments is unavailable for the following reasons:

- No central source exists for compiling invasive plant infestation and treatment information within Oregon.
- There is no requirement for county, private, or corporate landowners to report invasive plant information.

Weedmapper

An interagency cooperative effort with Oregon State University to collect spatial information on the distribution of noxious weeds in the state of Oregon. See www.weedmapper.org.

Despite the limited reporting on weed locations, a good picture of the distribution of noxious weed species is available on a species-by-species basis by WeedMapper (online at www.weedmapper.org).

Representative Invasive Plant Species

The condition of invasive plant infestations on BLM-administered lands within the planning area can be characterized by analyzing a few invasive plant species. The following representative list of invasive plant species is used to describe the condition of invasive plants on BLM-administered lands within the planning area:

- Canada thistle
- Dyer's woad
- False brome
- knotweeds
- Leafy spurge
- meadow knapweed
- Scotch and French brooms
- Spotted and diffuse knapweeds
- yellow starthistle

Table 3-24. Number Of Invasive Plant And Noxious Weed Species On BLM-Administered Lands Within The Planning Area

Plant Category	Planning Area	BLM Districts					
		Salem	Eugene	Roseburg	Coos Bay	Medford	Klamath Falls Resource Area (Lakeview District)
Invasive Plants	136	74	64	81	51	50	50
Noxious Weeds	61	26	28	28	29	36	28

Each of these species or species groups has a unique distribution pattern and strategy for spreading and resisting different treatment methods. Many of the identified invasive plant species are well distributed across the planning area. Some are limited in distribution and others have very few sites on BLM-administered lands. Although each species is unique, these sample invasive plant species represent a range of life histories and methods of introduction and spread sufficient to describe the condition of invasive plant species on BLM-administered lands within the planning area.

Canada Thistle

Canada thistle, a perennial with an extensive root system, occurs in a wide variety of open, moist, disturbed habitats including roadsides, streambanks, pastures, meadows, waste areas, campgrounds, clearcuts, roads, fires, and landslides (Hansen and Clevenger 2005, Turner 1999, Titus et al. 1998, Jensen 1991, Schoenberger et al. 1982, Neiland 1958). A study at Yellowstone National Park revealed that Canada thistle was found in habitats with varying levels of disturbance and that there is a direct relationship with species abundance and the level of disturbance (Allen and Hansen 1999, Turner et al. 1997). Canada thistle is rarely found in undisturbed forests (Heckman 1999, Bailey and Tappeiner 1998, Hutchison 1992, Chen et al. 1996, Dewey 1991, Parendes and Jones 2000, Young et al. 1967).

Canada thistle spreads sexually by seed and vegetatively by root and stem fragments. Most seeds are spread by animals, hay, contaminated crop seed, machinery, and irrigation water. Fewer are dispersed by wind (Nuzzo 2000). The majority of seeds germinate the year they are produced. Seeds are generally viable for less than 5 years, but could remain viable for up to 20 years in soil (Nuzzo 2000, Donald 1994).

After their germination, Canada thistle seedlings require space to grow and relatively high levels of light (Nuzzo 2000, Donald 1994). After they establish, Canada thistle spreads rapidly by vegetative growth in the root and underground stem systems. Within one season a plant can grow up to 20 feet horizontally in good growing conditions (Magnusson et al. 1987).

Canada thistle may establish in natural areas as part of the initial plant community after logging (Jensen 1991, Kellman 1969, Chen et al. 1996, Young et al. 1967), fire (Schoenberger et al. 1982), grazing, and road building (Meier and Weaver 1997).

A study in northern Idaho documented establishment of Canada thistle following clearcutting activities with varying levels of soil displacement. Timber harvesting activities with high levels of soil disturbance favor establishment of forbs, including Canada thistle, to the detriment of tree seedling establishment (Jensen 1991). Canada thistle establishment may take two or more seasons after disturbance events (Doyle et al. 1998, Willard et al. 1995, Jensen 1991).

Canada thistle is well-distributed across the state and is present on BLM-administered lands in every district within the planning area. See *Figure 3-53 (Distribution of Canada thistle)* (WeedMapper 2004a).

Dyer's Woad

Dyer's woad is an invader of rangelands and pastures. Dyer's woad behaves as a winter annual, biennial, or short-lived perennial. It is a prolific seed producer. The seeds are toxic to other plants and may remain viable in the soil for several years. This species only reproduces by seed (Kadrmas and Johnson 2002, Forest Health Technology Enterprise Team Update Team 1997).

Dyer's woad is spread by the transport of contaminated livestock, machinery, and soil; the sowing of contaminated seed; and the feeding of contaminated hay. Natural movements of wind and water also contribute to the spread of Dyer's woad (Kadrmas and Johnson 2002).

The apparent distribution of Dyer's woad in western Oregon is limited to the southeastern portion of the planning area. Dyer's woad infestations are reported from the Klamath Falls Resource Area of the Lakeview District and the Medford District. See *Figure 3-54 (Distribution of Dyer's woad)* (WeedMapper 2004a).

Figure 3-53. Distribution Of Canada Thistle

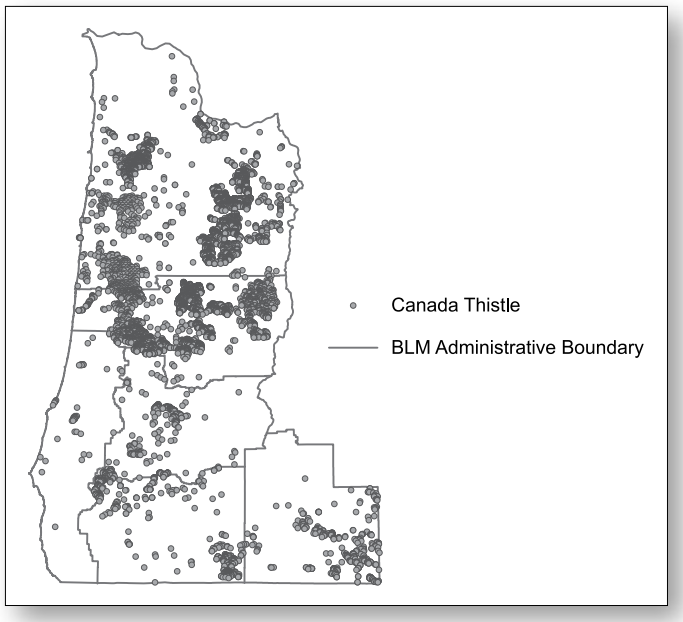
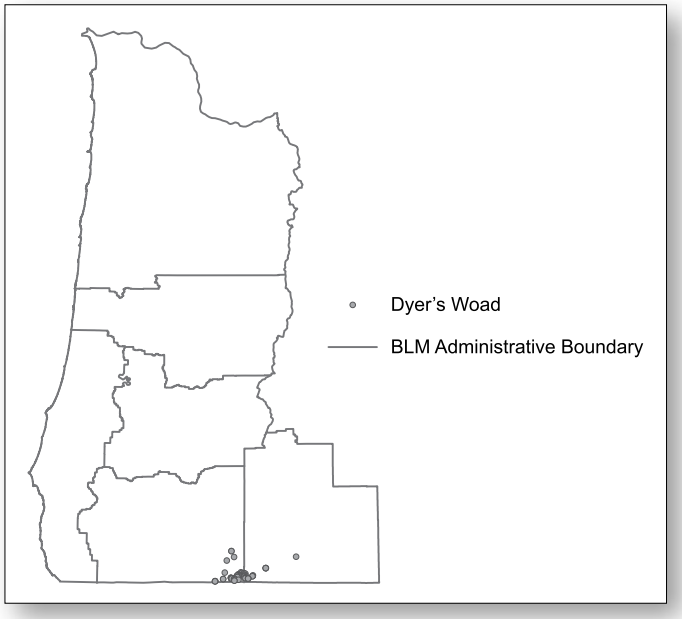


Figure 3-54. Distribution Of Dyer's Woad



False Brome

False brome, a perennial grass, reproduces by producing large quantities of seed. The seeds are dispersed by water, gravity, animals, and are often spread long distances by vehicles, off-highway vehicles, people, and road construction and maintenance equipment (Kaye 2003, False-brome Working Group Newsletter 2004).

False brome is shade tolerant, but can be easily crowded out by other shrubs and forbs. It grows in a wide variety of habitats including dry meadows; along streams, roads, and trails; and under forest canopies. Infestations spread along roads, trails, and down streams (Kaye 2003, False-brome Working Group Newsletter 2004).

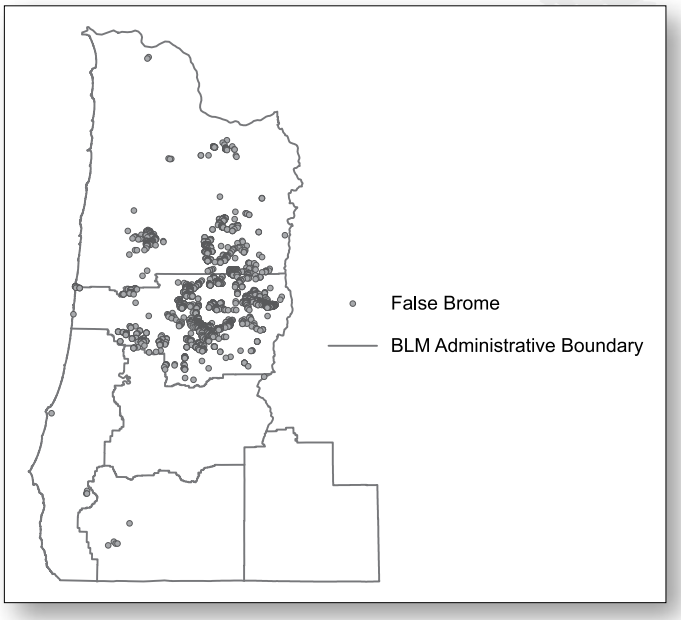
False brome has been reported on BLM-administered lands in the Eugene, Salem, and Medford Districts, and is also known to occur on nonfederal lands in southwestern Oregon and just over the crest of the Cascade Mountains in Jefferson County. See *Figure 3-55 (Distribution of false brome)* (WeedMapper 2004a).

Knotweeds

The knotweeds are long-lived perennials that create dense infestations in disturbed areas (e.g., streambanks and roads) and in waste areas. Roots and rhizomes can reach depths of 7 feet and distances of more than 20 feet from the parent plant. These infestations become dense and outcompete most native plant communities (Soll et al. 2007, Seiger 1991).

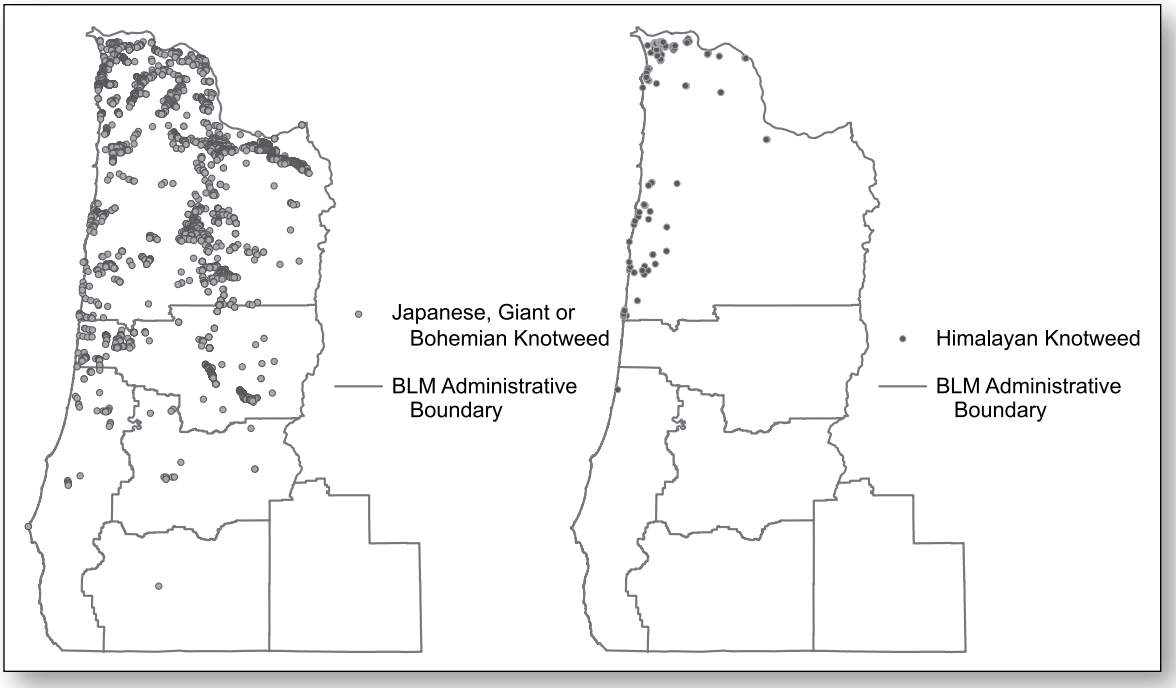
Knotweeds favor unshaded habitats, but can persist in areas of partial shade, particularly where the overstory is dominated by deciduous tree species. Knotweed infestations spread downstream during flood events, and are introduced along roads and waste areas as a result of human activity (Soll et al. 2007, Seiger 1991).

Figure 3-55. Distribution Of False Brome



Knotweeds are present on BLM-administered lands in all of the districts in the planning area, except the Klamath Falls Resource Area of the Lakeview District. See *Figure 3-56 (Distribution of Japanese, giant and Bohemian knotweeds, and the Himalayan knotweed)* (WeedMapper 2004a). Considerable effort has gone into inventorying the invasive knotweed species in some watersheds. However, these figures only reflect sites that have been reported. It is likely that these figures under-represent the actual distribution of knotweeds within the planning area.

Figure 3-56. Distribution Of Japanese, Giant And Bohemian Knotweeds, And The Himalayan Knotweed



Leafy Spurge

Leafy spurge is known to occur in a wide variety of habitats including agricultural, urban areas, grasslands, shrublands, and forests. This species is most vigorous in full sunlight and dry habitats but can also inhabit woodlands, prairies, and other habitats. The root system of leafy spurge is extensive and can reach depths beyond 12 feet into the soil profile and reach more than 30 feet from side to side. Infestations tend to grow into dense stands, easily outcompeting native plant communities (WeedMapper 2004b, Global Invasive Species Database 2005).

Leafy spurge can be introduced to new locations by accidentally including seeds in agricultural seed mixes and may be used as an ornamental in landscapes. Infestations can grow from a single established plant at a rate of 4 feet per year (Global Invasive Species Database 2005).

The distribution of leafy spurge in Oregon is primarily east of the crest of the Cascade Mountains and has been reported on BLM-administered lands in both the Medford District and Klamath Falls Resource Area of the Lakeview District. See *Figure 3-57 (Distribution of leafy spurge)* (WeedMapper 2004a).

Meadow Knapweed

Meadow knapweed was introduced into Oregon as a forage plant and today invades a variety of habitats within the planning area including roadsides, pastures, meadows, native prairies, oak savannahs, and forest openings. In western Oregon, meadow knapweed is becoming more common in clearcuts (Coombs et al. 2004). This species outcompetes native plant communities. It reproduces by seed and spreads by both natural processes and human activity (WeedMapper 2004c).

The reported distribution of meadow knapweed in Oregon is primarily west of the crest of the Cascade Mountains and has been documented on BLM-administered lands in every district within the planning area. See *Figure 3-58 (Distribution of meadow knapweed)* (WeedMapper 2004a).

Figure 3-57. Distribution Of Leafy Spurge

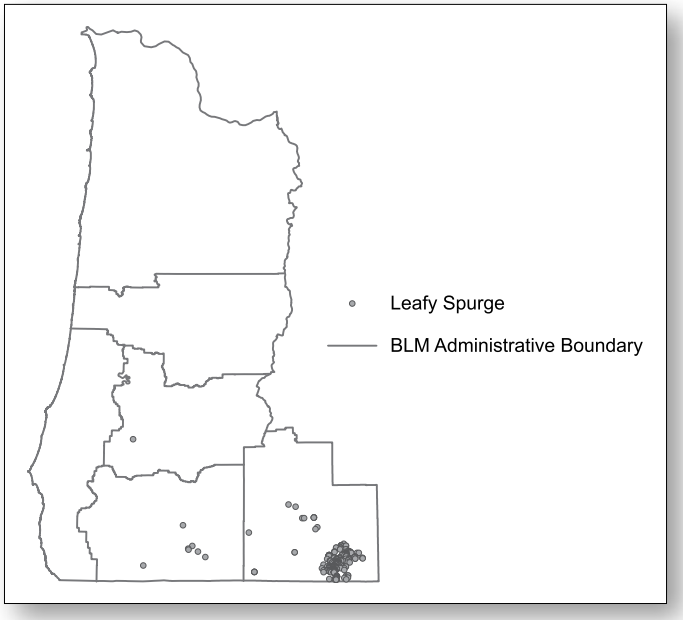
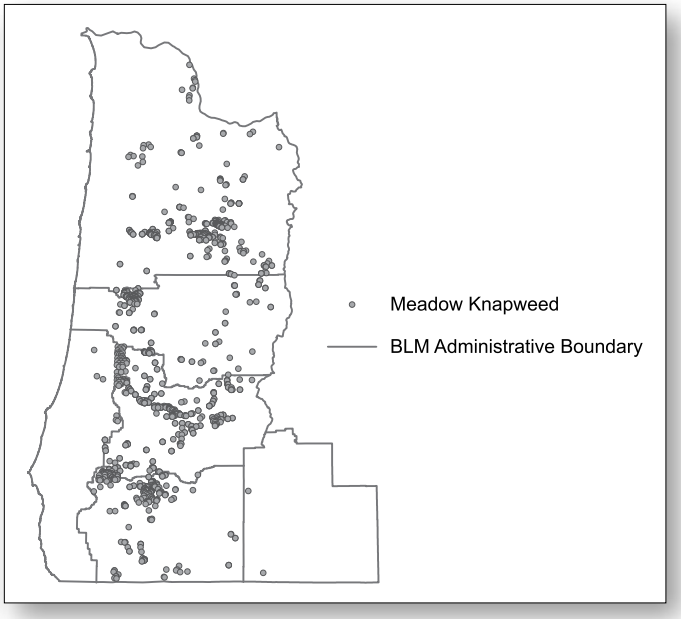


Figure 3-58. Distribution Of Meadow Knapweed



Scotch and French Brooms

Scotch and French brooms are pioneer species known to displace native plant species and increase the costs of timber production. They readily invade disturbed sites in natural areas, dunes, recreational areas, dry riverbeds, utility right-of-ways, open habitats, and forest lands. Scotch broom is shade intolerant but, given a chance, it invades areas soon after logging, clearing, and burning (Coombs et al. 2004). French broom has similar characteristics (Oregon Department of Agriculture 2007, Hoshovsky 1986).

Scotch and French brooms reproduce primarily by long-lived and hard-coated seeds. Mature plants produce a multitude of seeds that can remain viable in the soil for more than 50 years (Soll et al. 2007; Coombs et al. 2004, 160-161). The seeds are transported in soils, down streams, on machinery, and sometimes by birds and other animals that carry the seeds to new isolated areas (Watterson and Jones 2006, Hoshovsky 1986).

Scotch broom infestations are present across Oregon, except in the southeastern portion of the state. In western Oregon, the species is well-distributed north to south and is reported on BLM-administered lands in every district within the planning area. French broom infestations are currently limited to western Oregon and are reported to occur on BLM-administered lands in the Coos Bay, Eugene, Medford, and Roseburg districts. See *Figure 3-59 (Distribution of Scotch and French brooms)* (WeedMapper 2004a).

Spotted and Diffuse Knapweeds

Spotted and diffuse knapweeds are tap-rooted biennials or short-lived perennials that are successful in outcompeting desirable species and native plant communities by growing into dense infestations in open habitats (WeedMapper Team 2004c, 2004d).

Spotted and diffuse knapweed seeds are often spread by being carried along on vehicle frames and shoes to new roadside or trail environments (Sheley et al. 1998). In British Columbia, logging trucks, off-highway vehicles, and trail bikes are documented sources of knapweed spreaders. These knapweeds are also spread along waterways in crop seed and in hay (Strang et al. 1979). Undisturbed infestations spread their seed by wind and water. The seeds can persist in the soil for more than five years (Coombs et al. 2004, 198-199).

Transportation corridors, waterways, gravel pits, and industrial areas are common sites for diffuse knapweed infestations (Coombs et al. 2004, 198-199; Roche and Roche 1988). Diffuse knapweed is also known to invade well-managed rangelands (Sheley et al. 1998).

The two knapweeds have similar distribution patterns within the planning area, but diffuse knapweed is reported less frequently. See *Figure 3-60 (Distribution of spotted and diffuse knapweeds)* (WeedMapper 2004a). Both species are spread throughout the state. Spotted knapweed occurs on BLM-administered lands in all of the districts within the planning area, except for Eugene and Roseburg. Diffuse knapweed has been documented on BLM-administered lands in all of the districts within the planning area, except for Coos Bay and Medford.

Yellow Starthistle

Yellow starthistle is an invasive winter annual or, rarely, a biennial or short-lived perennial forb, which grows best in full light and dry conditions and is almost always found in disturbed areas or open grasslands dominated by annuals.

Yellow starthistle infestations can reach more than 6 million plants per acre (Callihan et al. 1993). At this density, yellow starthistle effectively displaces native plants; reduces wildlife habitats, species diversity, and land values; and limits access to recreational areas.

Figure 3-59. Distribution Of Scotch And French Brooms

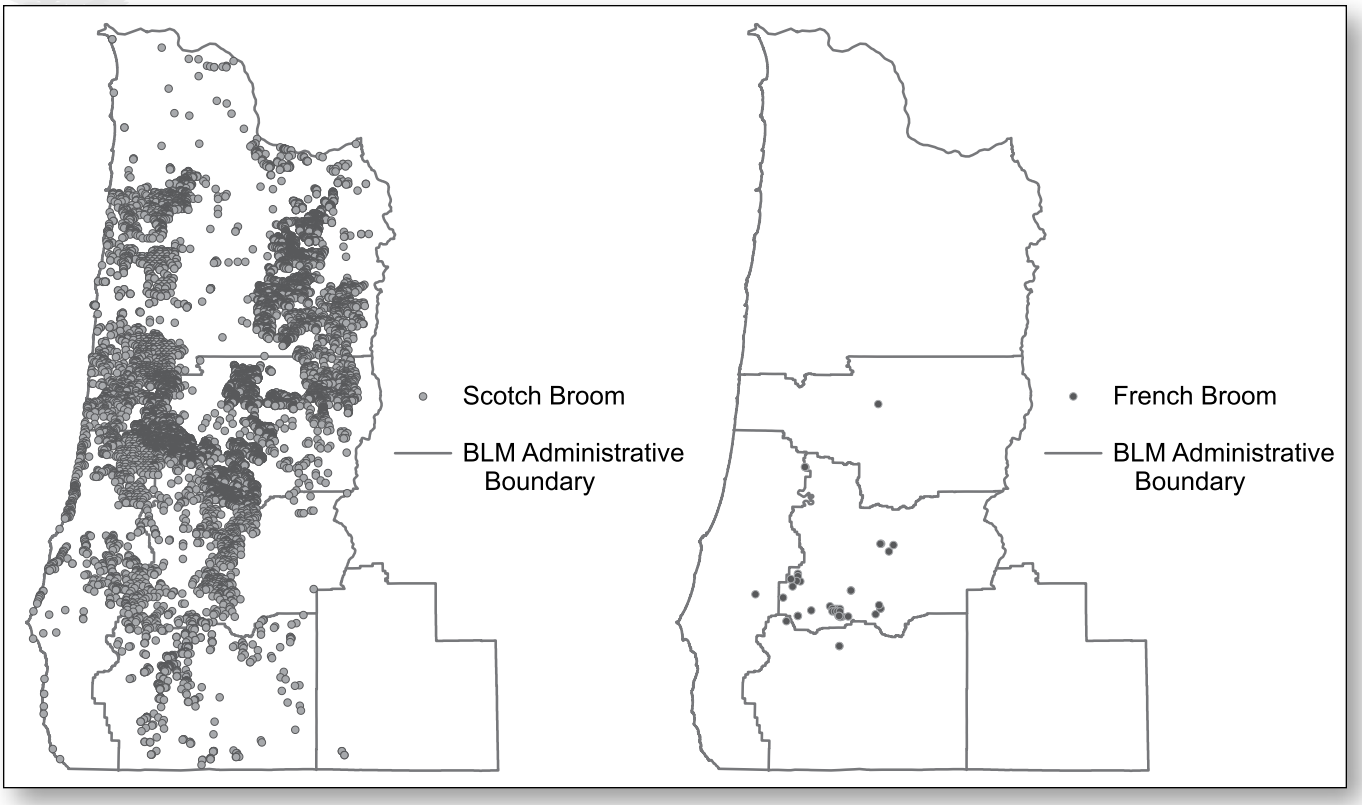


Figure 3-60. Distribution Of Spotted And Diffuse Knapweeds

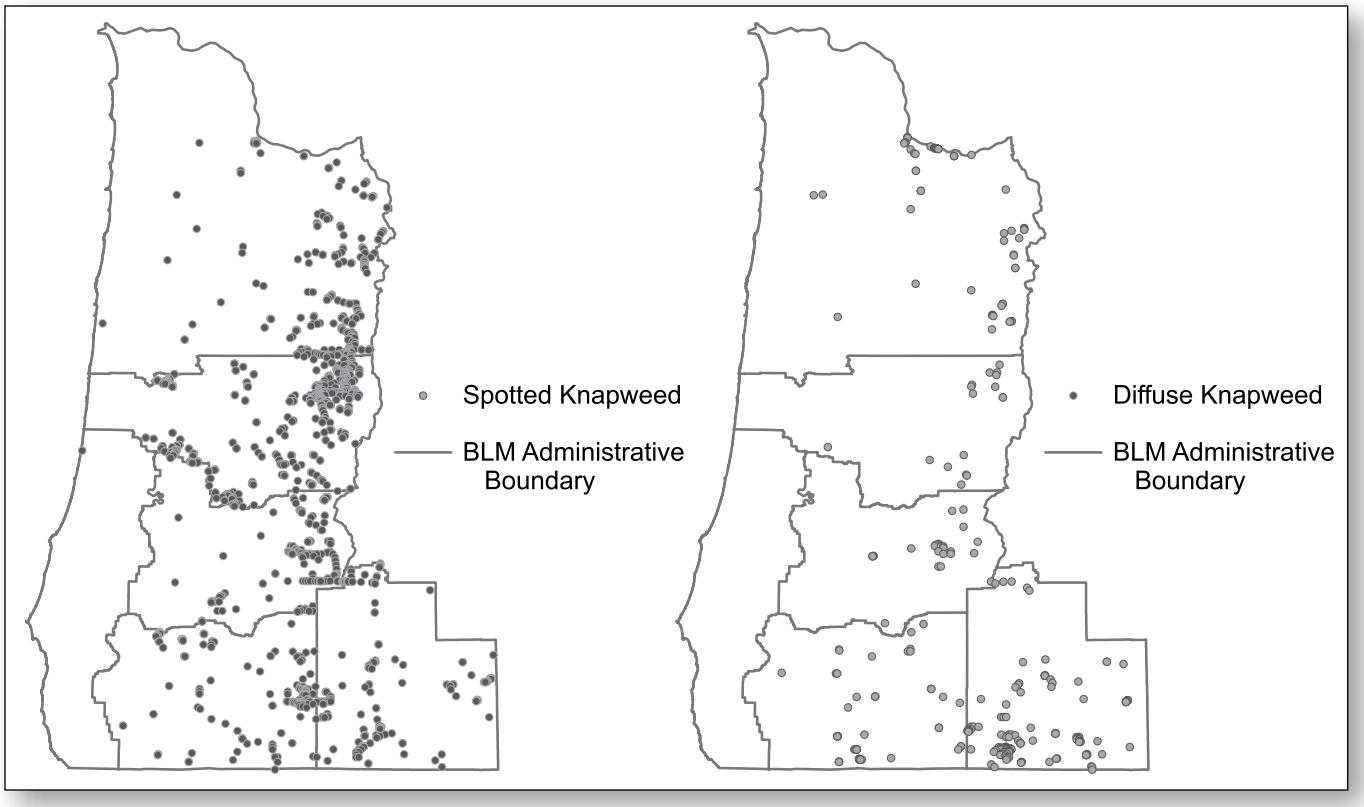
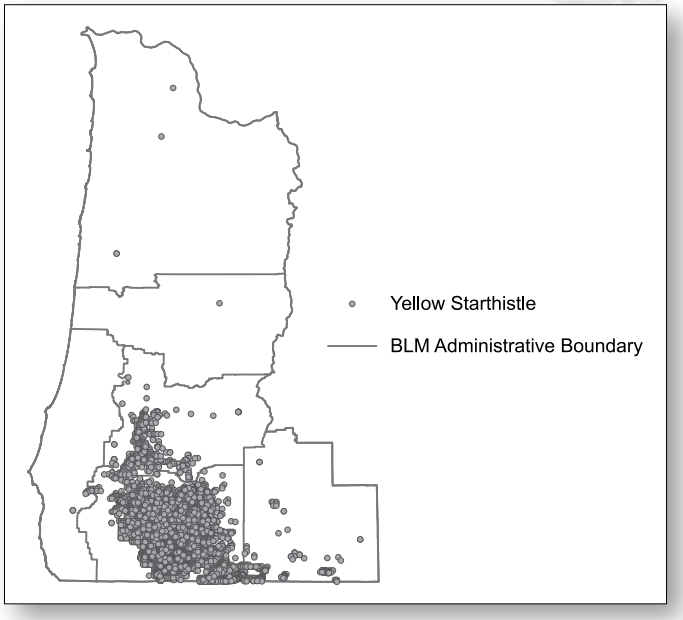


Figure 3-61. Distribution Of Yellow Starthistle



Seeds of yellow starthistle are dispersed short distances by wind and longer distances by animals and people. Yellow starthistle seeds may remain viable for up to 10 years (Callihan et al. 1993). Seeds are most often distributed long distances by such human activities as the movement of livestock, the movement of seeds on the undercarriage of vehicles and on road maintenance equipment, and the use of contaminated hay and crop seed (Healy and DiTomaso 2002, DiTomaso and Gerlach 2000). Yellow starthistle infestations have also been spread from gravel out of infested gravel pits to roadsides and other management activity sites (Roche and Roche 1988).

The yellow starthistle distribution pattern in Oregon is clustered in the northeast and southwest but is present in every physiographic province in the state. See *Figure 3-61 (Distribution of yellow starthistle)* (WeedMapper 2004a). Infestations of yellow starthistle are reported on BLM-administered lands in all of the districts within the planning area, except Salem.

Infestations of Invasive Plant Species

Some invasive plants (e.g., Scotch broom and purple loosestrife) have been intentionally introduced into the planning area for ornamental use or erosion control. Other species were introduced unintentionally by air, water, or transportation routes. Frequently, invasive plants are introduced by the movement of contaminated seed, agricultural materials, or animals; the use of contaminated equipment; and the spreading of infested gravel, road fill, and topsoil (USDI BLM 1996a).

Once introduced, these invasive plant species are spread primarily by vehicles, human activities, water, and wildlife. Initial infestations are often along roads and trails, landings, campgrounds, and other areas of high disturbance (Watterson and Jones 2006; Hansen and Clevenger 2005; and USDA USFS 2005a, 3-18, 3-23, 3-25, and 3-39). These source locations are present on both BLM-administered lands and other ownerships throughout the planning area. Occasionally, infestations are also introduced into relatively undisturbed areas (USDI BLM 2007d, 3-27).

Invasive plants are generally introduced and spread by human and management activities that result in ground disturbance and increased light. For example:

- Knotweed infestations are introduced along roads and waste areas as a result of human activity and then spread downstream during flood events (Hutchison 1992, Seiger 1991).
- False brome, knapweeds, Scotch broom, and other species also spread downstream after being introduced into stream systems (Watterson and Jones 2006).
- Logging trucks, off-highway vehicles, and trail bikes spread knapweed (Strang et al. 1979).
- Transportation corridors, waterways, gravel pits, and industrial areas are common sites for diffuse knapweed infestations (Roche and Roche 1988).

The likelihood of successful invasions and the vigor of infestations increase with the extent of ground disturbance and increased light levels (USDA USFS 2005a, 3-14 and 3-15; Allen and Hansen 1999; and Turner et al. 1997). Factors associated with timber harvesting activities that increase the chances of invasion include:

- increased light levels reaching the forest floor
- increased soil temperatures
- soil disturbance that can increase germination rates of seeds in a seed bank, or create seed beds (Nuzzo 2000, Parendes and Jones 2000, Heckman 1999, Bailey and Tappeiner 1998, Doyle et al. 1998, Titus et al. 1998, Outcalt and White 1981, Chen et al. 1996, Donald 1994, Kellman 1969, Neiland 1958)

Invasive plants are more likely to spread throughout a landscape where disturbance activities are evenly distributed than in landscapes where disturbance activities are spatially confined (USDA USFS 2005a, 3-14 & 3-15, and Appendix D, 7-17).

Reported weed sites for the invasive plant species described above show high densities of reported invasive plant sites in portions of all of the planning area. See *Figure 3-62 (Reported infestations of representative invasive plant species within the planning area)* and *Figure 3-63 (Distribution categories of invasive plant species for the fifth-field watersheds within the planning area)*.

The highest density fifth-field watersheds (shown in black on *Figure 3-63*) are those that have reported infestations on more than 25% of the square miles within them. The lightest gray areas represent fifth-field watersheds with reported infestations on 1% or fewer of the square miles within them, and the white areas show fifth-field watersheds with no reported infestations. The most expansive high-density invasive plant area is in the Medford District and extends north into the Roseburg and Coos Bay Districts. Expansive high-density invasive plant areas are also in the Eugene and Salem Districts.

Figure 3-62. Reported Infestations Of Representative Invasive Plant Species Within The Planning Area

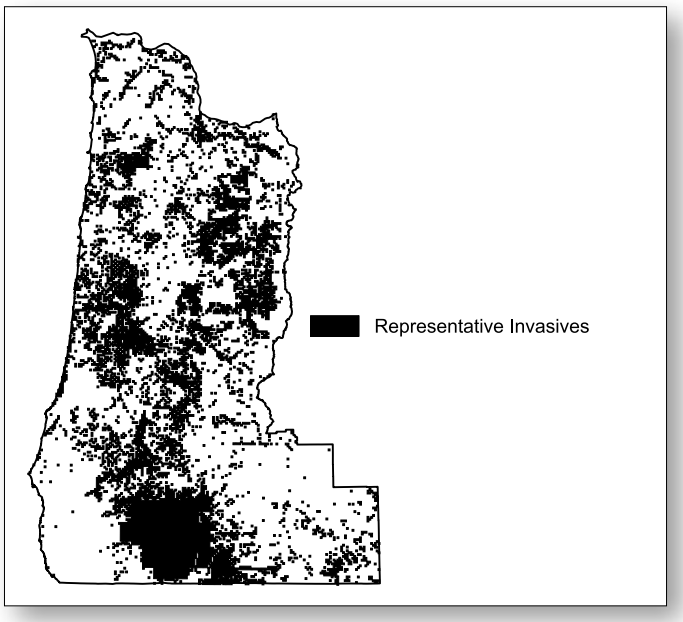
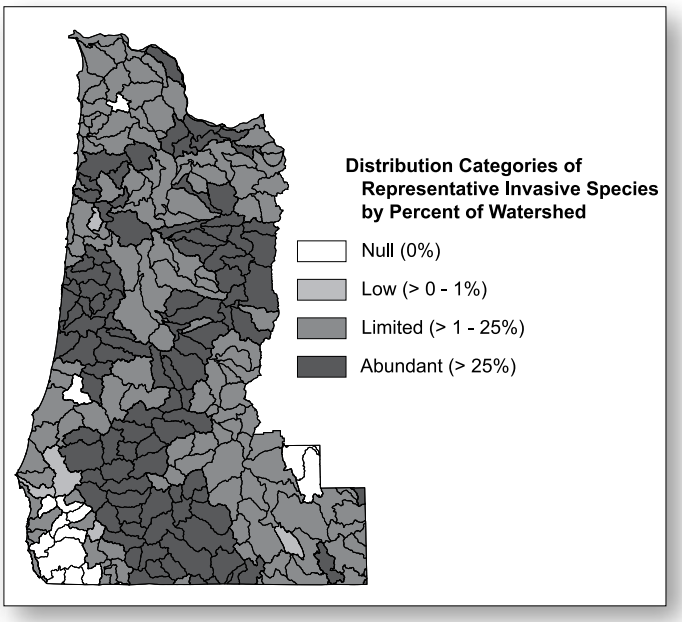


Figure 3-63. Distribution Categories Of Invasive Plant Species For The Fifth-Field Watersheds Within The Planning Area



Wildlife

Key Points

- Between 1985 and 2003, northern spotted owl populations in western Oregon declined by 2.8% per year, with the highest declines occurring in the northern half of this area.
- Since 1995, the rate of loss of northern spotted owl habitat on federally administered lands in western Oregon due to timber harvest has been reduced.
- Since the northern spotted owl was listed in 1990, new threats to species conservation have triggered the development of additional, habitat-specific conservation needs for the spotted owl in the planning area.
- Since 1995, the threat of wildfire to northern spotted owl habitat in the planning area has increased due to past management practices that fundamentally changed fuel conditions. The threat is greater in southwestern Oregon which, between 1994 and 2003, experienced fires that were higher in severity than was typical of its fire regimes.

Within the planning area, the BLM manages habitats that range from coastal beaches to montane forests and Great Basin sagebrush. Several thousand vertebrate and invertebrate species occur in the western and montane forests of Oregon. Eleven species are protected under the federal Endangered Species Act. A subset of individual species is specifically addressed in this final environmental impact statement because of their importance in the analysis of the alternatives, the consultation with the U.S. Fish and Wildlife Service, or high public interest.

Northern Spotted Owl

In 1990, the U.S. Fish and Wildlife Service listed the northern spotted owl (*Strix occidentalis caurina*) as threatened under the Endangered Species Act of 1973, as amended (USDI USFWS 1990). The northern spotted owl was listed as threatened throughout its range in the United States "due to loss and adverse modification of suitable habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms" (Anderson et al. 1990). Significant threats to the northern spotted owl included low or declining populations, limited or declining habitat, poor distribution of habitat or populations, predation and competition, lack of coordinated conservation measures, and vulnerability to natural disturbance (USDI USFWS 1992b). The U.S. Fish and Wildlife Service issued the final approved recovery plan for the northern spotted owl (USDI USFWS 2008a) on May 16, 2008.

Since 1984, there have been 1,333 known northern spotted owl sites (resident pairs or singles) recorded on BLM-administered lands in the planning area. Of these active known sites, in 2007 and 2008, BLM resource area biologists estimated that 1,110 still should be considered as active based on the process described by USDI USFWS/BLM and USDA USFS (2007). The BLM discontinued mandatory pre-project northern spotted owl surveys in 1995; since then, surveys on BLM-administered lands within the planning area have been conducted most consistently within the four Oregon demographic study areas that include BLM-administered lands (Coast Range, Tyee, Klamath and South Oregon Cascades). The BLM data indicate that 645 of these known sites (58%) were occupied by territorial spotted owls at some time during 2000-2004. Not all 1,110 known sites were surveyed during this period.

In addition to these known spotted owl sites, 196 predicted spotted owl nest locations that were defined in 2007 and 2008, in accordance with USDI USFWS/BLM and USDA USFS (2007), were mapped on BLM-administered lands within the planning area. These are locations where, based on habitat conditions and distances from known spotted owl activity sites, there is a reasonable likelihood of spotted owl occupancy.

Biological Overview

The following documents are the most recent summaries of the biological condition of the northern spotted owl across its range:

- Status and Trends in Demography of Northern Spotted Owls, 1985-2003 (Anthony et al. 2004)
- Scientific Evaluation of the Status of the Northern Spotted Owl (Courtney et al. 2004)
- Northern Spotted Owl Five-year Review: Summary and Evaluation (USDI USFWS 2004a)
- Status and Trends of Northern Spotted Owl Population and Habitat (Lint 2005)

Anthony et al. 2004 is the most recent meta-analysis of owl demographic data collected in 14 demographic study areas across the range of the northern spotted owl. Four of the study areas are in western Washington, six are in western Oregon, and four are in northwestern California. Summarizing this report, between 1985 and 2003:

- The northern spotted owl population declined over its entire range from Washington to California. Populations declined in nine demographic study areas and were stationary in four; population trend was undetermined in the Marin study area in California. The average population decline in the 14 areas was 3.7% per year. The decline was most pronounced in the four study areas in Washington (averaging 7.3% per year) and least pronounced in the four areas in California (averaging 2.2% per year).
- Within the six demographic study areas in western Oregon, populations declined in three and were stationary in three, with an average population decline in all six of 2.8% per year. However, within Oregon, population declines in the northern demographic study areas (Warm Springs, H.J. Andrews, and Coast Range), which averaged 4.9% per year, were more pronounced than in the southern demographic study areas (Tyee, South Oregon Cascades, and Klamath), where declines averaged less than 1% per year and populations statistically were stable.
- Comparing population trends on federal and non-federal lands, range-wide, the mean lambda (λ_{RJS}) for the eight demographic study areas on federal land was 0.976 (2.4% decline per year), compared to 0.942 (5.8% decline per year) in study areas on non-federal lands or with a mix of federal and non-federal lands. This suggested that northern spotted owl populations on federal lands had better demographic rates than elsewhere, but interspersion of land ownership in the study areas confounded the analysis. A similar, but less pronounced, trend was seen in western Oregon where the mean lambda for the three demographic study areas on federal land was 0.973 (2.7% decline per year), compared to 0.970 for those study areas with mixed ownerships (3.0% decline per year).
- Range-wide, adult survival rates declined in 5 of 14 study areas — all four study areas in western Washington and in the northwest California study area. This suggested that declines in adult survival rates might have been an important factor contributing to declining populations. However, in western Oregon, adult survival statistically was stable in all six study areas.

Courtney et al. 2004 was prepared for the U.S. Fish and Wildlife Service to "…report on the status of the northern spotted owl, summarizing and evaluating new information available since its listing, and any new understanding for information that existed at the time of listing" (USDI USFWS 2004a). The USFWS used Courtney et al. 2004 to assist its five-year status review of the northern spotted owl. The USFWS determined that the listing of the northern spotted owl as a threatened species still was warranted (USDI USFWS 2004a). Even though some risk factors had declined (e.g., habitat loss due to timber harvesting), other factors had continued (e.g., habitat loss due to wildfire and spotted owl population decline) and new risk factors with uncertain effects had developed since 1990 (e.g., potential competition from the barred owl [*Strix varia*], West Nile virus, and sudden oak death) (USDI USFWS 2004a).

Lint (2005) reported on the effects that the first 10 years of implementation of the Northwest Forest Plan had on the population and habitats of the northern spotted owl. His findings included:

- The estimated decline of the northern spotted owl population varied from 0 to 10% across the study areas in the Northwest Forest Plan area. The presence of barred owls, weather, past and present harvesting of habitat, wildfire, and insect infestations that alter habitat were possible contributors to those declines.
- Approximately 74% of the federal lands within the range of the northern spotted owl were capable of providing suitable habitat. Approximately 50% of the habitat capable area was providing suitable owl habitat.
- Precipitation, owl age, and habitat condition influence the survival and productivity of the northern spotted owl.
- The barred owl is present throughout the range of the northern spotted owl, so the likelihood of competitive interactions between the species raises concerns as to the future of the northern spotted owl.
- Barred owls, West Nile virus, and the management of suitable habitat for the northern spotted owl in fire-prone areas are likely to be future management concerns.

Northern Spotted Owl Habitat

This analysis addresses those portions of the planning area that are "habitat-capable" with respect to providing habitat conditions potentially used by northern spotted owls, excluding areas that cannot support habitat (e.g., because of soil limitations) or will not support owl nesting (e.g., because of high elevation) (see Lint 2005, Figure 3-7).

Suitable habitat for the northern spotted owl (which supports nesting, roosting and foraging) was described by Thomas et al. (1990, p. 164) as "multi-layered, multispecies canopy dominated by large (greater than 30 inches diameter at breast height) conifer overstory trees, and an understory of shade-tolerant conifers or hardwoods; a moderate to high (60 to 80%) canopy closure; substantial decadence in the form of large, live conifer trees with deformities—such as cavities, broken tops, and dwarf mistletoe infections; numerous large snags; ground cover characterized by large accumulations of logs and other woody debris; and a canopy that is open enough to allow owls to fly within and beneath it." Although subsequent research has refined this definition, it remains valid[2] (Courtney et al. 2004, Chapter 5).

Dispersal habitat for the northern spotted owl, which supports owl movement and survival (but not typically nesting), is comprised of forest stands with an average trunk diameter of at least 11 inches (when measured at a person's breast height); an average canopy closure of at least 40 percent; and structural components, such as snags and coarse woody debris, that support prey species (Thomas et al. 1990, pp. 27-29 and Appendix J and Courtney et al. 2004, Chapter 5).

The BLM, in cooperation with the U.S. Fish and Wildlife Service, developed the quantitative definitions of northern spotted owl habitats (i.e., the stand attributes that the BLM used to classify each stand as non-habitat, dispersal habitat or suitable habitat) shown in Table 88 of the Draft EIS (USDI BLM 2007, pp. 287-288). Habitat data for BLM-administered lands came from BLM operations inventory data and the BLM OPTIONS model[3]. Data for private, state and other federal lands came from 1996-vintage Interagency Vegetation Mapping Project (IVMP) data, which were updated using 2002 and 2004 data on clearcuts and stand-replacement fires.

[2]Studies in the California Klamath and Coast Range provinces (e.g., Dugger et al. 2005) found that habitat comprised of a mixture of older and younger forests supported owl reproduction better than habitat comprised almost exclusively of older forest. However, other studies have not supported that conclusion. Given the checkerboard land ownership pattern associated with BLM-administered lands in much of the planning area, homogeneity of older forest was not considered to be a management issue.

[3]Forest stands that initially were classified as "dispersal" were reclassified as "suitable" if they also met the structural stage classification definition of "mature multiple canopy" or "structurally complex" (USDI BLM 2007, 941-945); and, in the Salem District only, "suitable" stands with trees of a quadratic mean diameter of 11-20 inches were reclassified as "dispersal" due to regional considerations of treatment history, which placed the majority of stands toward the lower end of the 11-inch to 20-inch scale, and regional differences in the development of northern spotted owl nesting structure within stands within these classifications.

The BLM-administered lands in the planning area support 1,029,000 acres of suitable habitat and an additional 327,000 acres of dispersal habitat. These comprise 47% and 15%, respectively, of habitat-capable acres on BLM-administered lands. In 1994, about 7.4 million acres of suitable habitat were estimated to exist on all federal lands managed under the Northwest Forest Plan. As of April 12, 2004, the U.S. Fish and Wildlife Service had consulted on the removal or downgrading of about 190,500 of those acres (2.6% of 7.4 million acres) as a result of all management actions. An additional 187,000 acres of suitable habitat (2.5%) were estimated to have been lost during this period to stochastic events (USDI BLM 2007, Appendix H). About two-thirds of the stochastic loss was attributed to the 2002 Biscuit Fire, which burned more than 500,000 acres in southwest Oregon (Rogue River basin) and northern California. This fire resulted in a loss of approximately 113,451 acres of northern spotted owl suitable and dispersal habitats, including habitat within five late-successional reserves. Approximately 18,630 acres of northern spotted owl habitat were lost to the B&B Complex and Davis fires in the Eastern Cascades Province.

Geographic Areas of Concern

Areas of concern for the northern spotted owl were identified and discussed (but not specifically delineated by USDA USFS 1988 and 1991, Anderson et al. 1990, Tweten 1992 and USDI USFWS 1992a, among others) for their "poor distribution and quality of existing habitat in some areas; high level of natural and man-made fragmentation; and localized deficiencies in habitat connectivity" (USDA USFS 1991, 3&4–27). These areas are "of concern" because of the risk that management activities could create regional barriers, or strong filters, to owl movement and demographic interchange across the landscape.

Historically, demographic and genetic interchanges between northern spotted owl populations in the Cascades Mountains and the coastal mountains were facilitated by a variety of forest segments in Washington, Oregon and northern California. However, during the past century, most of these habitat segments have been supplanted by urban or agricultural development or habitat fragmentation from timber harvest.

Forsman et al. (2002, 11-12) identified three remaining forested segments in the planning area between the Cascade and Coast Range mountains. These were located between the Willamette and Umpqua valleys, the Umpqua and Rogue valleys, and south of the Rogue Valley. Tweten (1992) called these, respectively, the South Willamette-North Umpqua Area of Concern, and the Rogue-Umpqua and Ashland portions of the I-5 Area of Concern (herein referred to the Rogue-Umpqua Area of Concern and the Ashland Area of Concern). All three included BLM-administered lands in the planning area. With respect to their importance for northern spotted owl conservation, Forsman et al. (2002, 30) concluded:

> *"In recent efforts to develop management plans for the northern spotted owl it has been assumed that [these three] forested regions between the large lowland valleys of western Oregon function as dispersal pathways for northern spotted owls between the Coastal Mountains and Cascades Mountains (Thomas et al. 1990, FEMAT 1993). The data clearly demonstrate that this is the case, and that concerns regarding the importance of these areas as dispersal 'corridors' for northern spotted owls are warranted."*

The northern-most of these three "dispersal corridors" is the only forested segment between central Oregon and the Canadian border that links the Cascade Mountains and coastal mountains.

Conservation Needs of the Northern Spotted Owl

Thomas et al. (1990, 23-27) proposed that northern spotted owl conservation required:

- Large blocks of nesting, roosting, and foraging habitat (i.e., suitable habitat) that support clusters of reproducing owls, distributed across a variety of ecological conditions and spaced so as to facilitate owl movement between the blocks, and;

- Habitat conditions within and surrounding large blocks of suitable habitat that facilitate owl movement between the blocks and ensure the survival of dispersing owls.

Fourteen years after Thomas et al. (1990), Courtney et al. (2004, Chapter 9) concluded that, although subsequent northern spotted owl research had refined these conservation needs, they remained valid.

Subsequent to 2004, the U.S. Fish and Wildlife Service began identifying two additional "habitat-specific" conservation needs in its biological opinions[4]:

- A coordinated, adaptive management effort to reduce the loss of habitat due to catastrophic wildfire throughout the northern spotted owl's range, and a monitoring program to clarify whether these risk reduction methods are effective and to determine how owls use habitat treated to reduce fuels, and;
- In areas of significant population decline, the application of the full range of survival and recovery options for this species in light of significant uncertainty.

The U.S. Fish and Wildlife Service added these conservation needs because of findings that the range-wide loss of suitable habitat to wildfire, especially in southern Oregon, posed a greater threat to northern spotted owl conservation than previously had been thought (Courtney et al. 2004, Chapter 6) and because of observed declines in the spotted owl population documented by Anthony et al. (2004).

Conservation Need 1

The formation of large blocks of suitable habitat that support clusters of reproducing owls distributed across a variety of ecological conditions and are spaced so as to facilitate owl movement between the blocks.

Clusters of Reproducing Owls

Thomas et al. (1990, 24) and Lamberson et al. (1994) provided modeled and empirical evidence that "clusters" of at least 20 pairs of reproducing northern spotted owls, which supported one another demographically, were needed for subpopulation stability and persistence within a habitat block. In this context, demographic support means that reproducing owls are capable of interacting in such a manner that the subpopulation would remain stable. For example, the owls would not be so physically isolated from one another so as to repress their normal interactions. Therefore, a "large block of suitable habitat" consists of an arrangement and quality of habitat that is capable of supporting a cluster, or at least 20 pairs, of reproducing northern spotted owls that provide demographic support to one another.

Formation of Large Blocks of Suitable Habitat

A block of suitable habitat is comprised of suitable habitat that has a spatial arrangement (quantity and juxtaposition) needed to support at least one nesting northern spotted owl pair. As explained below, spatial arrangement is a function of the mean annual home range, which varies by physiographic province, and the minimum quantities of suitable habitat that must occur within both the home range and the 500-acre core area. These values are shown in *Table 3-25 (Metrics used to identify blocks of suitable habitat for the northern spotted owl).*

[4]The U.S. Fish and Wildlife Service, in its recent biological opinions, also identified two "habitat-independent" conservation needs: A coordinated research and adaptive management effort to better understand and manage competitive interactions between spotted and barred owls, and monitoring to better understand the risk of West Nile virus and sudden oak death to spotted owls and, for West Nile virus, research into methods that may reduce the likelihood or severity of outbreaks in spotted owl populations. This analysis does not address these conservation needs because, as habitat-independent, they would not be influenced by BLM management in the planning area.

Table 3-25. Metrics Used To Identify Blocks Of Suitable Habitat For The Northern Spotted Owl

Oregon Physiographic Province	Mean annual home range	Radius of a circle equal in size to the mean annual home range	Calculated minimum quantity of suitable habitat within a mean annual home range	Calculated minimum quantity of suitable habitat within a 500-acre core area
	(acres)	(miles)	(acres)	(acres)
West Cascades	2,900	1.2	1,450	250
Coast Range	4,520	1.5	2,260	250
Klamath	3,400	1.3	1,700	250

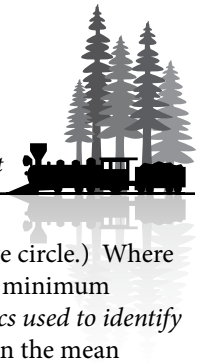
The size of the mean annual home range in each physiographic province[5] is based on Thomas et al. (1990, Appendix I) and Courtney et al. (2004, Chapter 5). Thomas et al. (1990:194) first tabulated the median annual home ranges of northern spotted owl pairs in different study areas and physiographic provinces. According to Courtney et al. (2004, 5-5), although the size of a northern spotted owl home range differed by physiographic province and forest type, and among individual owls within a study area, research between 1990 and 2004 showed that provincial variations were similar to those originally tabulated by Thomas et al. (1990, 194).

The "calculated minimum quantity of suitable habitat within a mean annual home range" for each province, shown in *Table 3-25* (*(Metrics used to identify blocks of suitable habitat for the northern spotted owl)* was based on Courtney et al. (2004, Chapter 5), Olson et al. (2004) and Dugger et al. (2005). It was a multiple of the mean annual home range and the minimum quantity of suitable habitat (50%) that should occur within that area to support owl survival and reproduction. Even though the quantity of suitable habitat is not the best predictor of owl reproduction and survival, and the observed quantities of suitable habitat within occupied owl home ranges vary by region and by study, in general, a northern spotted owl territory is considered to be unstable when less than 50% of the land within the home range supports suitable habitat. See Courtney et al. (2004, Chapter 5), Olson et al. (2004), Dugger et al. (2005) and USDI USFWS (2005b).

The BLM used several studies to estimate the size of, and the minimum quantity of suitable habitat within, a functional core area. Bingham and Noon (1997) defined the core area as that portion of a northern spotted owl home range that received disproportionately high use for nesting, roosting and access to prey; they suggested that 60-70% of owl reproducing season activity occurred in about 20% of the home range. Even though observed core area sizes varied greatly among owls (Courtney et al. 2004, 5-5), Thrailkill (pers. comm.) determined that Bingham and Noon 1997, Wagner and Anthony 1999, Franklin et al. 2000, and Irwin et al. 2004 collectively suggested a core area of about 500 acres. Meyer et al. 1998 and Zabel et al. 2003 found that their best fitting models for predicting owl occupancy also were at the 500-acre scale. Based on several studies (Bart 1995, Franklin et al. 2000, Zabel et al. 2003, and Dugger et al. 2005), 250 acres (50% of a 500-acre core area) was the minimum quantity of suitable habitat that must occur within the core area to form a stable nesting territory.

Because Conservation Need 1 is not specific to BLM-administered lands, this analysis mapped blocks of suitable habitat across all land ownerships. This analysis "moved" a 500-acre (core area) circle over the planning area, centering it on each 25 meter × 25 meter pixel in turn, and calculated the acres of suitable habitat on all lands within that circle. For those core areas that met or exceeded 250 acres (50%) in suitable habitat, the analysis calculated the acres of suitable habitat within the associated provincial mean annual home range. (The province-specific radius of such a circle is shown in *Table 3-25 [Metrics used to identify blocks of suitable habitat for the northern spotted owl]).* For home ranges that fell in more than one province,

[5]Metrics are not included for either the Eastern Cascades or Willamette Valley physiographic provinces because neither Thomas et al. (1990) nor Courtney et al.(2004) estimated mean annual home ranges of those provinces. For purposes of the analysis, the metrics for the West Cascades Province were applied to the Eastern Cascades Province. The Willamette Valley Physiographic Province is not capable of supporting habitat blocks (Lint 2005, Figure 3-7).



the analysis used the province-specific metrics appropriate for the center of the home range circle.) Where the amount of suitable habitat within the larger circle also met or exceeded the "calculated minimum quantity of suitable habitat within a mean annual home range" shown in *Table 3-25 (Metrics used to identify blocks of suitable habitat for the northern spotted owl),* the analysis identified all lands within the mean annual home range circle, collectively, as a block of suitable habitat. Such a block has both the minimum quantity and spatial arrangement of suitable habitat needed to support a pair of reproducing northern spotted owls.

Where blocks of suitable habitat touched or overlapped, the analysis aggregated those blocks into a single block of suitable habitat. This threshold was based on the expectation that northern spotted owl pairs would be less able to support each other demographically, which is a requirement of an owl cluster, when their potential nest locations were separated by more than the diameter of the mean annual home range.

As described above, a "large block" of suitable habitat is capable of supporting at least 20 pairs of reproducing northern spotted owls. The minimum size of a large block was determined using the formula proposed by Thomas et al. (1990, 198):

- 20 owl pairs × the median annual pair home range size × 0.75.

The function 0.75 accounted for the estimated 25% overlap of home ranges (Thomas et al. 1990). This formula generated the minimum area of a large block of suitable habitat in each province. See *Table 3-26 Metrics used to identify and map large blocks of suitable habitat for the northern spotted owl)*.

In accordance with the formula provided by Thomas et al. (1990, 198), if all lands within a habitat block equaled or exceeded the "minimum area of a large habitat block" shown in *Table 3-26* (*Metrics used to identify and map large blocks of suitable habitat for the northern spotted owl)*, the analysis defined that block as a large block of suitable habitat. (Where a block occurred in more than one province, the analysis used the minimum area metric for the province in which the majority of the block occurred.) The remaining blocks remained classified as "small" blocks of suitable habitat.

Distribution of Large Blocks of Suitable Habitat

Thomas et al. (1990:318) considered large blocks of suitable habitat to be distributed across a variety of ecological conditions when they occurred within the full range of ecological gradients (i.e., in all environmental regions of a landscape). In the Northwest Forest Plan (USDA USFS and USDI BLM 1994b, A-3), ecological gradients were defined by the boundaries of the physiographic provinces, which differentiated "areas of common biological and physical processes." This analysis also used the physiographic provinces to express ecological condition.

Spacing of Large Blocks of Suitable Habitat

Thomas et al. (1990, 25-26) considered large blocks of suitable habitat to be spaced properly (so as to facilitate northern spotted owl movement between the blocks) where those blocks were spaced no more

Table 3-26. Metrics Used To Identify And Map Large Blocks Of Suitable Habitat For The Northern Spotted Owl

Physiographic Province	Mean annual home range (acres)	Minimum area of a large habitat block (acres)
West Cascades	2,900	43,500
Coast Range	4,520	67,800
Klamath	3,400	51,000

than 12 miles apart. For small blocks of habitat that were capable of supporting 1 to 19 owl pairs, the distance dropped to no more than 7 miles apart.

Current Habitat Conditions

Current habitat conditions are displayed on *Map 3-4 (The current [2006] distribution of large and small habitat blocks for the northern spotted owl on all land ownerships in the planning area*). The purple lines are plotted 6 miles from large habitat blocks indicating where large habitat blocks are spaced no more than 12 miles apart. Pink lines are plotted 3.5 miles from all habitat blocks, indicating where small habitat blocks are spaced no more than 7 miles from other small or large habitat blocks.

Currently, the planning area supports large blocks of suitable habitat in all physiographic provinces[6]. However, as indicated by the purple lines on *Map 3-4*, there currently are spacing gaps of greater than 12 miles between some large habitat blocks. In the West Cascades and Klamath Provinces, as indicated by the pink lines that surround all habitat blocks, small habitat blocks currently are helping to provide the correct spacing between several large habitat blocks. In some locations (e.g., the gap between large habitat blocks northeast of Eugene), this support is limited.

In the Coast Range Province, current habitat conditions support only two large habitat blocks, both of which are poorly distributed within the province and isolated from large habitat blocks in the other provinces. In addition, small habitat blocks in the Coast Range Province are not positioned to support owl movement throughout most of the province, or between the large habitat blocks in the Coast Range Province and the Klamath and West Cascades Provinces.

Therefore, current habitat conditions in the planning area do not meet Conservation Need 1 because the distribution and spacing of large and small habitat blocks in the Coast Range Province do not meet the spacing criteria.

Conservation Need 2

Habitat conditions within and surrounding large blocks of suitable habitat that facilitate owl movement between the blocks and ensure the survival of dispersing owls

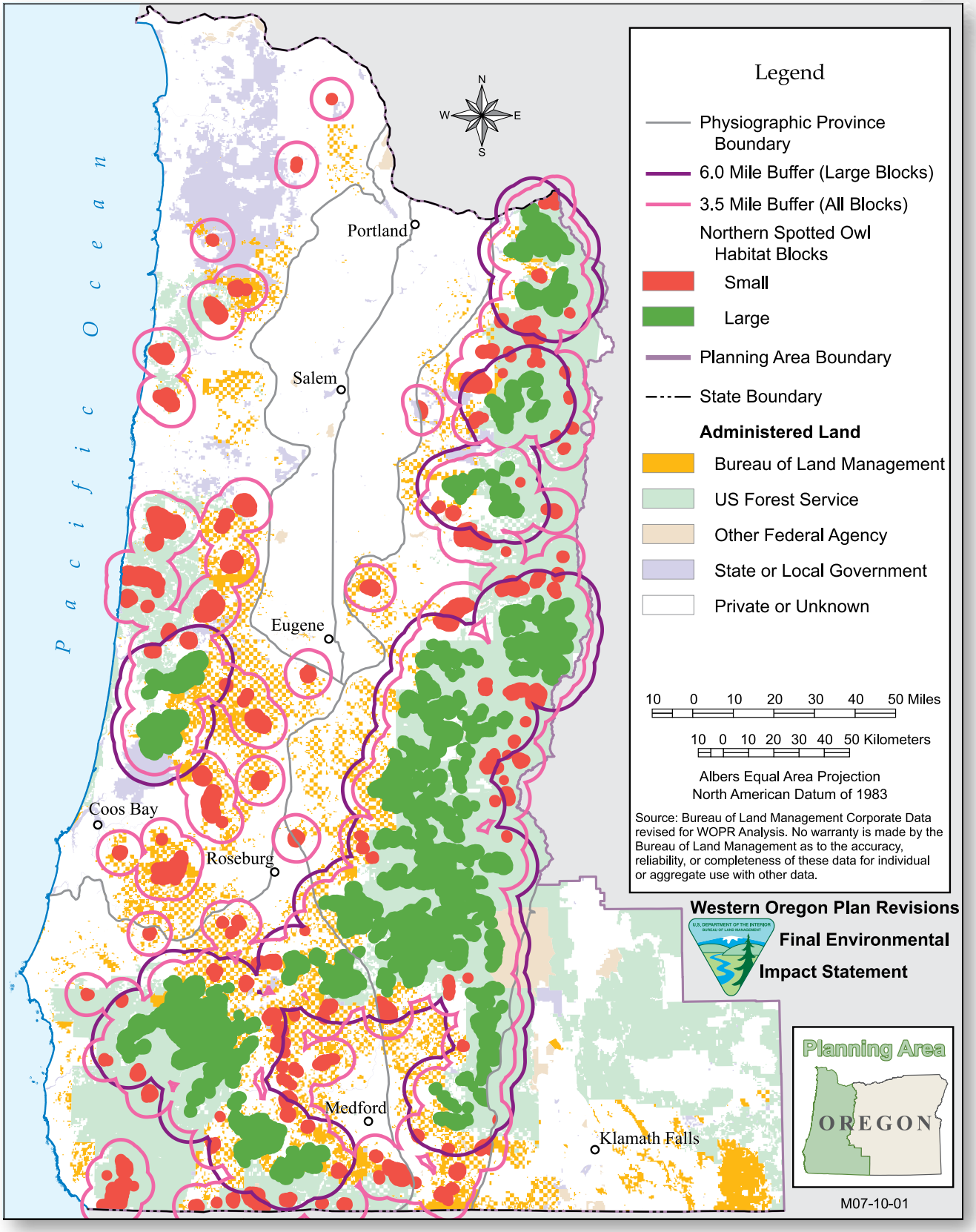
Habitat Conditions Within and Surrounding Large Blocks

Even though Thomas et al. (1990, 27-29 and Appendix J) and Courtney et al. (2004, Chapter 5) defined the minimum structural characteristics of dispersal habitat, the science on the northern spotted owl does not define the minimum quantity or spatial arrangement of such habitat needed to support owl movement between the blocks or the survival of dispersing owls. Instead, Thomas et al. (1990, 27 and 309-310) proposed that, if 50% of the land in a regulated forest supported stands that were older than 40 years (i.e., had an average trunk diameter of at least 11 inches and a canopy closure of at least 40%), and were managed in association with stands of older forest (e.g., visual and riparian corridors, and stands harvested on relatively long rotations), "We would expect much of that managed landbase to be suitable for passage by dispersing northern spotted owls." Although Forsman et al. (2002) subsequently examined northern spotted owl dispersal, the relationship between the degree of forest fragmentation and the movement and survival of dispersing owls was beyond the scope of their study (Forsman et al. 2002, 22). Therefore, the criteria proposed by Thomas et al. (1990) remain the best for evaluating minimum habitat conditions within and surrounding large blocks of suitable habitat that facilitate owl movement between the blocks and ensure the survival of dispersing owls.

[6]The BLM did not anticipate that the Willamette Valley Physiographic Province would support habitat blocks as per Lint 2005, Figure 3-7.

Map 3-4. The Current (2006) Distribution Of Large And Small Habitat Blocks On All Land Ownerships Within The Planning Area

(Note: Purple and pink lines reflect habitat block spacing requirements as described in the text.)



In addition to their criteria, Thomas et al. (1990, 23) stated that "Habitats between blocks [of suitable habitat] function better to allow owls to move (disperse) through them the more nearly they resemble suitable habitat…." Their determination was supported by subsequent research (Courtney et al. 2004, Chapter 5).

This analysis examined development of both dispersal habitat and suitable habitat at the fifth-field watershed scale. Watersheds at this scale typically are sufficiently large to contain multiple northern spotted owl pairs, and the principle management concern for this analysis is to evaluate owl movement between (as opposed to within) potential territories. Deficiencies in dispersal capability at the scale of the fifth-field watershed would better indicate potential problems with owl movement and survival than deficiencies in dispersal capability at finer scales (Thrailkill pers. comm.).

Although both dispersal habitat and suitable habitat types support owl movement and survival, suitable habitat supports those functions better. The analysis tallied development of dispersal habitat at thresholds of 10, 25, and 50% of the land base. As described above, even though the attainment of 50% in association with older stands was considered to be necessary to support owl movement and survival, lesser threshold amounts were included to evaluate departure from minimum necessary conditions. The analysis also tallied development of suitable habitat at thresholds of 10, 25, and 50% of the land base. Even though the attainment of 50% suitable habitat within the core area and the annual home range were considered to be the minimum quantity necessary to support stable northern spotted owl nest territories, lesser threshold amounts were included to evaluate departure from minimum necessary conditions.

Geographic Areas of Concern

The analysis evaluated habitat conditions within the three areas of concern identified by Forsman et al. (2002, 11-12). Although the areas of concern have been identified and described in many studies, they never have been specifically delineated. This analysis used data generated by the previous analyses to evaluate dispersal and suitable habitat conditions within those fifth-field watersheds that the BLM and U.S. Fish and Wildlife Service biologists felt were representative of each area of concern. This identification of the areas of concern by representative fifth-field watersheds is done solely for the purposes of this analysis and does not imply any delineation of the areas of concern.

Current Habitat Conditions

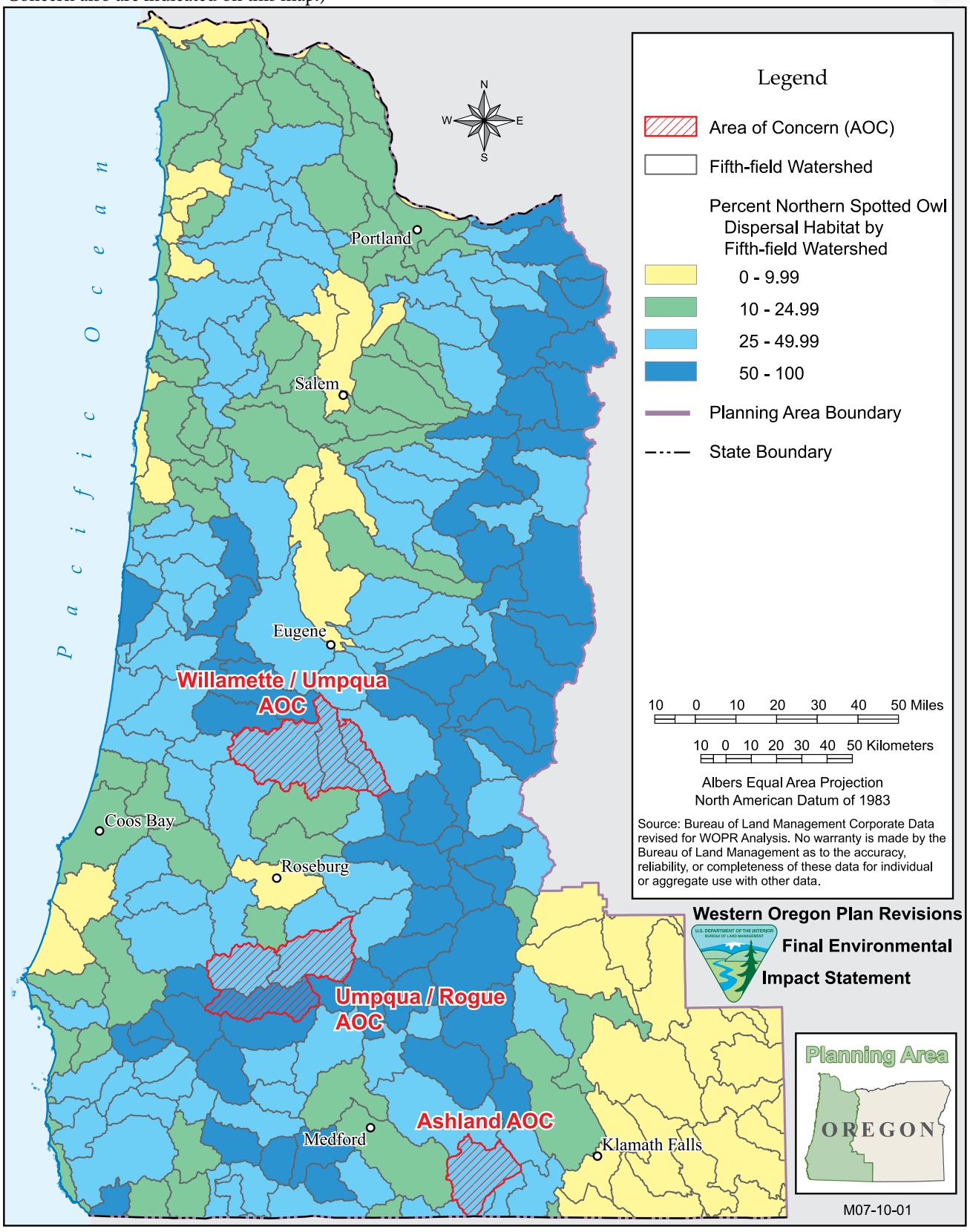
See *Map 3-5 (The current [2006] proportion of northern spotted owl dispersal habitat, on all land ownerships, within each fifth-field watershed of the planning area)*. In the West Cascades Province, functional watersheds (i.e., watersheds that support at least 50% dispersal habitat) are well distributed throughout all but the extreme southern portion of the province. However, functional watersheds are distributed poorly in the Klamath Province and are isolated in the Coast Range Province. In the Klamath Province, habitat conditions appear to be insufficient to support owl movement and survival throughout most of the province and appear to support only limited owl connectivity with the West Cascades Province. In the Coast Range Province, habitat conditions appear to be insufficient to support owl movement and survival throughout most of the province or to provide owl connectivity with the other provinces.

Map 3-6 (*The current [2006] proportion of northern spotted owl suitable habitat, on all land ownerships, within each fifth-field watershed of the planning area)*, shows the current portion of better-quality dispersal habitat (i.e., suitable habitat). Although 50 percent suitable habitat in an area the size of a provincial home range is considered to be the minimum quantity needed to support nesting, lesser (but undetermined) quantities of suitable habitat are expected to facilitate owl movement and survival. *Map 3-*6, therefore, augments Map *3-5*.

As shown in *Map 3-6,* only two fifth-field watersheds currently support 50 percent or more suitable habitat. However, the distribution of watersheds that support at least 25 percent suitable habitat indicates that habitat

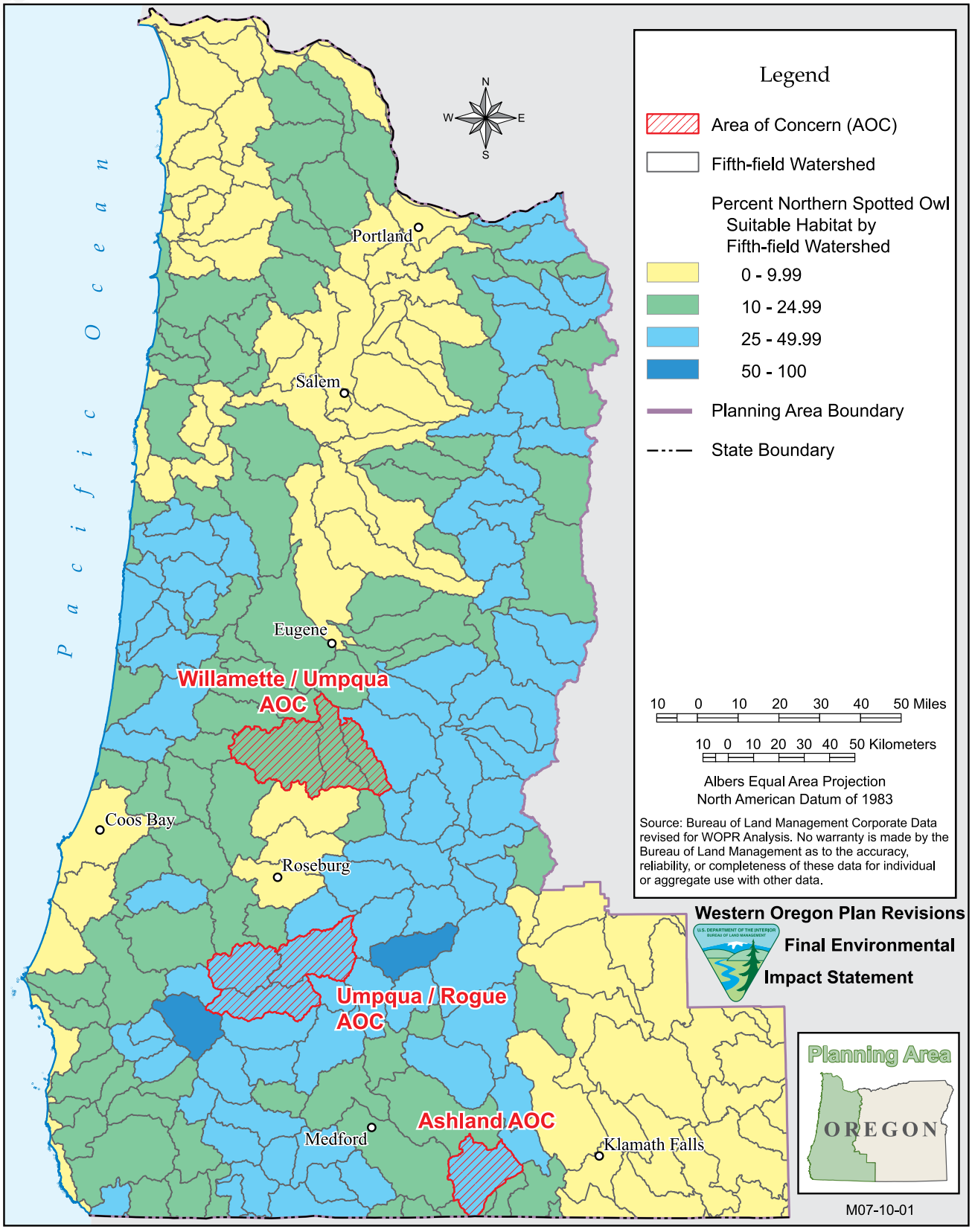
Map 3-5. The Current (2006) Proportion Of Northern Spotted Owl Dispersal Habitat, On All Land Ownerships, Within Each Fifth-Field Watershed Of The Planning Area

(Note: Watersheds that represent the South Willamette-North Umpqua, Umpqua-Rogue, and Ashland Areas of Concern also are indicated on this map.)



Map 3-6. The Current (2006) Proportion of Northern Spotted Owl Suitable Habitat, On All Land Ownerships, Within Each Fifth-Field Watershed of The Planning Area

(Note: Watersheds that represent the South Willamette-North Umpqua, Umpqua-Rogue, and Ashland Areas of Concern also are indicated on this map.)



quality in the extreme southern portion of the West Cascades Province allows these watersheds to support owl movement and survival better than is suggested by *Map 3-5*. In addition, *Map 3-6* suggests better connectivity between the West Cascades and Klamath Provinces, and less fragmentation among watersheds with better-quality dispersal habitat in the Klamath Province, than is suggested by *Map 3-5*. However, *Map 3-6* supports *Map 3-5* in illustrating the current limitation of dispersal habitat conditions in the Coast Range Province, and the apparent inadequacy of connectivity between watersheds in that province and watersheds in the Klamath and West Cascades Provinces.

Map 3-5 and *Map 3-6* also show, respectively, the portion of dispersal and suitable habitats within those watersheds that represent the three areas of concern. As shown in *Map 3-5 (The current [2006] proportion of northern spotted owl dispersal habitat, on all land ownerships, within each fifth-field watershed of the planning area),* only one of three watersheds within the Umpqua-Rogue Area of Concern currently supports sufficient dispersal habitat; habitat conditions in the other two watersheds in the Umpqua-Rogue Area of Concern and in the other two areas of concern are inadequate.

However, *Map 3-6* (*The current [2006] proportion of northern spotted owl suitable habitat, on all land ownerships, within each fifth-field watershed of the planning area)* indicates that spotted owl movement and survival through the Umpqua-Rogue and the Ashland areas of concern are facilitated by better-quality dispersal habitat in those watersheds, even though the quantity of dispersal habitat is inadequate. Both maps indicate that current habitat conditions in the South Willamette-North Umpqua Area of Concern are incapable of supporting owl movement and survival.

Therefore, current habitat conditions on all ownerships in the planning area do not meet Conservation Need 2 because, except in the West Cascades Province, they do not facilitate owl movement between large blocks of suitable habitat or ensure the survival of dispersing owls.

Conservation Need 3

A coordinated, adaptive management effort to reduce the loss of habitat due to catastrophic wildfire throughout the spotted owl's range, and a monitoring program to clarify whether these risk reduction methods are effective and to determine how owls use habitat treated to reduce fuels

Even though wildfire is one of the principal threats to the conservation of the northern spotted owl (Courtney et al. 2008, pp. 13-15), the scientific understanding of how northern spotted owls respond to wildfire is limited due, in part, to limited data, different methods of data collection, and differences between expected and observed owl uses of burned habitat (for example, see Courtney et al. 2004, Chapter 6, 4.7). This is especially true of fires that are less severe (i.e., are not stand-replacement fires) or occur in northern spotted owl habitats that are not yet suitable, or both.

According to the fire regime classification for western Oregon (see the *Fire and Fuels* section), the Coast Range and West Cascades Provinces are primarily within fire regimes III and V, which experience infrequent (every 35 to 200+ years) but severe (stand-replacement) fires, and the Klamath Province is primarily within fire regime I, which experiences more frequent (every 0 to 35 years) but less-severe (surface) fires.

On federally administered lands throughout the range of the northern spotted owl, between 1994 and 2003 stand-replacement fires removed 1.3% of spotted owl nesting habitat (Lint 2005, 56). While this loss of nesting habitat was negligible at the range-wide scale, loss of habitat to wildfire was locally severe where major fires occurred. Lint (2005, pp. 56-63) found that, on all federally administered lands in western Oregon between 1994 and 2003, the Klamath Province lost 6.6% of its northern spotted owl nesting habitat to stand-replacement wildfire, compared to a 0.8% loss in the West Cascades Province and no measurable loss in the Coast Range Province. The loss of habitat in the Klamath Province was due mainly to the Biscuit fire, which burned almost 500,000 acres in Oregon and California and was one of the largest fires in Oregon history. According to Courtney et al. (2004, 6-24 and 6-25), between 1994 and 2003, 50% of the natural

disturbance habitat loss that occurred within the range of the northern spotted owl can be attributed to the Biscuit fire. So the occurrences of fire between 1994 and 2003 could be interpreted only as a "snapshot" of fire occurrence, and extrapolation to longer term patterns of fire occurrence must be done with caution.

However, as is discussed in the Fire and Fuels section of this chapter, there is an emerging trend toward higher severity fires in southern Oregon due to past management practices that have fundamentally changed historic fuel conditions; i.e., southern Oregon will continue to experience fires that are higher in severity than typical of its fire regimes. This was supported by Davis (pers. com.), who found that, among the physiographic provinces in the planning area, the potential for high quality[7] northern spotted owl habitat to be lost to fire appeared to be substantially greater in the Klamath Province and the southern half of the West Cascades Province, than in the Coast Range Province or the northern half of the West Cascades Province[8].

To evaluate the potential loss of habitat due to catastrophic wildfire in the planning area, this analysis focused on the quantities of northern spotted owl habitat in high, low, and mixed fire severity regimes, and on the resiliency of these habitats to withstand fire. Because the BLM "adaptive management effort" referenced in the recovery plan (USDI USFWS 2008a) is confined to BLM-administered lands, this analysis evaluated these variables only on BLM-administered lands.

Fire Severity

A high severity burn typically consumes most of the vegetation in the burn area — a stand replacement fire. High fire severity presents a high risk of loss of northern spotted owl habitat. In contrast, a low severity burn typically consumes mostly ground litter and surface fuels, and causes little or no damage to surrounding trees. In a mixed severity burn, portions of the burn area might receive little or no damage to vegetation, whereas other portions receive substantial damage and all stages in between.

See *Table 3-27 (Associations between northern spotted owl habitats, structural stages and fire severity regimes) for general relationships among these factors.* Although they are not exact, these relationships provide a sufficient basis to evaluate the current conditions and trends with respect to this conservation need.

Fires in the mature structural stages generally are of low severity. This is because such stands have relatively high, closed canopies that inhibit development of understory vegetation and reduce fuel loads. This lessens the likelihood of a heat-intensive burn and commonly places the canopy above the reach of a cooler ground fire (USDA USFS 1982). Structurally complex forests typically are subject to mixed severity burns because such stands exhibit forest openings that foster the growth of understory vegetation and, consequently, higher fuel loads and higher-temperature burns (USDA USFS 1982). Structurally complex stands also exhibit multiple canopy layers that foster the movement of fire into the crown canopy. Because spotted owl suitable habitat generally falls within the mature or structurally complex structural stages, it generally is not subject to high severity fire.

Table 3-27. Associations Between Northern Spotted Owl Habitats, Structural Stages, And Fire Severity Regimes.

Northern Spotted Owl Habitats	Structural Stages	Fire Severity Regimes
Dispersal	All Young High Density	High
	Mature Single Canopy	Low
Suitable	Mature Multiple Canopy	Low
	All Structurally Complex	Mixed

[7]In this context, "high quality" spotted owl habitat is defined as lands that support at least 60 percent suitable habitat within a 0.50-mile radius circle (Davis pers. comm.)

[8]Davis (pers. comm.) measured the relative fire risk of a stand as a function of its biological and geographical condition, the area frequency of lightening strikes, and its distance from the nearest road.

evaluated only in the Klamath Falls Resource Area and the Medford District where there is an emerging trend toward higher severity fires.

A fire resilient stand has legacy trees. The stand structural stages that exhibit fire resiliency are: mature, structurally complex, stand establishment with legacy, young high density with legacy, and young low density with legacy structural stages.

Current Habitat Conditions

Fire severity is discussed separately for the southern and northern portions of the planning area due to the regional differences in fire severity regimes discussed above. See *Table 3-28 (Acres of northern spotted owl suitable and dispersal habitat on BLM-administered lands currently [2006] in low, high and mixed fire severity regimes in the southern and northern portions of the planning area).*

Table 3-29 shows the acres of northern spotted owl habitat in the Medford District and the Klamath Falls Resource that currently have fire resiliency.

No conclusions are made with respect to current habitat conditions because there are no established thresholds related to this conservation need. However, since the threat to spotted owl habitat from fire is likely to increase due to current forest conditions and future climatic changes (Courtney et al. 2008, ii and 13-15), and the U.S. Fish and Wildlife Service has identified habitat loss from fire as one of its primary concerns with respect to spotted owl recovery (USDI USFWS 2008a, 12), Conservation Need 3 establishes a need to increase, over time, the quantities of northern spotted owl habitat in the low and mixed fire severity regimes, and with fire resiliency.

Conservation Need 4

In areas of significant population decline, the application of the full range of survival and recovery options for

Table 3-28. Acres Of Northern Spotted Owl Suitable And Dispersal Habitat On BLM-Administered Lands Currently (2006) In Low, High, And Mixed Fire Severity Regimes In The Southern And Northern Portions Of The Planning Area

Portions of the Planning Area	Suitable Habitat (acres)		Dispersal Habitat (acres)		
	Low	Mixed	High	Low	Mixed
Southern Portion (Medford District and Klamath Falls Resource Area of the Lakeview District)	251,000	205,000	288,000	253,000	205,000
Northern Portion (Salem, Eugene, Roseburg, and Coos Bay Districts)	235,000	339,000	586,000	343,000	339,000

Table 3-29. Acres Of Northern Spotted Owl Suitable And Dispersal Habitat On BLM-Administered Lands Currently (2006) With Fire Resiliency In The Medford District And The Klamath Falls Resource Area

BLM-administered Lands	Suitable Habitat (acres)	Dispersal Habitat (acres)
Medford District	423,000	612,000
Klamath Falls Resource Area (Lakeview District)	32,000	38,000

this species in light of significant uncertainty

Information on northern spotted owl fecundity, survival, and population trends in the planning area was provided by Anthony et al. (2004) and was summarized above. In western Oregon, the area of "significant population decline" during 1985-2003 appeared to have been confined to the northern half of the planning area (where BLM-administered lands fall primarily within the Salem and Eugene Districts). However, the findings by Anthony et al. (2004) now are four years old, and there is a time lag between when a population change occurs and when it statistically is verified. For this reason, this analysis addresses the entire planning area.

Although Anthony et al. (2004) is the most comprehensive evaluation of northern spotted owl populations available to the BLM, the habitat block analysis described above, under Conservation Need 1, provides a credible estimate of the number of currently-functional spotted owl nest territories in the planning area. As described previously, when at least 50% of both a 500-acre core area and the associated mean provincial home range area support suitable habitat, that area could support a breeding pair of spotted owls, regardless of whether or not spotted owls actually occupy the area. The blocks of suitable habitat shown in *Map 3-4 (The current [2006] distribution of large and small habitat blocks for the northern spotted owl on all land ownerships in the planning area*) include 3,820,400 acres on all land ownerships. Since a block of suitable habitat is, by definition, capable of supporting at least one breeding pair, these habitat blocks are capable of supporting approximately 1,698 breeding pairs of spotted owls (based on the provincial home range sizes estimated by Thomas et al. 1990, 198). The large blocks of suitable habitat shown in *Map 3-4* include 2,428,300 acres on all land ownerships; those blocks of habitat are capable of supporting approximately 1,079 breeding pairs of spotted owls within clusters of 20 or more breeding pairs.

No conclusions are made with respect to survival and recovery options because there are no established thresholds related to this conservation need.

Northern Spotted Owl Critical Habitat

The Endangered Species Act of 1973, as amended, requires the U.S. Fish and Wildlife Service to designate critical habitat to the maximum extent prudent and determinable concurrently with listing a species as endangered or threatened. The U.S. Fish and Wildlife Service published its most recent final rule on northern spotted owl critical habitat on July 13, 2008 (USDI USFWS 2008b).

The final rule designated 44 critical habitat units (CHUs) in western Oregon, of which 25 CHUs include BLM-administered lands in the planning area. These CHUs include 688,900 acres of BLM-administered lands of which 656,300 acres (95%) are capable of supporting forest. Of these forest-capable acres, 358,400 acres (55%) currently support northern spotted owl suitable habitat, and an additional 58,600 acres (9%) currently support spotted owl dispersal habitat.